

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 March 11, 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. 62583
COOK County
Section 2003-31I
Route FAI 90/94
Project ACIM-943(369)55
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
2. Other special documentation and/or information that may be required by the contract special provisions

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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. 62583
COOK County
Section 2003-311
Project ACIM-943(369)55
Route FAI 90/94
District 1 Construction Funds**

10.0 miles of lighting and surveillance along FAI 90/94 (Dan Ryan Expressway) from 31st Street to the I-57 interchange 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 - 62583

State Job # - C-91-085-03
 PPS NBR - 1-74823-0505
 County Name - COOK- -
 Code - 31 - -
 District - 1 - -
 Section Number - 2003-31I

Project Number
 ACIM-0943/369/055

Route
 FAI 90/94

Item Number	Pay Item Description	Unit of Measure	Quantity	x	Unit Price	=	Total Price
XX004046	AERIAL CABLE REMOVAL	FOOT	51,135.000				
XX004383	REL CONTR T4 CAB SPL	EACH	1.000				
XX104800	COMB CC&G TBV.12	FOOT	161.000				
X0321973	MOD EX SERVICE INSTAL	EACH	2.000				
X0322256	TEMP INFO SIGNING	SQ FT	1,048.000				
X0322300	ELCBL C 18 4C TW SH	FOOT	147,147.000				
X0323360	WOOD POLE REMOVAL	EACH	295.000				
X0323363	ELCBL C 12 3/C	FOOT	5,403.000				
X0323426	SED CONT DR ST INL CL	EACH	282.000				
X0323574	MAINTAIN LIGHTING SYS	CAL MO	33.000				
X0323710	REMOV COND ATT TO STR	FOOT	2,158.000				
X0323898	CCTV DOME CAMERA	EACH	20.000				
X0323900	CONC FDN TY 1	FOOT	185.000				
X0323907	COMMUNICATIONS VAULT	EACH	27.000				
X0323914	FOC SPLICE - LATERAL	EACH	52.000				

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 Code - 31 - -
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Route
 FAI 90/94

Item Number	Pay Item Description	Unit of Measure	Quantity	x	Unit Price	=	Total Price
X0323917	CABINET MODEL 334	EACH	49.000				
X0323957	FOC SPLICE - MAINLINE	EACH	15.000				
X0324181	DISCON SN LTG/RM WIRE	EACH	51.000				
X0324190	REM/SALV SURVEIL EQP	L SUM	1.000				
X0324191	REM EX SURVEIL EQUIP	L SUM	1.000				
X0324237	CCTV DOME CAM HM TOW	EACH	10.000				
X0324252	E S INST 100A 120/240	EACH	10.000				
X0324254	E S INST 200A 120/240	EACH	3.000				
X0324280	LTG CT RCD C-TY SC/VP	EACH	6.000				
X0324292	MAIN EX TRAFFIC SURV	CAL MO	36.000				
X0324294	NON-INV MAG-IND VH DT	EACH	123.000				
X0324433	LT TOWER SERV PAD 6	SQ FT	7,946.000				
X0324510	LIGHT CONTROLLER FDN	EACH	8.000				
X0324591	NON-INV MAG-IND VD AS	EACH	616.000				
X0324592	2070 CONTROLLER	EACH	45.000				

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Item Number	Pay Item Description	Unit of Measure	Quantity	x	Unit Price	=	Total Price
X0324593	HAR FLASH BEACON ASMB	EACH	3.000				
X0324594	HAR STATION	EACH	1.000				
X0324596	CAB 334EQ RMP METR/SD	EACH	15.000				
X0324597	CCTV CABINET	EACH	26.000				
X0324598	RAMP METER FLASHER	EACH	14.000				
X0324599	ROD AND CLEAN EX COND	FOOT	98,748.000				
X0324602	UD RG-8UCB 1 1/4 POLY	FOOT	80.000				
X0324605	TEMP CCTV CAMERA STA	EACH	4.000				
X0324606	TEMP CCTV CAM STA REL	EACH	6.000				
X0324607	TEMP CCTV CAM STA R&S	EACH	10.000				
X0324697	SOIL STABILIZERS	POUND	112,152.000				
X0324698	APPLY DUST SUP AGENTS	UNIT	41.000				
X0324790	ELCBL C 19 12/C	FOOT	782.000				
X0324791	UTIL TRANSFORM PAD 4	EACH	5.000				
X0324792	C ENC RC 2-5 RGC 2X1	FOOT	947.000				

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Item Number	Pay Item Description	Unit of Measure	Quantity	x	Unit Price	=	Total Price
X0324793	LT TOWER SERV PAD SPL	SQ FT	137.000				
X0324794	COMM SHELTER 10X12	EACH	2.000				
X0324795	COMM SHELTER 10X20	EACH	1.000				
X0324796	CONC FDN TY 2	FOOT	190.000				
X0324797	ELCBL C 2C#2 & 1C#6G	FOOT	12,357.000				
X0324798	ELCBL C 2C#4 & 1C#6G	FOOT	18,676.000				
X0324799	ELCBL C 2C#1/0 & #6G	FOOT	3,442.000				
X0324800	CAB 334 DYN MESS SIGN	EACH	5.000				
X0324801	CAB 334 UNINTERRUP PS	EACH	11.000				
X0324802	CAB 334EQ SYS DETECT	EACH	24.000				
X0324803	CAB 334EQ RAMP METER	EACH	15.000				
X0324804	CAB 334EQ DMS/SYS DET	EACH	3.000				
X0324805	CAB 334EQ DYN MES SGN	EACH	5.000				
X0324806	CAB 334EQ UNINTER PS	EACH	11.000				
X0324807	CCTV CABINET EQUIPMNT	EACH	16.000				

ILLINOIS DEPARTMENT OF TRANSPORTATION
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 NUMBER - 62583

State Job # - C-91-085-03
 PPS NBR - 1-74823-0505
 County Name - COOK- -
 Code - 31 - -
 District - 1 - -
 Section Number - 2003-311

Project Number
 ACIM-0943/369/055

Route
 FAI 90/94

Item Number	Pay Item Description	Unit of Measure	Quantity	x	Unit Price	=	Total Price
X0324808	CCTV DM CAM HMT EX TW	EACH	4.000				
X0324809	CCTV DM CAM SIGN TRUS	EACH	2.000				
X0324810	E S INST 30A 120V	EACH	31.000				
X0324811	E S INST 200A 240/480	EACH	9.000				
X0324812	NEW DMS - CHICAGO RIV	L SUM	1.000				
X0324813	TEMP DETECT STATION	EACH	18.000				
X0324814	TEMP DET SYS REM/SALV	L SUM	1.000				
X0324815	TEMP DET SYS MONTH MN	CAL MO	33.000				
X0324816	TEMP DETECTION HUB	EACH	4.000				
X0324817	TEMP DETECT HUB RELOC	EACH	1.000				
X0324818	CCTV DIST SUBSYS COMC	L SUM	1.000				
X0324819	CCTV DIST SUBSYS TSC	L SUM	1.000				
X0324820	CCTV DIST SBSY I80@SL	L SUM	1.000				
X0324821	CCTV DIS SBSY I57@294	L SUM	1.000				
X0324822	CCTV DIS SBSY I57@I94	L SUM	1.000				

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Item Number	Pay Item Description	Unit of Measure	Quantity	x	Unit Price	=	Total Price
X0324823	CCTV DIS SBSY I55@I94	L SUM	1.000				
X0324824	CCTV DIS SBSY HILLSID	L SUM	1.000				
X0324825	CCTV DIS SBSY EM TR P	L SUM	1.000				
X0324826	TRAF SURV SYSTEM TSC	L SUM	1.000				
X0324827	TRAF SURV SYS I57@I94	L SUM	1.000				
X0324828	TRAF SURV SYS I55@I94	L SUM	1.000				
X0324829	HWAY ADV RADIO CS UPG	L SUM	1.000				
X0324830	HWAY ADV RADIO COM EQ	L SUM	1.000				
X0324831	UNINTER POWER SUP UPG	L SUM	1.000				
X0324834	TEMP DMS SYSTEM	L SUM	1.000				
X0324835	LED DMS F-MATRIX CNFG	EACH	11.000				
X0324836	AUTO TRAF RECORD CAB	EACH	2.000				
X0324837	CB 2P 50A 240V EX MPC	EACH	1.000				
X0324882	PAC SB ENG GEN SYS IO	EACH	3.000				
X0324883	PAC SB ENG GEN SYS RO	L SUM	1.000				

ILLINOIS DEPARTMENT OF TRANSPORTATION
SCHEDULE OF PRICES
CONTRACT
NUMBER - 62583

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Code - 31 - -
District - 1 - -
Section Number - 2003-311

Project Number
ACIM-0943/369/055

Route
FAI 90/94

Item Number	Pay Item Description	Unit of Measure	Quantity	x	Unit Price	=	Total Price
X0324884	TEMP CCTV CAM STA MM	CAL MO	24.000				
X4066414	BC SC SUPER "C" N50	TON	23.000				
X4066426	BC SC SUPER "D" N70	TON	21.000				
X4066614	BCBC SUP IL-19.0 N50	TON	53.000				
X6640200	TEMP CH LK FENCE	FOOT	1,755.000				
X7011015	TR C-PROT EXPRESSWAYS	L SUM	1.000				
X7015050	PORT CHANGE MESS SIGN	CAL MO	198.000				
X7040600	FUR TEMP CONC BARRIER	FOOT	1,120.000				
X7240600	REM RE-ERECT EX SIGN	EACH	5.000				
X8040100	ELECT CONN TO SIN STR	EACH	73.000				
X8100045	CON ENC RC 1-3" CNC	FOOT	252.000				
X8100060	CON T 4 GALVS PVC CTD	FOOT	20.000				
X8101300	CON T 5 GALVS PVC CTD	FOOT	550.000				
X8110110	CON ATS 1 GALVS PVC	FOOT	17,486.000				
X8110115	CON ATS 2 GALVS PVC	FOOT	11,649.000				

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Item Number	Pay Item Description	Unit of Measure	Quantity	x	Unit Price	=	Total Price
X8110121	CON ATS 3 GALVS PVC	FOOT	1,467.000				
X8110125	CON ATS 4 GALVS PVC	FOOT	1,350.000				
X8160145	UD 2#2 #2G EPRRH1.25	FOOT	5,648.000				
X8160160	UD 2#4#4G EPRRH1.25	FOOT	17,149.000				
X8160370	UD 3#4 #6G EPRRH1.25	FOOT	31,141.000				
X8160380	UD 3#2 #4G EPRRH1.25	FOOT	106,543.000				
X8210020	TEMP LUM SV HM HM 400	EACH	24.000				
X8210055	FLUOR LUM FOR SN LTNG	EACH	293.000				
X8250070	TEMP LIGHT CONTR IO	EACH	2.000				
X8300575	LT P A 47.5MH 1-6MA	EACH	38.000				
X8350205	LT TOW 100MH LM 12 IO	EACH	42.000				
X8350305	LT TOW 110MH LM 12 IO	EACH	82.000				
X8350405	LT TOW 120MH LM 12 IO	EACH	11.000				
X8420102	REM EX UNPAS LUM SALV	EACH	392.000				
X8670100	PULLING PEDESTAL	EACH	19.000				

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X8700200	ECA C EPRTC 3C 2/0 6G	FOOT	5,577.000				
X8700210	ECA C EPRTC 3C 4/0 4G	FOOT	1,864.000				
X8700220	ECA C EPRTC 3C 4/0 2G	FOOT	782.000				
X8700550	ECA C TC 3C 350MCM	FOOT	715.000				
X8710028	FIB OPT CBL 6F SM	FOOT	353,667.000				
X8710030	FIB OPT CBL 48F SM	FOOT	92,447.000				
X8710034	FIB OPT CBL 60F SM	FOOT	33,540.000				
X8710035	FIB OPT CBL 96F SM	FOOT	61,654.000				
X8710045	FIB OPT CBL 12F SM PT	FOOT	2,138.000				
X8710052	FO TERM PANEL 12F	EACH	50.000				
X8730248	ELCBL C 18 4PR TW SH	FOOT	2,177.000				
X8801200	SH P LED 1F 2S BM	EACH	2.000				
X8801210	SH P LED 1F 2S PM	EACH	28.000				
X8950112	MOD EX SURVEIL CAB	EACH	5.000				
Z0013798	CONSTRUCTION LAYOUT	L SUM	1.000				

ILLINOIS DEPARTMENT OF TRANSPORTATION
 SCHEDULE OF PRICES
 CONTRACT
 NUMBER - 62583

State Job # - C-91-085-03
 PPS NBR - 1-74823-0505
 County Name - COOK- -
 Code - 31 - -
 District - 1 - -
 Section Number - 2003-31I

Project Number
 ACIM-0943/369/055

Route
 FAI 90/94

Item Number	Pay Item Description	Unit of Measure	Quantity	x	Unit Price	=	Total Price
Z0048665	RR PROT LIABILITY INS	L SUM	1.000				
Z0076600	TRAINEES	HOUR	5,000.000		0.800		4,000.000
20100110	TREE REMOV 6-15	UNIT	797.000				
20100210	TREE REMOV OVER 15	UNIT	207.000				
20101000	TEMPORARY FENCE	FOOT	15,366.000				
20101700	SUPPLE WATERING	UNIT	500.000				
20200100	EARTH EXCAVATION	CU YD	4,075.000				
20201200	REM & DISP UNS MATL	CU YD	921.000				
21101615	TOPSOIL F & P 4	SQ YD	87,017.000				
25000210	SEEDING CL 2A	ACRE	18.000				
25000400	NITROGEN FERT NUTR	POUND	1,623.000				
25000500	PHOSPHORUS FERT NUTR	POUND	1,623.000				
25000600	POTASSIUM FERT NUTR	POUND	1,623.000				
25100630	EROSION CONTR BLANKET	SQ YD	86,933.000				
25200110	SODDING SALT TOLERANT	SQ YD	84.000				

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Item Number	Pay Item Description	Unit of Measure	Quantity	x	Unit Price	=	Total Price
28000250	TEMP EROS CONTR SEED	POUND	1,675.000				
28000400	PERIMETER EROS BAR	FOOT	13,058.000				
28000510	INLET FILTERS	EACH	141.000				
31101400	SUB GRAN MAT B 6	SQ YD	300.000				
35100500	AGG BASE CSE A 6	SQ YD	215.000				
35300300	PCC BSE CSE 8	SQ YD	83.000				
35300510	PCC BSE CSE 10 1/2	SQ YD	201.000				
40600200	BIT MATLS PR CT	TON	0.100				
40600300	AGG PR CT	TON	0.500				
42001300	PROTECTIVE COAT	SQ YD	125.000				
42400200	PC CONC SIDEWALK 5	SQ FT	132.000				
44000006	BIT SURF REM 1 1/2	SQ YD	241.000				
44000035	BIT SURF REM	SQ YD	39.000				
44000100	PAVEMENT REM	SQ YD	279.000				
44000500	COMB CURB GUTTER REM	FOOT	156.000				

ILLINOIS DEPARTMENT OF TRANSPORTATION
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 County Name - COOK- -
 Code - 31 - -
 District - 1 - -
 Section Number - 2003-311

Project Number
 ACIM-0943/369/055

Route
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Item Number	Pay Item Description	Unit of Measure	Quantity	x	Unit Price	=	Total Price
44000600	SIDEWALK REM	SQ FT	228.000				
44001700	COMB C C&G REM & REPL	FOOT	24.000				
44001980	CONC BARRIER REMOV	FOOT	233.000				
44004250	PAVED SHLD REMOVAL	SQ YD	25.000				
48202400	BIT SHLD SUPER 6	SQ YD	450.000				
50200100	STRUCTURE EXCAVATION	CU YD	33.000				
50200400	ROCK EXC STRUCT	CU YD	10.000				
50300225	CONC STRUCT	CU YD	3.000				
50300510	RUSTICATION FINISH	SQ FT	53.000				
50800205	REINF BARS, EPOXY CTD	POUND	210.000				
54201267	P CUL 2 RCCP 12	FOOT	67.000				
54213657	PRC FLAR END SEC 12	EACH	6.000				
60600605	CONC CURB TB	FOOT	352.000				
60603800	COMB CC&G TB6.12	FOOT	41.000				
63000000	SPBGR TY A	FOOT	133.000				

ILLINOIS DEPARTMENT OF TRANSPORTATION
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 County Name - COOK - -
 Code - 31 - -
 District - 1 - -
 Section Number - 2003-31I

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Item Number	Pay Item Description	Unit of Measure	Quantity	x	Unit Price	=	Total Price
63100167	TR BAR TRM T1 SPL TAN	EACH	1.000				
66400305	CH LK FENCE 6	FOOT	982.000				
66400520	CH LK FENCE 12	FOOT	210.000				
66407600	CH LK GATES 6X12 DBL	EACH	2.000				
66410300	CH LK FENCE REMOV	FOOT	973.000				
66410400	CH LK FENCE REM & RE	FOOT	773.000				
66900200	NON SPL WASTE DISPOSL	CU YD	796.000				
66900450	SPL WASTE PLNS/REPORT	L SUM	1.000				
66900530	SOIL DISPOSAL ANALY	EACH	10.000				
67100100	MOBILIZATION	L SUM	1.000				
72000100	SIGN PANEL T1	SQ FT	276.000				
72000300	SIGN PANEL T3	SQ FT	179.000				
72700100	STR STL SIN SUP BA	POUND	954.000				
73400100	CONC FOUNDATION	CU YD	4.000				
80400200	ELECT UTIL SERV CONN	L SUM	1.000		140,000.00		140,000.00

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Item Number	Pay Item Description	Unit of Measure	Quantity	x	Unit Price	=	Total Price
80700140	GROUND ROD 5/8 X 10	EACH	564.000				
80800300	TEMP WP45 CL4	EACH	6.000				
80800400	TEMP WP50 CL4	EACH	179.000				
80800500	TEMP WP60 CL4	EACH	43.000				
80800520	TEMP WP60 CL4 8MA	EACH	2.000				
80800850	TEMP WP90 CL4 15MA	EACH	22.000				
81000400	CON T 1 1/4 GALVS	FOOT	188.000				
81000600	CON T 2 GALVS	FOOT	95,276.000				
81000800	CON T 3 GALVS	FOOT	11,673.000				
81001000	CON T 4 GALVS	FOOT	1,794.000				
81016400	CON T 1 1/4 HDP COIL	FOOT	517,755.000				
81016800	CON T 3 HDP COIL	FOOT	600.000				
81017000	CON T 4 HDP COIL	FOOT	80.000				
81018500	CON P 2 GALVS	FOOT	11,467.000				
81018525	CON P 2 HDP COIL	FOOT	1,798.000				

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Item Number	Pay Item Description	Unit of Measure	Quantity	x	Unit Price	=	Total Price
81018700	CON P 3 GALVS	FOOT	1,655.000				
81018900	CON P 4 GALVS	FOOT	1,739.000				
81018925	CON P 4 HDP COIL	FOOT	600.000				
81022300	CON ENC C 4 PVC	FOOT	2,740.000				
81023750	CON ENC C 3 PVC	FOOT	126.000				
81300220	JUN BX SS AS 6X6X4	EACH	316.000				
81300530	JUN BX SS AS 12X10X6	EACH	272.000				
81300550	JUN BX SS AS 12X12X6	EACH	10.000				
81300830	JUN BX SS AS 18X18X8	EACH	20.000				
81300840	JUN BX SS AS 18X18X12	EACH	2.000				
81300960	JUN BX SS AS 42X36X12	EACH	8.000				
81306400	RELOC EX JUNCT BOX	EACH	64.000				
81306500	REM EX JUNCTION BOX	EACH	11.000				
81400100	HANDHOLE	EACH	1.000				
81400200	HD HANDHOLE	EACH	123.000				

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Item Number	Pay Item Description	Unit of Measure	Quantity	x	Unit Price	=	Total Price
81500200	TR & BKFIL F ELECT WK	FOOT	222,647.000				
81700110	EC C EPR RHW 1C 10	FOOT	62,629.000				
81800100	A CBL 3-1C3/0 A MES W	FOOT	1,400.000				
81800700	A CBL 3-1C2 AL MESS W	FOOT	63,601.000				
82102310	LUM SV HOR MT 310W	EACH	42.000				
82106100	LUM SV HMHM 400W (IO)	EACH	824.000				
82107110	UP LUM 70W HPS SS HS	EACH	382.000				
82107310	UP LUM 150W HPS SS HS	EACH	8.000				
83050860	LT P A 47.5MH 2-6MA	EACH	2.000				
83600200	LIGHT POLE FDN 24D	FOOT	361.000				
83700250	LT TOWER FDN 44D	FOOT	1,955.000				
84100110	REM TEMP LIGHT UNITS	EACH	24.000				
84200500	REM EX LT UNIT SALV	EACH	651.000				
84200705	LIGHTING FDN REM PART	EACH	24.000				
84500110	REMOV LIGHTING CONTR	EACH	8.000				

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Item Number	Pay Item Description	Unit of Measure	Quantity	x	Unit Price	=	Total Price
84500120	REMOV ELECT SERV INST	EACH	8.000				
84500130	REMOV LTG CONTR FDN	EACH	8.000				
86300400	CONT CAB TYPE IV	EACH	2.000				
87000172	ECA C EPRTC 3C 4 #6G	FOOT	174.000				
87000212	ECA C EPRTC 3C 2 #6G	FOOT	680.000				
87000214	ECA C EPRTC 3C 2 #4G	FOOT	2,207.000				
87302405	ELCBL AS COMM 18 3PR	FOOT	800.000				
87502100	TS POST PS 2 1/2	EACH	9.000				
87502207	TS POST PS 5	EACH	20.000				
87502210	TS POST PS 7	EACH	9.000				
87800200	CONC FDN TY D	FOOT	9.000				
87900200	DRILL EX HANDHOLE	EACH	18.000				
88600300	DET LOOP T3	FOOT	780.000				
89502300	REM ELCBL FR CON	FOOT	450.000				
89502350	REM & RE ELCBL FR CON	FOOT	3,605.000				

CONTRACT NUMBER

62583

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:

RETURN WITH BID/OFFER

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.

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

RETURN WITH BID/OFFER

- 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 ___

RETURN WITH BID/OFFER

(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 _____

RETURN WITH BID/OFFER

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. 62583
 COOK County
 Section 2003-311
 Project ACIM-943(369)55
 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. 62583
COOK County
Section 2003-311
Project ACIM-943(369)55
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. 62583
COOK County
Section 2003-311
Project ACIM-943(369)55
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



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

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. 62583
COOK County
Section 2003-311
Project ACIM-943(369)55
Route FAI 90/94
District 1 Construction Funds**



Illinois Department of Transportation



NOTICE TO BIDDERS

- 1. TIME AND PLACE OF OPENING BIDS.** Sealed proposals for the improvement described herein will be received by the Department of Transportation at the Harry R. Hanley Building, 2300 South Dirksen Parkway, in Springfield, Illinois until 10:00 o'clock a.m., March 11, 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. 62583
COOK County
Section 2003-311
Project ACIM-943(369)55
Route FAI 90/94
District 1 Construction Funds**

10.0 miles of lighting and surveillance along FAI 90/94 (Dan Ryan Expressway) from 31st Street to the I-57 interchange 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 March 1, 2005

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

ERRATA Standard Specifications for Road and Bridge Construction (Adopted 1-1-02) (Revised 3-1-05)

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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), Project ACIM-094-3(369)055, Section 2003-311, 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.

FAI 90/94 (I-90/94)
Section: 2003-311
County: Cook
Contract No.: 62583

LOCATION OF PROJECT

The project begins in two locations: East of the Halsted Street overpass on I-57 and west of the Martin Luther King Jr. Drive overpass on I-94 (Bishop Ford Freeway), in the City of Chicago, in Cook County. The project extends northerly along the centerline of the said roadways to I-90/94 (Dan Ryan Expressway). The project continues northerly along the centerline of the Dan Ryan Expressway to 31st Street. The project also extends easterly from the I-90/94 Interchange along the centerline of I-90 (Chicago Skyway) to State Street.

The Project also includes Intelligent Traffic System (ITS) work at the following remote locations:

- Traffic Systems Center in Oak Park.
- Traffic Systems Center in Schaumburg.
- Dynamic Message Sign at the Chicago River
- Dynamic Message Sign on the Bishop Ford

The work includes both lighting and surveillance work.

DESCRIPTION OF PROJECT

The project consists of removal and replacement of the existing lighting and surveillance equipment.

Lighting. Specifically, the lighting work includes replacement of the existing lighting system from the Halsted Street overpass on I-57 and from the Martin Luther King overpass on the Bishop Ford to the 31st Street overpass on the Dan Ryan. In general the conventional lighting system will be replaced with a high mast lighting system. Conventional lighting will be utilized on I-57 between Halsted Street and the railroad overpass on I-57 and between overpasses as required.

Existing light poles, luminaires, and lighting controllers shall be removed and turned over to IDOT. Existing foundations may be identified for removal. Existing cable and cable duct will be abandoned in place.

New light poles, conventional luminaires, lighting controllers, equipment foundations, raceways, handholes, junction boxes, cable and other ancillary equipment will be furnished and installed. New light towers and high mast luminaires will be furnished by IDOT under procurement Contract 62582 and installed under this Contract.

Existing underpass lighting will be replaced at most underpasses throughout the project.

Existing sign lighting will be removed when overhead signs are removed and new sign lighting will be furnished and installed for all overhead signs.

Temporary lighting and temporary power connections will be furnished and installed as shown on the Plans and herein specified and as required to maintain roadway illumination to the existing levels of illumination at all times.

Surveillance. Specifically the Surveillance (ITS) work includes: Ramp Metering, Highway Advisory Radio, Closed Circuit Television, Dynamic Message Signs, Communications and Detection Systems.

PRESTAGE SITE CONSTRUCTION MEETINGS

This work shall consist of meetings with all concerned parties prior to each construction stage. The meetings shall be set up and conducted by the Contractor and shall include all Subcontractors connected with the particular stage. The Department's project staff and all concerned parties, as directed by the Engineer, shall be invited to attend.

The meetings are intended to help improve the coordination and quality of construction, personnel safety on the project site, and safety of the traveling public.

At each meeting, the Contractor shall indicate the current construction schedule for the particular stage, discuss maintenance of traffic, traffic control, project site personnel safety, compliance with the plans and specifications including quality construction, and all other pertinent subjects. Minutes of the meetings will be taken by the Resident Engineer and distributed to those persons in attendance.

The prestage site construction meetings will not be paid for separately but shall be included in the cost of the traffic control item(s) in the Contract.

LOCATION OF UNDERGROUND STATE MAINTAINED FACILITIES

The existing State-maintained facilities will be identified and located by the Electrical Maintenance Contractor as provided elsewhere in these special provisions. Existing electrical work that is being or has been constructed, under Contract 62583 but has not yet been accepted by the Department will be identified and located for each Construction Contract by the 62583 Contractor. The 62583 Contractor shall be responsible for locating existing IDOT electrical facilities that are his responsibility to maintain, as well as locating underground IDOT electrical facilities for other Contractors working on the Dan Ryan reconstruction project, and for other entities who request locating services from the Department for places within the limits of improvement. The Contractor shall also be liable for any damage to IDOT facilities resulting from inaccurate locating. If at any time, the facilities are damaged, the Contractor shall immediately notify the Department and make all necessary arrangements for repair to the satisfaction of the Engineer.

A single locate of existing State-maintained and Contractor-maintained facilities for each construction Contract starting work after the existing equipment has been located for the Contractor shall be included in this Contract. This work will not be paid for separately but shall be considered included in the costs of the Contract. Separate payment will not be made. Additional location services provided to the other construction Contractors, or to other entities, will be paid for at the standard rates for location services in the Contract between IDOT and the Electrical Maintenance Contractor current at the time of the request for locating services.

UTILITY COORDINATION – CITY OF CHICAGO

Effective Date: September 30, 1985

Revised Date: November 1, 1996

The City of Chicago is to make adjustments to their street lighting, emergency communication, 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.

STATUS OF UTILITIES TO BE ADJUSTED

The Contractor shall carefully coordinate work with the following utilities:

NORTH OF 47TH STREET

Name of Utility	Type	Location	Estimated Dates for Start and Completion of Relocation or Adjustment
People Energy	Gas main (Sta. 1628+75 southbound) (Sta. 2629+10 northbound)	at 32 nd St. & Dan Ryan	Gas main to remain. Contractor to excavate and coordinate protection around gas main with extreme care.
City of Chicago	36" Water Main (Sta. 1628+70 southbound) (Sta. 2628+90 northbound)	at 32 nd St.& Dan Ryan	To be relocated by IDOT Contract 62691. Contractor to coordinate work areas. Relocation to be completed by July 2005
City of Chicago	24" Water Main (Sta. 1595+75 southbound) (Sta. 2595+95 northbound)	at 37 th St. & Dan Ryan	To be relocated by IDOT Contract 62691. Contractor to coordinate work areas. Relocation to be completed by December 2005
City of Chicago	24" Water Main (Sta. 1543+80 southbound) (Sta. 2544+00 northbound)	at 45 th St. & Dan Ryan	To be relocated by IDOT Contract 62692. Contractor to coordinate work areas. Relocation to be completed by December 2005

FAI ROUTE 90/94
SECTION 2003-311
COOK COUNTY
CONTRACT #62583

ComEd	Electrical Duct (Sta. 120+22 to 126+00)	Wentworth Ave. South of 35 th Street.	Electrical duct to remain. Contract 62585 Contractor to verify exact location of Com Ed duct prior to driving temporary sheet piling. Contractor to coordinate installation of Com Ed manhole at this location.
SBC	Telephone Duct Sta. 1595+95 (southbound) 2596+15 (northbound)	High Mast Light Towers 7 WAB3 7 WEF4	This Contract (62583) to positively locate existing duct in the vicinity of these HMLT's. Once locations are established pole locations are to be adjusted as necessary with the Engineer's approval.
IDOT	Pipe Underdrain Sta. 4555+05, 88' RT	High Mast Light Tower 7 VEF3	This Contract (62583) to positively locate existing 12" pipe underdrain in the vicinity of this HMLT. Once location is established pole location to be adjusted as necessary with the Engineer's approval.
IDOT	Pipe Underdrain Sta. 4559+15, 77' RT	High Mast Light Tower 7 VEF2	This Contract (62583) to positively locate existing 12" pipe underdrain in the vicinity of this HMLT. Once location is established pole location to be adjusted as necessary with the Engineer's approval.
IDOT	Pipe Underdrain Sta. 4563+20, 101' RT	High Mast Light Tower 8 VEF1	This Contract (62583) to positively locate existing 12" pipe underdrain in the vicinity of this HMLT. Once location is established pole location to be adjusted as necessary with the Engineer's approval.
IDOT	Pipe Underdrain Sta. 3530+20, 76' LT	High Mast Light Tower 7 UCD1	This Contract (62583) to positively locate existing 12" pipe underdrain in the vicinity of this HMLT. Once location is established pole location to be adjusted as necessary with the Engineer's approval.
IDOT	Pipe Underdrain Sta. 3562+80, 112' LT	High Mast Light Tower 8 VAB1	This Contract (62583) to positively locate existing 12" pipe underdrain in the vicinity of this HMLT. Once location is established pole location to be adjusted as necessary with the Engineer's approval.

SOUTH OF 71ST STREET

<u>Name of Utility</u>	<u>Type</u>	<u>Location</u>	<u>Estimated Dates for Start and Completion of Relocation or Adjustments</u>
People's Energy	4" Gas in potential conflict with DET.	72 nd & Lafayette STA 1359+08 LT	Contractor shall use caution when excavating.
People's Energy	4" Gas in potential conflict with HAR.	72 nd & Lafayette STA 1358+28 LT	Contractor shall use caution when excavating.
SBC	36 MTD in potential conflict with COM & L	75 th & Lafayette STA. 1339+68 LT	Contractor shall use caution when excavating.
SBC	36 MTD in potential conflict with DET.	75 th & Lafayette STA. 1339+56 LT	Contractor shall use caution when excavating.
SBC	36 MTD in potential conflict with COM & L.	77 th and Lafayette STA. 1325+99 LT	Contractor shall use caution when excavating.
CTA Electric	6H, 4W in potential conflict with COM & L.	79 th and Lafayette STA. 1314+14 LT	Contractor shall use caution when excavating.
People's Energy	16" M.P. main in potential conflict with COM & L.	79 th and Lafayette STA. 1313+43 LT	Contractor shall use caution when excavating.
People's Energy	16" L.P. main in potential conflict with COM & L.	79 th and Lafayette STA. 1313+38 LT	Contractor shall use caution when excavating.
People's Energy	6" Gas in potential conflict with DMS.	81 st St 1300+66 LT	Contractor shall use caution when excavating.
Com Ed	1H, 2W in potential conflict with DMS.	81 st & Lafayette STA 1300+66 LT	Contractor shall use caution when excavating.
People's Energy	36" H.P. main w/ 42" steel casing in potential conflict with COM, L, DET & DMS.	81 st and Lafayette STA. 1299+13 LT	Contractor shall use caution when excavating.
People's Energy	6" Gas in potential conflict with L.	83 rd & Lafayette STA 1287+48 LT	Contractor shall use caution when excavating.
People's Energy	6" Gas in potential conflict with DET.	85 th & Lafayette STA 1272+85 LT	Contractor shall use caution when excavating.
SBC	24 MTD in potential conflict with COM.	87 th & Lafayette STA. 1259+79	Contractor shall use caution when excavating.
SBC	8 MTD in potential conflict with COM, L, & CCTV.	92 nd and Lafayette STA. 1226+78 LT	Contractor shall use caution when excavating.
People's Energy	6" Gas in potential conflict with DET.	93 rd & Lafayette STA 1219+ 05 LT	Contractor shall use caution when excavating.
People's Energy	50.8" Steel main, potential conflict with COM, L, & CCTV.	CTA Turnaround and Lafayette STA. 1206+71 LT	Contractor shall use caution when excavating.
People's Energy	16" Steel main, potential conflict with COM, L, & CCTV.	CTA Turnaround and Lafayette STA. 1206+65 LT	Contractor shall use caution when excavating.
CTA Electric	Duct in potential conflict with COM, L, & CCTV.	95 th and Lafayette STA. 1205+26 LT	Contractor shall use caution when excavating.
SBC	12 MTD in potential conflict with COM, L, & CCTV.	95 th and Lafayette STA. 1204+32 LT	Contractor shall use caution when excavating.

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CTA Electric	6H, 4W duct in potential conflict with COM, L & CCTV.	95 th and Lafayette STA. 1201+10 LT	Contractor shall use caution when excavating.
People's Energy	6" Gas in potential conflict with L.	74 th & State 2348+65 RT	Contractor shall use caution when excavating.
People's Energy	24" Gas in potential conflict with L.	74 th & State 2348+52 RT	Contractor shall use caution when excavating.
Com Ed	2H, 3W in potential conflict with L.	74 th & State 2348+38 RT	Contractor shall use caution when excavating.
Com Ed	2H, 3W in potential conflict with DET.	74 th St STA 2345+66	Contractor shall use caution when excavating.
People's Energy	24" Gas in potential conflict with DET.	74 th St STA 2345+66	Contractor shall use caution when excavating.
SBC	Duct in potential conflict with COM & L.	75 th and S. State STA. 2339+87 RT	Contractor shall use caution when excavating.
SBC	36 MTD in potential conflict with COM & L.	77 th and S. State STA. 2326+05 RT	Contractor shall use caution when excavating.
People's Energy	2 – 6" Gas mains in potential conflict with DET & DMS.	78 th St 2319+03 RT	Contractor shall use caution when excavating.
People's Energy	24" Gas in potential conflict with DET & DMS.	78 th St 2318+92 RT	Contractor shall use caution when excavating.
People's Energy	16" M.P. Steel Main in potential conflict with COM, L, DET & DMS.	79 th and S. State STA. 2313+66 RT	Contractor shall use caution when excavating.
People's Energy	16" L.P. Steel Main in potential conflict with COM, L, DET & DMS.	79 th and S. State STA. 2313+62 RT	Contractor shall use caution when excavating.
CTA Electric	Duct in potential conflict with COM, L, DET & DMS.	79 th and S. State STA. 2313+54 RT	Contractor shall use caution when excavating.
People's Energy	36" H.P. Steel Main in potential conflict with COM, L, & DET.	81 st and S. State STA. 2299+32 RT	Contractor shall use caution when excavating.
People's Energy	24" Gas & 6" Gas in potential conflict with DET.	82 nd & State STA 2292+55 RT	Contractor shall use caution when excavating.
People's Energy	12" & 6" Gas in potential conflict with DET & DMS.	86 th & State STA 2266+43 RT	Contractor shall use caution when excavating.
SBC	15 MTD in potential conflict with DET & DMS.	86 th & State STA 2266+43 RT	Contractor shall use caution when excavating.
Com Ed	2H, 3W duct in potential conflict with DET & DMS.	87 th and S. State STA. 2266+43 RT	Contractor shall use caution when excavating.
SBC	24 MTD in potential conflict with COM & L.	87 th and S. State STA. 2259+96 RT	Contractor shall use caution when excavating.
CTA Electric	Duct in potential conflict with COM & L.	87 th St STA 2259+90	Contractor shall use caution when excavating.
SBC	15 MTD in potential conflict with DET & HAR.	89 th PL STA 2242+54 RT	Contractor shall use caution when excavating.
Com Ed	4H, 3W in potential conflict with DET & HAR.	89 th PL STA 2242+54 RT	Contractor shall use caution when excavating.
People's Energy	12" & 2" Gas in potential conflict with DET & HAR.	89 th PL STA 2242+54 RT	Contractor shall use caution when excavating.
SBC	8 MTD in potential conflict with COM, L, & CCTV.	92 nd and S. State STA. 2226+94 RT	Contractor shall use caution when excavating.
People's Energy	12" Gas & 6" Gas in potential conflict with DET.	94 th & State STA 2213+13 RT	Contractor shall use caution when excavating.
Com Ed	2H, 3W in potential conflict with DET.	94 th & State STA 2213+13 RT	Contractor shall use caution when excavating.

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SBC	15 MTD in potential conflict with DET.	94 th & State STA 2213+13 RT	Contractor shall use caution when excavating.
People's Energy	50.8" Steel Main in potential conflict with COM & L.	95 th and S. State STA. 2206+90 RT	Contractor shall use caution when excavating.
People's Energy	16" Main in potential conflict with COM & L.	95 th and S. State STA. 2206+84 RT	Contractor shall use caution when excavating.
SBC	12 MTD in potential conflict with COM, & L.	95 th and S. State STA. 2204+54 RT	Contractor shall use caution when excavating.
People's Energy	30" M.P. Main in potential conflict with COM, L, DET AND CCTV.	Michigan Ave Entrance Ramp STA. 2029+00 to 2029+38 RT	Contractor shall use caution when excavating.
SBC	24 MTD in potential conflict with COM, L, DET & CCTV.	Michigan Ave Entrance Ramp STA. 2028+91 to 2029+35 RT	Contractor shall use caution when excavating.
Com Ed	3H, 3W duct in potential conflict with COM, L, DET & CCTV.	Michigan Ave Entrance Ramp STA. 2028+91 to 2029+35 RT	Contractor shall use caution when excavating.
Com Ed	3H, 3W duct in potential conflict with COM & L.	S. State and W. 99 th STA. 422+76 RT	Contractor shall use caution when excavating.
SBC	24 MTD in potential conflict with COM & L.	S. State and W. 99 th STA. 422+66 RT	Contractor shall use caution when excavating.

The above represents the best information available to the Department and is included for the convenience of the bidder. The applicable sections of the Standard Specifications shall apply. This coordination and cooperation by the Contractor will not be paid for separately but shall be considered included in the costs of the Contract.

COORDINATION WITH OTHER CONSTRUCTION PROJECTS

The Contractor shall plan and coordinate their activities with ongoing construction Contracts within the project limits, including the construction of the arterial and parallel frontage road system. The Contractor shall make every effort to coordinate the work described in these Special Provisions with any work being done in other construction Contracts as noted below.

The Contractor shall coordinate with the Construction Contracts listed below. These Contracts include infrastructure work for roadway lighting and ITS systems consisting of raceways, handholes, equipment foundations, and trench and backfill as noted on the plans. The infrastructure to be installed in separate Contracts is defined "by others" as shown on the Plans. These items to be installed "by others" are shown on the Plans as information for the Contractor to gain an understanding of the entire system being installed under a series of simultaneous Contracts. Since several Contracts are simultaneously in progress in the same general area, coordination between Contractors and between the Contractor and the Engineer will be required for installation purposes.

The work in Contract 62583 shall be installed within the Maintenance of Traffic provided in the Contracts listed below. It is the responsibility of the 62583 Contractor to coordinate with other Contractors and provide any additional Maintenance of Traffic necessary as provided elsewhere in these special provisions.

Coordination between the various Contractors regarding the sequence and timing for execution of work items shall be in accordance with Article 105.08 of the Standard Specifications and as herein noted. The Contract limits and coordination items are as follows:

1. Existing Contract #62733 (Dan Ryan Contract 2B) Lighting and Surveillance for Advance Contracts (various locations between 83rd St and 31st St)
Coordination Items:
 - A. Contract #62733 involves the installation of new high mast tower lighting equipment and new detection/ramp metering equipment within the limits of the following Dan Ryan Civil Contracts: #62586, #62589, #62590, and # 62594.
 - B. In those areas, the Contract #62733 Contractor shall be responsible for coordinating existing surveillance equipment removal (by others) with proposed ramp metering installations such that the existing equipment remains in operation as long as possible. The new ramp metering equipment shall be operational prior to the new ramp being opened to traffic.
 - C. In the areas described in item A above, the Contractor shall coordinate with the Contract #62733 Contractor regarding new equipment installations. Surveillance cabinets 37, 41, 42, 47, 49, 50, 51, 52, 59, 60, 61, and 62 (including foundations) slated for installation in Contract #62733 shall be complete in place and accepted by the Engineer prior to commencement of work required to connect the cabinets to new communications/surveillance system components.

- D. CCTV cabinets and poles are to be installed at the following sites in Contract #62733: DR-5A, DR-5B, DR-6A, DR-6B, DR-7A, DR-7B, DR-7C, DR-7D, and DR-7E. At those locations, the cabinets shall be complete in place and accepted by the Engineer prior to the installation of the new cameras in this Contract. At sites DR-9A and DR-9B, the CCTV cabinets are to be installed in Contract #62733, with the poles and cameras installed in this Contract. The poles shall be complete in place accepted by the Engineer prior to the installation of the cabinets. The cabinets shall be complete in place on the poles and accepted by the Engineer prior to the installation of the cameras. At all CCTV locations, the pole foundations shall be installed by others as shown on the plans.
 - E. When directed by the Engineer the Contractor shall assume maintenance responsibility for all lighting and surveillance systems installed in Contract 62733 in accordance with the Project Schedule in the plans.
2. Existing Contract #62585 (Dan Ryan Contract 5) SB Ramps between 31st St and 39th St
- Coordination Items:
- A. Coordinate existing surveillance equipment removal (by Contract #62733 Contractor) with proposed vehicle detection installations such that the existing equipment remains in operation as long as possible. Unless otherwise approved by the Engineer, the new vehicle detection equipment on the ramps shall be operational prior to the new ramp being opened to traffic.
 - B. The existing DMS cabinets for the DMS structure at 37th St will be removed under Contract #62733, coordinated with Contract #62585. Temporary DMS service shall be provided as shown on the plans such that the DMS operation is maintained throughout the Contract. The existing DMS shall operate in the temporary configuration until the new DMS sign, structure, and cabinets have been installed. The new DMS sign, structure and foundation installation are slated for this Contract, coordinated with future Contract #62301.
 - C. Foundations for surveillance cabinets 23 and 27 shall be installed by the Contract #62585 Contractor. The foundations shall be complete in place and accepted by the Engineer prior to the commencement of work on the installation of the cabinets or the connection of communications/surveillance components to the foundations. Coordinate surveillance SC cabinet 25 and 29 foundation installations with slope grading operations.
 - D. Coordinate new communications/surveillance conduit installations under pavement (by others) with the new surveillance equipment being installed under this Contract.
 - E. Provide permanent wiring for high-mast lighting equipment installed in Contract #62733 and remove all temporary wiring and poles.

3. Existing Contract #62584 (Dan Ryan Contract 10) NB Ramps between 31st St and 39th St
Coordination Items:
 - A. Coordinate existing surveillance equipment removal (by Contract #62733 Contractor) with proposed vehicle detection installations such that the existing equipment remains in operation as long as possible. Unless otherwise approved by the Engineer, the new vehicle detection equipment on the ramps shall be operational prior to the new ramp being opened to traffic.
 - B. The foundation for surveillance cabinet 32 is to be installed by the Contract #62584 Contractor. The foundation shall be complete in place and accepted by the Engineer prior to the commencement of work on the installation of the cabinet or the connection of communications/surveillance components to the foundation. Coordinate surveillance cabinet 26, 28, and 30 foundation installations with slope grading operations.
 - C. Coordinate new communications/surveillance conduit installations under pavement (by others) with the new surveillance equipment being installed under this Contract.
 - D. Provide permanent wiring for high-mast lighting equipment installed in Contract #62733 and remove all temporary wiring and poles.
 - E. Coordinate the communications cable pulling pedestals PP-18 and PP-19 foundation installation with slope grading operations.

4. Existing Contract #62590 (Dan Ryan Contract 7) NB and SB C-D System between 67th St and 71st St
Coordination Items:
 - A. Coordinate existing surveillance equipment removal (by others) with proposed vehicle detection/ramp metering installations such that the existing equipment remains in operation as long as possible. The new ramp metering equipment shall be operational prior to the new ramp being opened to traffic.
 - B. Coordinate communications/surveillance system connections to new surveillance cabinets 49, 50, 51, and 52 per item 1B above.
 - C. Coordinate new communications/surveillance conduit installations under pavement (by others) with the new surveillance equipment being installed under this Contract.
 - D. Complete permanent wiring for high-mast lighting equipment installed in Contract #62733, remove all temporary wiring and poles, and install CCTV cameras at CCTV sites DR-7D and DR-7E.

5. Existing Contract #62586 (Dan Ryan Contract 9B) Frontage Roads and Ramps between 47th St and 59th St
Coordination Items:
 - A. Coordinate existing surveillance equipment removal (by others) with proposed vehicle detection/ramp metering installations such that the existing equipment remains in operation as long as possible. The new ramp metering equipment shall be operational prior to the new ramp being opened to traffic.

- B. The existing DMS cabinets for the DMS structure at 37th St will be removed under Contract #62586. Temporary DMS service shall be provided as shown on the plans such that the DMS operation is maintained throughout the Contract. The existing DMS shall operate in the temporary configuration until the new DMS sign, structure, and cabinets have been installed. The new DMS sign, structure and foundation installation are slated for this Contract, coordinated with future Contract #62301.
 - C. Coordinate communications/surveillance system connections to new surveillance cabinets 37, 41, and 42 per item 1B above.
 - D. Coordinate new communications/surveillance conduit installations under pavement (by others) with the new surveillance equipment being installed under this Contract.
 - E. Complete permanent wiring for high-mast lighting equipment installed in Contract #62733, remove all temporary wiring and poles, and install CCTV cameras at CCTV sites DR-5A, DR-5B, DR-6A, and DR-6B.
 - F. Coordinate the communications cable pulling pedestals PP-13 and PP-14 foundation installation with slope grading operations.
6. Existing Contract #62693 (Dan Ryan Contract 9C) Frontage Roads and Ramps between 59th St and 63rd St
Coordination Items:
- A. Coordinate high-mast lighting foundations (by others) and complete permanent wiring for high-mast lighting equipment including installation of CCTV Cameras. All new ramps must be completely illuminated prior to the new ramp being opened for traffic.
7. Existing Contract #62589 (Dan Ryan Contract 11) Skyway Interchange Bridges and Local Lanes from Wentworth Ave to 67th St
Coordination Items:
- A. Coordinate existing surveillance equipment removal (by others) with proposed vehicle detection installations such that the existing equipment remains in operation as long as possible. Unless otherwise approved by the Engineer, the new vehicle detection equipment shall be operational prior to the new ramp being opened to traffic.
 - B. Coordinate new communications/surveillance conduit installations under pavement (by others) with the new surveillance equipment being installed under this Contract.
 - C. Coordinate communications/surveillance system connections to new surveillance cabinet 47 per item 1B above.
 - D. Complete permanent wiring for high-mast lighting equipment installed in Contract #62733, remove all temporary wiring and poles, and install CCTV cameras at CCTV sites DR-7A, DR-7B, and DR-7C.
 - E. Coordinate the installation of the foundations for HAR antenna HAR-02, communications shelter COMM-02, and communications shelter COMM-03 with slope grading operations.

8. Existing Contract #62594 (Dan Ryan Contract 12) NB and SB C-D System between 79th St and 83rd St

Coordination Items:

- A. Coordinate existing surveillance equipment removal (by others) with proposed vehicle detection/ramp metering installations such that the existing equipment remains in operation as long as possible. The new ramp metering equipment shall be operational prior to the new ramp being opened to traffic.
- B. Coordinate new communications/surveillance conduit installations under pavement (by others) with the new surveillance equipment being installed under this Contract.
- C. Coordinate communications/surveillance system connections to new surveillance cabinets 59, 60, 61 and 62 per item 1B above.
- D. Coordinate the installation of new DMS sign DMS-29 on the existing structure with the Contract #62594 Contractor. The installation of the existing structure, sign and foundation shall be coordinated between the Contract #62594 Contractor and the Contract #62733 Contractor.
- E. Coordinate high-mast lighting foundations (by others) and complete permanent wiring for high-mast lighting equipment installed in Contract #62594, remove all temporary wiring and poles, and install CCTV Cameras at CCTV sites DR-9A and DR-9B.
- F. Coordinate the communications cable pulling pedestal PP-07 foundation installation with slope grading operations.

9. Future Civil Contracts

The following future Civil Contracts, scheduled to be under construction during the course of this Contract, will require coordination with this Contract. The Contracts are as follows:

- Contract #62693 (Dan Ryan Contract 9C) 63rd Street to 59th Street Reconstruction of Frontage Roads, Retaining Walls and Ramps
- Contract #62300 (Dan Ryan Contract 14) NB Express Lanes from 31st St to 71st St
- Contract #62302 (Dan Ryan Contract 15) SB Express Lanes from 31st St to 71st St
- Contract #62694 (Dan Ryan Contract 17A) NB Ramps from 71st St to I-57
- Contract #62695 (Dan Ryan Contract 17B) SB Ramps from 71st St to I-57
- Contract #62872 (Dan Ryan Contract 17D) Utility Relocation and Storm Sewer jacking from I-57 Interchange to 73rd Street.
- Contract #62301 (Dan Ryan Contract 18) NB Local Lanes from 31st St to Wentworth Ave
- Contract #62303 (Dan Ryan Contract 19) SB Local Lanes from 31st St to Wentworth Ave

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- Contract #62304 (Dan Ryan Contract 20A) NB Inside Lanes from 71st St to I-57
- Contract #62305 (Dan Ryan Contract 20B) SB Inside Lanes from 71st St to I-57
- Contract #62592 (Dan Ryan Contract 23A) NB Outside Lanes from 71st St to I-57
- Contract #62593 (Dan Ryan Contract 23B) SB Outside Lanes from 71st St to I-57

Coordination Items:

- A. Some communications/surveillance elements are to be installed in separate Contracts “by others” as shown on the plans. These communications/surveillance elements to be installed “by others” are shown on the plans as information for the Contractor to gain an understanding of the entire communications/surveillance system being installed under a series of previous, simultaneous, and future Contracts. Since several Contracts are simultaneously in progress in the same general area, communications/surveillance element installation coordination between other Contractors and the Contractor and the Engineer shall be required. Due to the uncertain sequencing status of the various Contracts, the “by others” elements may or may not be in place at the time of the Contract’s construction. If a “by others” element as shown on the plans is in place at the time of connection to that element by the Contractor, the Contractor shall connect to that element as shown on the plans. If the “by others” element is not in place at the time of connection by the Contractor, the Contractor shall coordinate with the appropriate other Contractor and the Engineer to determine when the connection can be made. Communications/surveillance elements “by others” are shown as accurately as possible as of the date shown on the plans. The Contractor shall coordinate with other Contractors to verify final locations and elevations for communications/surveillance elements “by others” before installing communications/surveillance elements in this Contract that connect to or overlap work “by others.”
- B. Coordinate the installation of DMS signs, structures, and foundations with the appropriate civil Contract. At 57th St, 37th St, and the Chicago River DMS sites, the existing sign shall remain in operation until the new sign is on site, tested, and ready for immediate installation. New DMS signs shall not be installed until the support structure and foundations are complete in place and accepted by the Engineer.
- C. Coordinate existing surveillance equipment removal (by others) with proposed vehicle detection/ramp metering installations such that the existing equipment remains in operation as long as possible. The new ramp metering equipment shall be operational prior to the new ramp being opened to traffic. Mainline and local lane detection shall be maintained such that, at the time the existing detection is removed from operation, temporary detection shall be in place as shown on the plans or as directed by the Engineer.

- D. Within the limits of all future civil Contracts, the existing surveillance equipment cabinets shall be removed in this Contract, with the foundations removed in the appropriate civil Contract. The Contractor shall coordinate with the civil Contractor to ensure timely removal of each cabinet and foundation as directed by the Engineer.
 - E. Except for CCTV/light tower and DMS support structure foundations, all surveillance equipment cabinets and foundations within the limits of the future civil Contracts will be installed in this Contract. The Contractor shall coordinate with the civil Contractor to ensure that all utility, slope grading, and pavement/retaining wall conflicts are mitigated prior to foundation placement. CCTV/light tower and DMS support structure foundations will be installed by the civil Contractor as shown on the plans.
 - F. All CCTV/light towers, cabinets, and cameras will be installed in this Contract. Coordinate with the civil Contractor such that the tower foundations are complete in place and accepted by the Engineer prior to installation of towers, cabinets, and cameras.
 - G. Coordinate new communications/surveillance conduit installations under pavement and through retaining walls (by others) with the new surveillance equipment being installed under this Contract. The Contractor shall connect conduit installed under this contract to the termini of conduit installed in other contracts where shown in the Plans as a continuous run. Contractor shall install conduit under this contract within conduit sleeves (under pavement and through retaining walls) installed in other contracts where shown in the Plans. The Contractor shall locate the termini of conduit installed by others for connection to conduit installed under this contract.
 - H. Coordinate the installation of handholes with the civil Contractors as detailed above. If a handhole is located on a boundary between two civil Contracts, the Contractor shall coordinate with both civil Contractors and the Engineer to determine the most appropriate time to install the handhole such that the new communications/surveillance equipment will not be damaged by either Contractor, and will be operational as quickly as possible.
 - I. Coordinate the installation of electrical and fiber optic cable with the civil Contractors as detailed above. No additional payment shall be made for the re-pulling of cable due to construction staging conflicts.
 - J. Coordinate with the future Contract #62593 Contractor regarding the removal and installation of handholes, conduit and wiring within the limits of the southbound added travel lane at the I-94/I-57 interchange as shown on the plans.
 - K. Coordinate high mast light tower foundations (by others), install high mast light towers and luminaires, install sign luminaires, install temporary wiring as required and install permanent wiring for all lighting equipment including CCTV cameras. Remove all temporary wiring and poles.
10. Conduit, Handhole, Foundation Installation Coordination (all Contracts)
On all Contracts, the Contractor shall coordinate with the appropriate civil Contractor to ensure that all ITS conduits in slope grading areas are installed at a minimum depth of 30 inches below finished grade. The Contractor shall coordinate with the appropriate

civil Contractor to ensure that handholes and foundations are not installed until the final slope elevation at each location has been determined.

For a composite summary detailing surveillance equipment placement and coordination within the various Dan Ryan Contracts, see the “Dan Ryan ITS Construction Staging – Proposed Equipment Installation by Contract” spreadsheet matrix contained elsewhere herein.

For a composite summary detailing under which Contract the existing surveillance equipment cabinets become operational, see the “Dan Ryan – Existing ITS Cabinets Removed from Operation by Civil Contract” spreadsheet matrix contained elsewhere herein.

Surveillance removal sheets and proposed surveillance equipment construction staging maps are included in the Plans as an additional Contractor coordination reference.

Add the following paragraph to the beginning of Article 105.08. “The Contractor shall identify all such work items (including the items listed in the Contract) at the beginning of the Contract and coordinate the sequence and timing for their execution and completion with the other Contractors through the Engineer. All of these work items shall be identified as separate line items in the Contractor’s proposed Construction Progress Schedule. Items requiring coordination between Contracts are not limited to those items listed herein. The Contractor shall exercise diligent effort to coordinate all Contract work for the benefit of the project effort as a whole. Additional compensation or the extension of Contract time will not be allowed for the progress of the work items affected by the lack of such coordination by the Contractor”.

11. Contract #62582 Lighting and Surveillance Procurement
 - A. Light Towers and 400 watt high mast luminaires installed under this Contract will be purchased by IDOT under Contract 62582.

The Contractor shall schedule his operations so as to take delivery and store as applicable all the materials in accordance with the following schedules:

LIGHT TOWER DELIVERY SCHEDULE				
Delivery Time Frame		Quantity		
No earlier Than	No later Than	100 Ft. M.H.	110 Ft. M.H.	120 Ft. M.H.
May 1, 2005	May 30, 2005	42	82	11
LUMINAIRE DELIVERY SCHEDULE				
Delivery Time Frame		Quantity		
No earlier Than	No later Than	Quantity		
May 1, 2005	May 30, 2005	824		

Exact delivery dates within the delivery window shall be closely coordinated with the Engineer and the Supply Contractor.

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Dan Ryan ITS Construction Staging - Proposed Equipment Installation By Contract

EQUIPMENT				CONTRACT NO. (YEAR)																			
TYPE	EQUIPMENT SITE NO.	CABINET NO.	APPROX. STATION	2 (05-07)	2B (04-07)	5 (04-05)	7 (04-05)	9B (04-05)	9C (05)	10 (04-05)	11 (04-05)	12 (04-05)	14 (06)	15 (06)	17A (05)	17B (05)	18 (07)	19 (07)	20A (07)	20B (07)	23A (06)	23B (06)	
	RM-01/DET-01/DET-02	A2	200+50	C											F2								
	Ext CCTV	A1	139+15	C											F2								
	RM-02/DET-08	M2	8764+16	C											F2								
	RM-03/DET-09	68	2215+83	C											F2								
	RM-04/DET-12	65	1250+36	C												F2							
	RM-05/DET-13	64	2268+75	C											F2	F2							
	RM-06/DET-15	62	2286+71		C							F2B											
	RM-07/DET-17	59	1312+03		C							F2B											
	RM-08/DET-19	58	2313+90	C											F2								
	RM-08A/DET-20	57	1331+75	C												F2							
	RM-09/DET-21	56	2344+34	C											F2	F2							
	RM-10/DET-24	53	1360+77	C												F2							
	RM-11/DET-25	52	2371+05		C		F2B																
	RM-12/DET-27	49	1386+36		C		F2B																
	RM-13/DET-31	46	2428+80	C					F2														
	RM-13A	45	1441+77	C					F														
	RM-14/DET-36	41	1473+52		C			F2B															
	RM-15/DET-37	42	2476+25		C			F2B															
	RM-16/DET-40	37	1521+52		C			F2B															
	RM-17/DET-41	38	2538+40	C													F2						
	RM-17A	35A	1552+11	C														F2					
	RM-18/DET-44	36	2560+88	C													F2						
	RM-19/DET-45	31	1576+58	C														F2					
	DET-03-.04	M1	1138+15	C																			
	DET-05-.06	71	233+63	C											F2						F2		
	DET-07	69	144+74	C												F2							
	DET-10	67	1217+46	C												F2							
	DET-11	66	2243+35	C											F2								
	DET-14	63	1273+11	C												F2							
	DET-16/DMS-30	61	1288+46		C							F2B											
	DET-18	60	2310+13		C							F2B											
	DET-19A	58A	2332+00	C											F2								
	DET-20A	57A	1314+50	C												F2							
	DET-22	55	1348+78	C												F2							
	DET-23	54	2355+40	C											F2	F2							
	DET-26	51	1376+34		C		F2B																
	DET-28	50	2380+57		C		F2B																
	DET-29	47	1405+15		C						F2B												
	DET-30	48	2414+02	C													F2						
	DET-31A	46A	2439+18	C					F2														
	DET-32	45A	1427+80	C					F2														
	DET-33-.35/DMS-03	44	2455+60	C													F2						
	DET-34	43	1449+97	C														F2					
	DET-38	39	1493+14	C														F2					
	DET-39	40	2523+96	C													F2						
	DET-41A	38A	2449+53	C												F2							
	DET-42	35	1541+75	C														F2					
	DET-43	33	1561+38	C														F2					
	DET-46	34	2576+15	C													F2						
	DET-47	32	2588+61	C																			
	DET-48	29	1592+51	C			F2				F												
	DET-49/DMS-04	30	2599+66	C						F2													
	DET-50	27	1603+30	C			F																
	DET-51	28	2616+97	C						F2													
	DET-52	25	1619+22	C			F2																
	DET-53	26	2627+65	C						F2													
	DET-54	23	1630+07	C			F																
	DMS-30 (UPS)	DMS-30	1288+82	C																		F2	
	DMS-02	DMS-02	2283+00	C																		F2	
	DMS-02 (UPS)	DMS-02A	2283+30	C																		F2	

CABINETS
RM = Ramp Meter Station
DET = Detector Station
DMS = Dyn. Message Sign
ATR = Automatic Traffic Recorder Station
PP = Pulling Pedestal Station

FAI ROUTE 90/94
SECTION 2003-311
COOK COUNTY
CONTRACT #62583

Dan Ryan ITS Construction Staging - Proposed Equipment Installation By Contract																								
EQUIPMENT				CONTRACT NO. (YEAR)																				
TYPE	EQUIPMENT SITE NO.	CABINET NO.	APPROX. STATION	2 (05-07)	2B (04-07)	5 (04-05)	7 (04-05)	9B (04-05)	9C (05)	10 (04-05)	11 (04-05)	12 (04-05)	14 (06)	15 (06)	17A (05)	17B (05)	18 (07)	19 (07)	20A (07)	20B (07)	23A (06)	23B (06)		
CABINETS RM = Ramp Meter Station DET = Detector Station DMS = Dyn. Message Sign ATR = Automatic Traffic Recorder Station PP = Pulling Pedestal Station	DMS-03 (UPS)	DMS-03	2455+90	C													F2							
	DMS-31 (UPS)	DMS-31	1476+32	C														F2						
	DMS-32	DMS-32	1585+15	C														F2						
	DMS-32 (UPS)	DMS-32A	1585+45	C														F2						
	DMS-04 (UPS)	DMS-04	2599+36	C														F2						
	DMS-08	DMS-08	Chi. River	C														F2						
	DMS-08 (UPS)	DMS-08A	Chi. River	C														F2						
	DMS-29	DMS-29	Bish. Ford				C (Ex.)						F											
	DMS-29 (UPS)	DMS-29A	Bish. Ford				C (Ex.)						F											
	ATR-NB	ATR-01	2503+20	C										F2										
	ATR-SB	ATR-02	1501+20	C											F2									
	PP-01	PP-01	230+26	C																			F2	
	PP-02	PP-02	1143+40	C																		F2		
	PP-03	PP-03	2027+60	C																			F2	
	PP-04	PP-04	2211+19	C												F2								
	PP-05	PP-05	2235+00	C																			F2	
	PP-06	PP-06	2260+00	C																			F2	
	PP-07	PP-07	2289+75	C									F2											
	PP-08	PP-08	2314+00	C												F2								
	PP-09	PP-09	2337+00	C												F2								
PP-10	PP-10	2363+00	C																			F2		
PP-11	PP-11	2381+03	C																					
PP-12	PP-12	4420+00	C															F2						
PP-13	PP-13	4456+80	C					F2																
PP-14	PP-14	4500+90	C					F2																
PP-15	PP-15	4531+20	C															F2						
PP-16	PP-16	4557+25	C															F2						
PP-17	PP-17	4588+00	C								F2													
PP-18	PP-18	4617+30	C							F2														
PP-19	PP-19	4637+40	C															F2						
MICROLOOP CONDUITS RM = Ramp Meter Station DET = Detector Station	RM-01/DET-01/DET-02	A2	200+50												D (NB)	D (SB)								
	RM-02	M2	8764+16												D									
	RM-03	68	2215+83												D									
	RM-04	65	1250+36													D								
	RM-05	64	2268+75													D								
	RM-06	62	2286+71																					
	RM-07	59	1312+03										D											
	RM-08	58	2313+90													D								
	RM-08A	57	1331+75														D							
	RM-09	56	2344+34													D								
	RM-10	53	1360+77														D							
	RM-11	52	2371+05					D																
	RM-12	49	1386+36					D																
	RM-13	46	2433+17							D														
	RM-13A	45	1441+77							D														
	RM-14	41	1473+52						D															
	RM-15	42	2476+25						D															
	RM-16	37	1521+52						D															
	RM-17	38	2538+40															D						
	RM-17A	35A	1552+11																D					
	RM-18	36	2560+88																D					
	RM-19	31	1576+58																D					
	DET-03	M1	1138+15																				D	
	DET-04	M1	1138+15																				D(SBO)	
	DET-05	71	233+63																	D(RO,NBO)		D(RI,NBI)	D(SBO)	
	DET-06	71	233+63													D(R)					D(SBI)		D(SBO)	
	DET-07	69	144+74														D(R)				D(RO,SBI)		D(RI,SBO)	
	DET-08	M2	8764+16																		D(R,NBI)		D(NBO)	
	DET-09	68	2215+83																		D(NBI)		D(NBO)	

Dan Ryan ITS Construction Staging - Proposed Equipment Installation By Contract

EQUIPMENT				CONTRACT NO. (YEAR)																			
TYPE	EQUIPMENT SITE NO.	CABINET NO.	APPROX. STATION	2 (05-07)	2B (04-07)	5 (04-05)	7 (04-05)	9B (04-05)	9C (05)	10 (04-05)	11 (04-05)	12 (04-05)	14 (06)	15 (06)	17A (05)	17B (05)	18 (07)	19 (07)	20A (07)	20B (07)	23A (06)	23B (06)	
	DET-10	67	1217+46													D(R)					D(SBI)		D(SBO)
	DET-11	66	2242+75												D(R)					D(NBI)		D(NBO)	
	DET-12	65	1250+36																		D(SBI)		D(SBO)
	DET-13	64	2268+75																		D(NBI)		D(NBO)
	DET-14	63	1273+11													D(R)					D(SBI)		D(SBO)
	DET-15	62	2286+71									D(R)								D(NBI)		D(NBO)	
	DET-16	61	1288+46									D(R)									D(SBI)		D(SBO)
	DET-17	59	1312+03									D											
	DET-18	60	2310+13									D											
	DET-19	58	2313+90												D(R)						D(NBI)		D(NBO)
	DET-19A	58A	2332+00												D								
	DET-20	57	1331+75													D(R)							D(SBO)
	DET-20A	57A	1314+50													D							
	DET-21	56	2344+34												D								
	DET-22	55	1348+78													D(R)					D(SBI)		D(SBO)
	DET-23	54	2355+40												D(R)						D(NBI)		D(NBO)
	DET-24	53	1360+77														D						
	DET-25	52	2371+05				D(R)							D(NBO)				D(NBI)					
	DET-26	51	1376+34				D(R)								D(SBO)				D(SBI)				
	DET-27	49	1386+36				D(R,L)								D(SB)								
	DET-28	50	2380+57				D(R,L)							D(NB)									
	DET-29	47	1405+15								D(R,L)				D(SB)								
	DET-30	48	2414+02								D(L)												
	DET-31	46	2433+17											D(NB)									
	DET-31A	46A	2439+18						D														
	DET-32	45A	1427+80						D(R)						D(SB)								
	DET-33	44	2472+80												D(NB)								
	DET-34	43	1449+97																				
	DET-35	44	2472+80												D(SB,R)						D(L)		
	DET-36	41	1473+52												D(SB)								
	DET-37	42	2476+25												D(NB)								
	DET-38	39	1493+14												D(SB)								
	DET-39	40	2523+96												D(NB)						D(L)		
	DET-40	37	1521+52												D(SB,R)								
	DET-41	38	2538+40												D(NB)								
	DET-41A	38A	2449+53																		D(R,L)		
	DET-42	35	1544+28												D(SB,R)						D(R,L)		
	DET-43	33	1561+38												D(SB)						D(R,L)		
	DET-44	36	2560+88												D(NB)						D(L)		
	DET-45	31	1576+58												D(SB)						D(L)		
	DET-46	34	2576+15												D(NB)						D(R,L)		
	DET-47	32	2588+61								D												
	DET-48	29	1592+51				D																
	DET-49	30	2599+66								D(R)				D(NB)								
	DET-50	27	1603+30				D(R)														D(L)		
	DET-51	28	2616+97								D												
	DET-52	25	1619+22				D																
	DET-53	26	2627+65																				
	DET-54	23	1630+07				D(R)																
	ATR-NB	ATR-01	2503+20																				
	ATR-SB	ATR-02	1501+20												D(SBI)								
	CH-0A (CCTV-01)	CH-0A	235+00																				
	BF-0B (CCTV-02)	BF-0B	1147+07																				
	BF-0D (CCTV-03)	BF-0D	2003+81																				
	DR-11 (CCTV-04)	DR-11	1200+00																				F
	DR-10A (CCTV-05)	DR-10A	1241+00																				F
	DR-9C (CCTV-06)	DR-9C	2265+15																				
	DR-9A (CCTV-07)	DR-9A	2297+00											F									
	DR-8A (CCTV-08)	DR-8A	1359+00																				

MICROLOOP CONDUITS
RM = Ramp Meter Station
DET = Detector Station
ATR = Automatic Traffic Recorder Station

CCTV STATIONS
(cameras/cabinets mounted on High-mast Towers)

FAI ROUTE 90/94
SECTION 2003-311
COOK COUNTY
CONTRACT #62583

Dan Ryan ITS Construction Staging - Proposed Equipment Installation By Contract																								
EQUIPMENT				CONTRACT NO. (YEAR)																				
TYPE	EQUIPMENT SITE NO.	CABINET NO.	APPROX. STATION	2 (05-07)	2B (04-07)	5 (04-05)	7 (04-05)	9B (04-05)	9C (05)	10 (04-05)	11 (04-05)	12 (04-05)	14 (06)	15 (06)	17A (05)	17B (05)	18 (07)	19 (07)	20A (07)	20B (07)	23A (06)	23B (06)		
CCTV STATIONS (cameras/cabinets mounted on High-mast Towers)	DR-7C (CCTV-09)	DR-7C	2397+00	CA	C, P						F													
	DR-7A (CCTV-10)	DR-7A	1421+75	CA	C, P						F													
	DR-6B (CCTV-11)	DR-6B	2457+00	CA	C, P			F																
	DR-5B (CCTV-12)	DR-5B	1508+00	CA	C, P			F																
	DR-4C (CCTV-13)	DR-4C	2542+50	C, CA, P														F						
	DR-3C (CCTV-14)	DR-3C	1599+92	C, CA, P															F					
	DR-2B (CCTV-15)	DR-2B	28th St.	C, CA, P														F						
DR-2A (CCTV-16)	DR-2A	Canal St.	C, CA, P															F						
"FUTURE" CCTV STATIONS (cameras/cabinets mounted on High-mast Towers)	CH-0B (SC-01)	CH-0B	220+00	C, CA, P																		F		
	BF-0A (SC-02)	BF-0A	2032+00	C, CA, P											F									
	BF-0C (SC-03)	BF-0C	1137+75	C, CA, P																	F			
	DR-10C (SC-04)	DR-10C	1216+75	C, CA, P												F								
	DR-10B (SC-05)	DR-10B	2226+75	C, CA, P													F							
	DR-9B (SC-06)	DR-9B	1287+15	CA, P	C								F										F	
	DR-8C (SC-07)	DR-8C	1324+25	C, CA, P												F								
	DR-8B (SC-08)	DR-8B	2346+75	C, CA, P												F	F							
	DR-7E (SC-09)	DR-7E	2371+80	CA	C, P			F																
	DR-7D (SC-10)	DR-7D	1388+50	CA	C, P			F																
	DR-7B (SC-11)	DR-7B	2402+00	CA	C, P							F												
	DR-6D (SC-12)	DR-6D	2435+75	C, CA, P						F														
	DR-6C (SC-13)	DR-6C	1448+00	C, CA, P						F														
	DR-6A (SC-14)	DR-6A	1473+35	CA	C, P											F								
	DR-5A (SC-15)	DR-5A	1525+90	CA	C, P																			
	DR-4B (SC-16)	DR-4B	2555+00	C, CA, P														F						
	DR-4A (SC-17)	DR-4A	1567+00	C, CA, P															F					
DR-3D (SC-18)	DR-3D	2588+40	C, CA, P															F						
DR-3B (SC-19)	DR-3B	1608+00	C, CA, P																F					
DR-3A (SC-20)	DR-3A	1625+50	C, CA, P																F					
DYNAMIC MESSAGE SIGN STRUCTURES (Station Shown is Structure Location)	DMS-30	61	1287+00	S																	F (right)		F (left)	
	DMS-02	DMS-02	2283+00	S																	F (left)		F (right)	
	DMS-03	44	2461+50	S														F						
	DMS-31	DMS-31	1476+62	S																				
	DMS-32	DMS-32	1583+50	S																				
	DMS-04	30	2607+00	S																				
	DMS-08	DMS-08	Chi. River	S																				
DMS-29	DMS-29	Bish. Ford	S(New)	S(Ex)								F												
HIGHWAY ADVISORY RADIO	HAR-01	N/A	I-57	A												F2								
	HAR-02	N/A	Skyway	A							F2													
	HAR-03	N/A	Roos. Rd	A																	F2			
FLASHING BEACON SIGNS (Station Shown is Structure Location; Un-numbered Cabinets Mounted on Signs)	FBS-01	N/A	I-57	S																				
	FBS-02	N/A	Bish. Ford	S																		F2		
	FBS-03	N/A	2232+35	S																			F2	
	FBS-04	N/A	1343+00	S																				
	FBS-05	N/A	2446+00	S														F2						F2
	FBS-06	N/A	Roos. Rd	S																		F2		
COMM HUBS	COMM-01	N/A	I-57	SH(Ex)																				
	COMM-02	N/A	Skyway(w)	SH							F2													
	COMM-03	N/A	Skyway(e)	SH							F2													
	COMM-04	N/A	N. of 31st	SH																		F2		

D = Detector Conduit in Contract (R = Ramp(s), L = Local Lanes, NB/SB = Express Lanes, NBI/SBI = NB/SB Mainline Inside Lanes, NBO/SBO = NB/SB Mainline Outside Lanes, RI/RO = Ramp Inside/Outside Lanes)

C = Cabinet in Contract. Coordinate with appropriate Civil contract as shown.

F = Foundation in Contract

F2/F2B = Foundation in Contract 2/2B. Coordinate with appropriate Civil contract as shown.

P = CCTV/Lt. pole in Contract

CA = CCTV Camera in Contract

S = Sign Structure in Contract

S(Ex) = Existing DMS relocated from 57th St. - installed in C2B on structure provided in C12, S(New) = New DMS (to replace the relocated DMS installed on the Existing Structure in C2B/12)

A = HAR Antenna in Contract

SH = Comm Shelter in Contract (Ex = Existing)

Dan Ryan - Existing ITS Cabinets Removed from Operation By Civil Contract

EQUIPMENT		CONTRACT NO. (YEAR)																
LOCATION	SITE NO.	5 (04-05)	7 (04-05)	9B (04-05)	9C (05)	10 (04-05)	11 (04-05)	12 (04-05)	14 (06)	15 (06)	17A (06)	17B (06)	18 (07)	19 (07)	20A (07)	20B (07)	23A (06)	23B (06)
EB 57 @ Halsted (Ent. Ramp)	A2										X							
WB 57 @ Halsted (Exit Ramp)	A5	EX.	CAB.	AND	FDN	TO	REMAIN											
WB 57 @ C&WI RR (Mainline)	A3	EX.	CAB.	AND	FDN	TO	REMAIN											
WB 57 @ Wentworth (Exit Ramp)	A1										X							
NB 57-EB Bishop Ford Ramp	M990														X			
NB 57-NB Ryan Ramp	M92										X							
SB Ryan-EB Ford (W. of Mich Av)	M1															X		
NB Wabash-NB Ryan Ent. Ramp	M2										X							
SB Ryan-SB 57 Ramp	N89																	X
NB 57-NB Ryan Ent. Ramp Gore	M90																X	
NB Ryan STA. 2215 (Ent. Ramp)	O86										X							
NB Ryan STA. 2215 (Mainline)	O88										X							
SB Ryan STA. 1216 (Exit Ramp)	O87											X						
NB Ryan STA. 2242 (Ent. Ramp)	O84										X							
SB Ryan STA. 1247 (Ent. Ramp)	O85											X						
NB Ryan STA. 2267 (Ent. Ramp)	P82										X							
SB Ryan STA. 1273 (Exit Ramp)	P83											X						
NB Ryan STA. 2293 (Ent. Ramp)	P80							X										
NB Ryan STA. 2301 (Exit Ramp)	P78							X										
SB Ryan STA. 1298 (Exit Ramp)	P81							X										
SB Ryan STA. 1301 (Ent. Ramp)	P79							X										
SB Ryan STA. 1306 (Ent. Ramp)	P77							X										
NB Ryan STA. 2319 (Ent. Ramp)	P76										X							
NB Ryan STA. 2325 (Exit Ramp)	R74										X							
SB Ryan STA. 1320 (Exit Ramp)	P75											X						
SB Ryan STA. 1324 (Mainline)	P73											X						
SB Ryan STA. 1327 (Ent. Ramp)	R71											X						
NB Ryan STA. 2346 (Ent. Ramp)	R72										X							
NB Ryan STA. 2352 (Exit Ramp)	R70										X							
SB Ryan STA. 1353 (Exit Ramp)	R69											X						
SB Ryan STA. 1359 (Ent. Ramp)	R67											X						
NB Ryan STA. 2373 (Ent. Ramp)	R66		X															
NB Ryan STA. 2377 (Mainline)	CMS-2		X															
SB Ryan STA. 1377 (Frontage Rd.)	R65		X															
SB Ryan STA. 1385 (Ent/Exit Ramp)	R63		X															
SB Ryan STA. 1410 (Exp/Local)	S61						X											
NB Ryan STA. 2413 (Exp/Local)	S64								X									
NB Ryan STA. 2430 (Ent. Ramp)	S62				X													
SB Ryan STA. 1432 (Exit Ramp)	S59				X													
SB Ryan STA. 1443 (Ent. Ramp)	S57				X													
NB Ryan STA. 2439 (Exit Ramp)	S60				X													
NB Ryan STA. 2448 (Local)	T58				X													
NB Ryan STA. 2449 (Frontage Rd)	T56				X													
SB Ryan STA. 1448 (Ent. Ramp)	T55				X													

Dan Ryan - Existing ITS Cabinets Removed from Operation By Civil Contract																		
EQUIPMENT		CONTRACT NO. (YEAR)																
LOCATION	SITE NO.	5 (04-05)	7 (04-05)	9B (04-05)	9C (05)	10 (04-05)	11 (04-05)	12 (04-05)	14 (06)	15 (06)	17A (05)	17B (05)	18 (07)	19 (07)	20A (07)	20B (07)	23A (06)	23B (06)
SB Ryan STA. 1448 (Frontage Rd)	T53				X													
SB Ryan STA. 1453 (Exit Ramp)	T51			X														
NB Ryan STA. 2457 (Mainline)	CMS-3			X														
NB Ryan STA. 2471 (Exit Ramp)	T54			X														
SB Ryan STA. 1472 (Ent. Ramp)	T49			X														
NB Ryan STA. 2475 (Frontage Rd)	T52			X														
SB Ryan STA. 1475 (Frontage Rd)	T47			X														
NB Ryan STA. 2478 (Ent. Ramp)	T50			X														
SB Ryan STA. 1481 (Exit Ramp)	T45			X														
SB Ryan STA. 1502 (Exit Ramp)	U43			X														
NB Ryan STA. 2502 (Exit Ramp)	U48			X														
SB Ryan STA. 1503 (Frontage Rd)	U41			X														
NB Ryan STA. 2509 (All Lanes)	U46			X														
SB Ryan STA. 1511 (All Lanes)	U39			X														
NB Ryan STA. 2541 (All Lanes)	V44												X					
SB Ryan STA. 1542 (Ramp/Locals)	V37													X				
SB Ryan STA. 1546 (Rmps/Exprs)	V35													X				
NB Ryan STA. 2549 (Exit Ramp)	V42												X					
NB Ryan STA. 2561 (Ent. Ramp)	V40								X									
NB Ryan STA. 2567 (Express)	V38								X									
SB Ryan STA. 1566 (Ramp/Exprs)	V33																X	
SB Ryan STA. 1572 (Ramp/Local)	V31																X	
NB Ryan STA. 2574 (Exit Ramp)	V36								X									
NB Ryan STA. 2588 (Ramp/Exprs)	W34					X												
SB Ryan STA. 1592 (Exit Ramp)	W29	X																
NB Ryan STA. 2597 (Mainline)	CMS-4					X												
NB Ryan STA. 2602 (Ramp/Exprs)	W32					X												
SB Ryan STA. 1606 (All lanes)	W27	X																
NB Ryan STA. 2610 (35th St. int.)	CMS-4A (No #)					X												
NB Ryan STA. 2617 (Ramp/Local)	W30					X												
SB Ryan STA. 1623 (Express)	W25									X								
NB Ryan STA. 2623 (Express)	W28								X									
NB Ryan STA. 2628 (Exit Ramp)	W26					X												
SB Ryan STA. 1629 (Ramp/Local)	W23	X																
NB Ryan @ Chicago River	CMS-8													X				
NB ATR @ 51st St.	ATR-NB			X														
SB ATR @ 51st St.	ATR-SB			X														
HAR @ 51st St.	HAR Antenna			X														

X = ITS Cabinet/HAR Antenna removed from operation during Civil Contract

For cabinets removed from operation during Civil Contracts 7, 9B, 11, and 12, the cabinet and the foundation shall be removed in the Civil contract.

For cabinets removed from operation during Civil Contracts 5 & 10, the cabinet and the foundation shall be removed in ITS Contract 2B.

Rev. 10/29/04

For cabinets removed from operation during all other Civil Contracts, the cabinet shall be removed in ITS Contract 2, and the foundation shall be removed in the Civil contract.

Add the following paragraph to the beginning of Article 105.08. "The Contractor shall identify all such work items (including the items listed in the Contract) at the beginning of the Contract and coordinate the sequence and timing for their execution and completion with the other Contractors through the Engineer. All of these work items shall be identified as separate line items in the Contractor's proposed Construction Progress Schedule. Items requiring coordination between Contracts are not limited to those items listed herein. The Contractor shall exercise diligent effort to coordinate all Contract work for the benefit of the project effort as a whole. Additional compensation or the extension of Contract time will not be allowed for the progress of the work items affected by the lack of such coordination by the Contractor".

(CTE – 11/29/2004)

CONTRACTOR COOPERATION

The Contractor's attention is directed to the fact that other separate Contracts will 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.

CTA Coordination

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

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

Mr. Marvin A. Watson
General Manager, Construction
567 W. Lake Street
P. O. Box 7598
Chicago, IL 60680-7598
(312) 681-3860

2. NOTIFICATION TO CTA:

- A. After the letting of the contract and prior to performing any work, the CTA Representative shall be notified by the Department to attend the pre-construction meeting. In this meeting, the Contractor shall confer with the CTA's Representative regarding the CTA's requirements for the protection of CTA utilities clearances, operations, and safety.

- B. Prior to the start of any work on or over the CTA's right-of-way, the Contractor shall meet with the CTA Representative to determine his requirements for flagmen and other necessary items related to the work activities on, over, and next to the CTA facilities and to receive CTA's approval for the Contractor's proposed operations.
- C. The Contractor shall notify the CTA Representative 72-hours in advance of the time he intends to enter upon the CTA right-of-way for the performance of any work.

3. PROTECTION OF THE CTA TRAFFIC:

- A. The CTA will be operating mainline trains and performing rail yard operations 24 hours per day, seven days per week during the construction of this project.
- B. The Contractor shall, at all times, take special care to conduct his operations over, under, adjacent to or adjoining the CTA facilities in such a manner as to prevent settlement, damage or displacement to any CTA structures, equipment, tracks or portions thereof and to prevent interruption of train service.
- C. Any damage to the tracks, or other CTA facilities caused by the Contractor's operations, shall be replaced or repaired by the CTA at the Contractor's expense.

4. REIMBURSEMENT OF COSTS:

- A. All Contractors performing work on or near CTA property shall be required to provide a deposit, in advance, equal to the CTA's Construction Department's estimate. This estimated amount equals the anticipated amount of CTA services and includes, but is not limited to, Flagging charges, Inspector charges, and Maintenance charges. No Contractor will be permitted to work prior to submission of a deposit.
- B. If the deposited amount is used up, prior to the completion of the project, the CTA will require an additional deposit to cover the anticipated work remaining. Any money unused at time of project completion will be returned to the Contractor within 30 days.
- C. All checks must be made payable to Chicago Transit Authority and be submitted, with a copy of the estimate, to the CTA Treasury Department, 567 West Lake Street, P.O. Box 7565, 7th Floor, Chicago, IL 60680-7565.
- D. The Department will not be liable for any delays by the CTA in providing flagmen or other services required by this Special Provision.

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

6. CTA OPERATING RESTRICTIONS:

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

- A. When the construction work is performed adjacent to an active track and the work does not involve the track or the third rail, the Contractor can provide (and the right-of-way allows for) an uninterrupted physical barrier (fence) at least 6 feet high (above track or platform level) to separate the work area from operating track(s). With the barrier in place, work at track level may be permitted at any time without CTA flagman and Slow Zone protection.

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

- B. Work that is adjacent to or over the CTA operating tracks without a barrier in place requires CTA flagmen. Work is to be done during the following hours:

- Monday through Friday – 9:00 a.m. to 3:00 p.m.
(Based on one slow zone allowed in each direction per line)
- Monday through Saturday, inclusive - 8:00 p.m. to 4:00 a.m.
- Sunday - 12:00 a.m. to Monday 4:00 a.m.

- C. Work within the clearance envelope may require a single track operation and hours and length of single track will be determined by CTA rail operations (see paragraph 13 for clearance envelope).

- D. As much work as possible is to be done under normal CTA operating conditions (under traffic) without disruption of train movements.

- E. In order to request a single track (taking one track out of service), the Contractor, through the Resident Engineer, shall notify the CTA Representative forty-two (42) calendar days in advance of the proposed interruption.

- F. Interruptions will be provided solely at the CTA's discretion, depending upon the transit service demands for special events and possible conflicts with prior commitments to other work scheduled on the same route.

- G. No more than one service interruption will be allowed simultaneously on this CTA Line.

- H. If the Contractor is unable to return the CTA track to normal operation on time, after the interruption, liquidated damages of at least \$100.00 per minute of delay shall be paid directly to the CTA by the Contractor. Liquidated damages paid by the Contractor will not be reimbursed.

7. Pedestrian traffic to the CTA facilities shall be maintained at all times.
8. A notice of at least seventy-two (72) hours shall be given to the CTA prior to any beam removal or replacement, which will cause interruption to the CTA facilities and service.
9. Simultaneous work on two piers that will require flagmen and affect the train operation shall not be allowed. Work, which will require flagmen, shall be limited to only **one side of the track at a time**.
10. CTA shall have access to all storage tracks and unrestricted train operation over special holidays such as "July 4" and events such as the "Taste of Chicago". Dates for the above and other special holidays and events such as conventions, auto shows, World Series, etc., will be given to the Department as soon as they are available.
11. The Contractor will be required to take all precautions to avoid debris, concrete, and other materials falling over and/or on the tracks.
12. **OTHER SPECIAL CONDITIONS:**
 - A. The Contractor shall caution all employees of the presence of electric third rail (600 volts DC), live cables, and moving trains on CTA tracks. The Contractor shall take all necessary precautions to prevent damage to life or property through contact with the electrical or operations systems. The Contractor shall caution all employees that any contact with live electric third rail or "live" portions of train undercarriage may result in a severe burn or death.
 - B. The Contractor shall establish third-rail safety precautions in accordance with Authority regulations, such as, using insulating hoods or covers for live third rail or cables adjacent to the work. The Authority will provide CTA-qualified personnel to the Contractor as Contact Personnel. Unless otherwise noted, only CTA personnel are allowed to disconnect power.
 - C. Safety Training: All employees of the Contractor or his Subcontractors who are required to work upon or adjacent to the CTA's operating tracks shall be required to attend and provide evidence of completion of a right-of-way safety training course administered by CTA.
 - D. Arrangements for the safety training course shall be the Contractor's responsibility. Contact the CTA Representative to arrange for the safety course.
 - E. The cost of the course is \$150.00 per person, payable to the CTA prior to taking the course. The cost of this course and the employee's time for the course shall be considered incidental to the cost of the contract. The course is one day long from 8:00 a.m. to 4:00 p.m.
 - F. The Contractor his Subcontractors and all of his employees who are required to work on or around the CTA's operating tracks shall wear a CTA type safety vest.

13. CTA TRANSIT CLEARANCES:

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

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

14'-6" vertical from the top of the high running rail.

14. PROTECTIVE SHIELD:

A. The Contractor shall furnish, install, and later remove a protective shield to protect the CTA traffic from damage due to falling material and objects during construction. The protective shield may be a platform, a net or any other Department approved structure.

B. A minimum vertical clearance of 14'-6" above the high running rail of the CTA tracks shall be provided at all times.

C. The protective shield and the supporting members shall be designed to sustain a load of 200 pounds per square foot in addition to its own weight. Drawings and design calculations for the protective shield shall be stamped by an Illinois Licensed Structural Engineer and shall be submitted to the Department for approval. The protective shield shall be constructed only after the Department has approved the drawings and the design.

15. The contractor shall be required to provide a schedule for material removal, delivery of new material, crane operation over and around the tracks, and a schedule for access of workmen to the construction site.

INTERIM COMPLETION DATES

The Contract has many locations that require an interim completion date to open ramps for traffic, to avoid conflicts with other Contracts and to meet the Department's requirements for winter traffic conditions. The Contractor must complete all work at the locations by 11:59 PM on the interim completion dates specified. The Contractor will coordinate proposed interim completion dates and sequence of construction with the Engineer and other Contractors to present an effective and timely schedule for successful completion of the project. The locations and interim completion dates are shown on the suggested Construction Schedule included in the Contract Plans.

FAILURE TO COMPLETE THE INTERIM WORK ON TIME

Should the Contractor fail to complete the work list previously on or before the completion date as specified in the Special Provision for INTERIM COMPLETION DATES or within such extended time as may have been allowed by the Department, the Contractor shall be liable to the Department in the amount of \$5500.00 per location not as a penalty but as liquidated damages, for each calendar day or portion thereof of overrun in the Contract time or such extended time as may have been allowed.

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

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

All other work shall meet the Contract completion date specified in COMPLETION DATE PLUS GUARANTEED WORKING DAYS.

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, December 31, 2007 except as specified herein.

The Contractor will be allowed to complete all clean-up work and punch list items within 20 guaranteed working days after the completion date for opening the roadway to traffic. Under extenuating circumstances the Engineer may direct that certain items of work, not affecting the safe opening of the roadway to traffic, may be completed within the guaranteed working days allowed for clean up work and punch list items. Temporary lane closures for this work may be allowed at the discretion of the Engineer.

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.

FAILURE TO COMPLETE THE WORK ON TIME

Effective Date: September 30, 1985

Revised Date: June 28, 1996

Should the Contractor fail to complete the work on or before the completion date as specified in the Special Provision for "Completion Date Plus Guaranteed Working Days", or within such extended time as may have been allowed by the Department, the Contractor shall be liable to the Department in the amount of \$6,200.00, not as a penalty but as liquidated damages, for each calendar day or a portion thereof of overrun in the Contract time or such extended time as may have been allowed.

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

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

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 work shall consist 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 meters (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 will be included as part of this pay item.

Basis of Payment. This work shall be paid for at the Contract unit price per square meter (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.

CHANGEABLE MESSAGE SIGNS

This item shall be as contained in the Special Provisions for "Portable Changeable Message Signs" except as follows:

Six (6) 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 contractor's 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.

GENERAL ELECTRICAL REQUIREMENTS

Effective Date: March 1, 2003

Add the following to Article 801 of the Standard Specifications:

“Maintenance transfer and Preconstruction Inspection:

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

Establish the procedures for formal transfer of maintenance responsibility required for the construction period.

Establish the approximate location and operating condition of lighting and/or traffic control systems which may be affected by the work

Marking of Existing Cable Systems. The party responsible for maintenance of any existing lighting and/or traffic control systems at the project site will, at the Contractor's request, mark and/or stake, once per location, all underground cable routes owned or maintained by the State. A project may involve multiple "locations" where separated electrical systems are involved (i.e. different controllers). The markings shall be taken to have a horizontal tolerance of at least 304.8 mm (one (1) foot) to either side.. The request for the cable locations and marking shall be made at the same time the request for the maintenance transfer and preconstruction inspection is made. The Contractor shall exercise extreme caution where existing buried cable runs are involved. The markings of existing systems are made strictly for assistance to the Contractor and this does not relieve the Contractor of responsibility for the repair or replacement of any cable run damaged in the course of his work, as specified elsewhere herein. NOTE THAT

THE CONTRACTOR SHALL BE ENTITLED TO ONLY ONE REQUEST FOR LOCATION MARKING OF EXISTING SYSTEMS AND THAT MULTIPLE REQUESTS MAY ONLY BE HONORED AT THE CONTRACTOR'S EXPENSE. NO LOCATES WILL BE MADE AFTER MAINTENANCE IS TRANSFERRED, UNLESS IT IS AT THE CONTRACTOR'S EXPENSE.

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

Delete the last paragraph of Article 801.06 of the Standard Specifications.

Revise the 7th and 8th paragraphs of Article 801.08 of the Standard Specifications to read:

“Engineer’s Stamp. After the Engineer reviews the submittals for conformance with the design concept of the project, the Engineer will stamp the drawings indicating their status as ‘Approved’, ‘Approved-As-Noted’, ‘Disapproved’, or ‘Information Only’. Since the Engineer's review is for conformance with the design concept only, it is the Contractor's responsibility to coordinate the various items into a working system as specified. The Contractor shall not be relieved from responsibility for errors or omissions in the shop, working, layout drawings, or other documents by the Department's approval thereof. The Contractor must still be in full compliance with Contract and specification requirements.

Resubmittals. All submitted items reviewed and marked ‘APPROVED AS NOTED’, or ‘DISAPPROVED’ are to be resubmitted in their entirety with a disposition of previous comments to verify Contract compliance at no additional cost to the state unless otherwise indicated within the submittal comments.”

Revise Article 801.12 of the Standard Specifications to read:

“Lighting Operation and Maintenance Responsibility. The scope of work shall include the assumption of responsibility for the continuing operation and maintenance the of existing, proposed, temporary, sign and navigation lighting, or other lighting systems and all appurtenances affected by the work as specified elsewhere herein.”

Add the following to Section 801.12 of the Standard Specifications:

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

Add the following to Section 801 of the Standard Specifications:

“Splicing of Lighting cables. Splices above grade, such as in poles and junction boxes, shall have a waterproof sealant and a heat-shrinkable plastic cap. The cap shall be of a size suitable for the splice and shall have a factory-applied sealant within. Additional seal of the splice shall be assured by the application of sealant tape or the use of a sealant insert prior to the installation of the cap. Either method shall be assured compatible with the cap sealant. Tape sealant shall be applied in not less than one half-lapped layer for a length at least 6.35 mm (1/4-inch) longer than the cap length and the tape shall also be wrapped into the crotch of the splice. Insert sealant shall be placed between the wires of the splice and shall be positioned to line up flush or extend slightly past the open base of the cap.

Lighting Cable Identification. Each wire installed shall be identified with its complete circuit number at each termination, splice, junction box or other location where the wire is accessible.

Lighting Cable Fuse Installation. Standard fuse holders shall be used on non-frangible (non-breakaway) light pole installations and quick-disconnect fuse holders shall be used on frangible (breakaway) light pole installations. Wires shall be carefully stripped only as far as needed for connection to the device. Over-stripping shall be avoided. An oxide inhibiting lubricant shall be applied to the wire for minimum connection resistance before the terminals are crimped-on. Crimping shall be performed in accordance with the fuse holder manufacturer's recommendations. The exposed metal connecting portion of the assembly shall be taped with two half-lapped wraps of electrical tape and then covered by the specified insulating boot. The fuse holder shall be installed such that the fuse side is connected to the pole wire (load side) and the receptacle side of the holder is connected to the line side.

Grounding of Lighting Systems. All electrical systems, equipment and appurtenances shall be properly grounded in strict conformance with the NEC, even though every detail of the requirements is not specified or shown. Good ground continuity throughout the electrical system shall be assured. All electrical

circuit runs shall have a continuous equipment grounding conductor. IN NO CASE SHALL THE EARTH BE CONSIDERED AS AN ADEQUATE EQUIPMENT GROUNDING PATH. Where connections are made to painted surfaces, the paint shall be scraped to fully expose metal at the connection point and serrated connectors or washers shall be used. Where metallic conduit is utilized as the equipment grounding conductor, extreme care shall be exercised to assure continuity at joints and termination points. No wiring run shall be installed without a suitable equipment ground conductor. Where no equipment ground conductor is provided for in the plans and associated specified pay item, the Contractor is obligated to bring the case to the attention of the Engineer who will direct the Contractor accordingly. Work which is extra to the Contract will be paid extra. All connections to ground rods, structural steel, reinforcing steel or fencing shall be made with exothermic welds. Where such connections are made to insulated conductors, the connection shall be wrapped with at least 4 layers of electrical tape extended 152.4 mm (six inches) onto the conductor insulation. Where a ground field of "made" electrodes is provided, the exact locations of the rods shall be documented by dimensioned drawings as part of the Record Drawings. Equipment ground wires shall be bonded, using a splice and pigtail connection, to all boxes and other metallic enclosures throughout the wiring system.

Lighting Unit Identification. Each pole, light tower and underpass light shall be labeled as indicated in the plans to correspond to actual circuiting, and as designated by the Engineer. They shall be installed by the Contractor on each lighting unit pole shaft and on the underpass walls, or piers, as shown in the details. Median-mounted poles shall have two sets of identification labeling oriented to allow visibility from travel in either direction. Lighting Controllers shall also be identified by means identification decals as described herein. Identification shall be in place prior to placing the equipment in service. Identification of weathering steel poles shall be made by application of letters and numerals as specified herein to an appropriately sized 3.175 mm (1/8-inch) thick stainless steel plate which shall be banded to the pole with two stainless steel bands. Identification of painted poles shall be made by application of letters and numerals as specified herein via an adhesive approved by the paint manufacturer for the application. Identification of luminaires which are not pole mounted, such as underpass luminaires, shall be done using identification brackets. In general, the brackets shall be mounted adjacent to and within one foot of their respective luminaires. The brackets shall be fabricated from 3.175 mm (one-eighth (1/8)) inch aluminum alloy sheet according to the dimensions shown on the plans. The bracket shall be bent so as to present the luminaire identification numbers at a sixty (60) degree angle to the wall. The bracket shall be attached to concrete walls with three (3) 6.35 mm (1/4 inch), self drilling, snap-off type galvanized steel concrete anchors set flush with the wall, or power driven fasteners approved by the

Engineer. The brackets shall be offset from the wall with 12.7 mm (1/2") aluminum bushings. The structural steel shall not be drilled to attach the brackets. The luminaire identification numbers shall be applied to the bracket using the method described for identification applied to poles.

ELECTRIC UTILITY SERVICE CONNECTION

Effective Date: January 1, 2002

Revised Date: January 12, 2005

Description. This item shall consist of payment for work performed by **ComEd** in providing or modifying electric service as indicated. THIS MAY INVOLVE WORK AT MORE THAN ONE ELECTRIC SERVICE. For a summary of the Electric Service Drop Locations see the schedule contained elsewhere herein.

CONSTRUCTION REQUIREMENTS

General. It shall be the Contractor's responsibility to contact **ComEd**. The Contractor shall coordinate his work fully with the **ComEd** both as to the work required and the timing of the installation. No additional compensation will be granted under this or any other item for extra work caused by failure to meet this requirement. **Please contact ComEd, New Business Center Call Center, at 866 NEW ELECTRIC (1-866-639-3532) to begin the service connection process. The Call Center Representatives will create a work order for the service connection. The representative will ask the requestor for information specific to the request. The representative will assign the request based upon the location of project.**

The Contractor should make particular note of the need for the earliest attention to arrangements with **ComEd** for service. In the event of delay by **ComEd**, no extension of time will be considered applicable for the delay unless the Contractor can produce written evidence of a request for electric service within 30 days of execution.

Method Of Payment. The Contractor will be reimbursed to the exact amount of money as billed by **ComEd** for its services. Work provided by the Contractor for electric service will be paid separately as described under ELECTRIC SERVICE INSTALLATION. No extra compensation shall be paid to the Contractor for any incidental materials and labor required to fulfill the requirements as shown on the plans and specified herein.

For bidding purposes, this item shall be estimated as \$140,000.00

Basis Of Payment. This work will be paid for at the contract lump sum price for **ELECTRIC UTILITY SERVICE CONNECTION** which shall be reimbursement in full for electric utility service charges.

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Controller Name	Station Number	Approximate Service Location	New or Existing Feed	Voltage	Circuit Breaker Size	Month/Year Service is Required	Equipment
DMS-UPS-29	N/A	119th & I-57 (TSC Cabinet E14)	Existing	120/240	100 Amp	June/2005	DMS-29
A2	202+60	West of Wallace, South of I-57	Existing	120/240	30 Amp	September/2005	DET-01, RM-01, HAR-01
A5	99+00	West of Wallace, South of I-57	Existing	120/240	30 Amp	September/2005	DET-02
Controller 'A'	229+00	99th and Yale (South of I-57)	Existing	240/480	2-175 Amp	October/2005	Lighting
71	234+15	LaSalle and South of I-57	Existing	120/240	30 Amp	December/2005	DET-05, DET-06
M1	309+70	East 100th Street & Indiana Ave. (same as controller 'M')	Existing	120/240	30 Amp	December/2006	DET-03, DET-04
M2	2031+25	98th and Wabash	Existing	120/240	30 Amp	September/2005	DET-08, RM-02
69	145+00	North of 97th & S. Lafayette	Existing	120/240	30 Amp	September/2005	DET-07
Controller 'M'	1137+90	East 100th Street & Indiana Ave.	Existing	240/480	2-175 Amp	October/2005	Lighting
Controller 'N'	1167+50	North of 97th & S. Lafayette	Existing	240/480	2-175 Amp	2007	Lighting
68	2216+00	94th St., East of State Street	Existing	120/240	30 Amp	September/2005	DET-09, RM-03
67	1217+60	93rd Street, east of LaFayette	New	120/240	30 Amp	September/2005	DET-10
Temporary 'O'	2234+54	91st St. East of State Street	Existing	240/480	2-175 Amp	October/2005	Lighting
Controller 'O'	2231+61	91st St. East of State Street	New	240/480	2-175 Amp	May/2006	Lighting
Controller 'P'	1287+50	North of 83rd St. West of Lafayette	New	240/480	2-175 Amp	October/2005	Lighting
FBS-03	2232+35	89th St., East of State Street	Existing	120/240	30 Amp	June/2006	FBS-03
66	2243+40	90th St. and State St.	Existing	120/240	30 Amp	September/2005	DET-11
65	1250+40			120/240	30 Amp	September/2005	DET-12, RM-04
64	2268+80	86th St., East of State St.	Existing	120/240	30 Amp	September/2005	DET-13, RM-05
DMS-UPS-02	2280+90			120/240	100 Amp	September/2005	DMS-02
63	1273+10	85th St., West of LaFayette	Existing	120/240	30 Amp	September/2005	DET-14
DMS-UPS-30/61	1288+70	81st St., West of Lafayette	Existing	120/240	100 Amp	Note 1	DET-16, DMS-30
60	2310+95	78th St., East of State St.	Existing	120/240	50 Amp	September/2005	DET-18
58	2322+15			120/240	30 Amp	September/2005	DET-19, RM-08
58A	2331+99			120/240	30 Amp	September/2005	DET-19A
57	1324+50	77th St., West of Lafayette	Existing	120/240	30 Amp	September/2005	DET-20
57A	1314+88			120/240	30 Amp	September/2005	DET-20A

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FBS-04	1343+00	72nd St., West of Lafayette	Existing	120/240	30 Amp	June/2006	FBS-04
56	2344+30	74th St., East of State St.	Existing	120/240	30 Amp	September/2005	DET-21, RM-09
54	2355+30			120/240	30 Amp	September/2005	DET-23
55	1348+90	72nd St., West of Lafayette	Existing	120/240	30 Amp	September/2005	DET-22
53	1360+85			120/240	30 Amp	September/2005	DET-24, RM-10
Controller 'R'	2348+50	North of 71st St. East of State Street	New	240/480	2-175 Amp	May/2006	Lighting
Temporary 'R'	2339+79			240/480	2-175 Amp	October/2005	Lighting
50	2380+60	70th St., East of State Street	Existing	120/240	30 Amp	Note 1	DET-28
51	1376+25	68th Street, west of LaFayette	New	120/240	30 Amp	Note 1	DET-26
Comm. Hut	2397+00	North of 67th Street, East of State	New	120/240	200 Amp	December/2005	Comm. Shelter, HAR-02
Comm. Hut		IDOT Maintenance Yard	New	120/240	200 Amp	December/2005	Comm. Shelter
47	1405+15			120/240	30 Amp	September/2005	DET-29
48	2414+00	64th St., East of State Street	Existing	120/240	30 Amp	September/2005	DET-30
46A	2439+10	61st Place, east of Wentworth	New	120/240	30 Amp	September/2005	DET-31A
46	2433+00	61st Place, east of Wentworth	New	120/240	30 Amp	September/2005	DET-31, RM-13
45A	1427+80	60th St., West of Wells St.	Existing	120/240	30Amp	September/2005	DET-32
45	1441+05			120/240	30 Amp	September/2005	RM-13A
43	1449+90			120/240	30 Amp	December/2005	DET-34, FBS-05
FBS-05	2446+00	60th Street, East of Wentworth	New	120/240	30 Amp	January/2007	FBS-05
Controller 'T'	1447+75	South of 59th Street, West of Wells Street	New	240/480	2-175 Amp	October/2005	Lighting
DMS-UPS-03/44	2455+80	57th Place and LaSalle St.	Existing	120/240	100 Amp	September/2005	DMS-03,DET-33,DET-35
DMS-UPS-31	1476+45	South of 55th Street, West of Wells Street	Existing	120/240	100 Amp	Note 1	DMS-31
39	1493+20	South of 53rd Street, West of Wells Street	New	120/240	30 Amp	September/2005	DET-38
40	2524+00	South of 47th Street, West of Wells Street	New	120/240	30 Amp	Note 1	DET-39
38A	2549+50	46th Street, East of LaSalle	Existing	120/240	30 Amp	December/2006	DET-41A
38	2537+90	46th Street, East of LaSalle	Existing	120/240	30 Amp	December/2006	DET-41, RM-17
35A	1552+10	45th Place West of Wentworth	Existing	120/240	30 Amp	December/2006	RM-17A

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35	1544+30	45th Place West of Wentworth	Existing	120/240	30 Amp	December/2006	DET-42
33	1561+00	Root Street, West of Wentworth	Existing	120/240	30 Amp	December/2006	DET-43
31	1575+90			120/240	30 Amp	December/2006	DET-45, RM-19
DMS-UPS-32	1585+15	37th Steet, West of Wentworth	Existing	120/240	100 Amp	September/2005	DMS-32
36	2561+00	Root Street, East of LaSalle	New	120/240	30 Amp	December/2006	DET-44, RM-18
34	2576+00			120/240	30 Amp	December/2006	DET-46
Controller "V"	1566+50	North of Root Street, East of Wentworth	New	240/480	2-175 Amp	October/2005	Lighting
29	1593+50	37th Street, West of Wentworth	New	120/240	30 Amp	September/2005	DET-48
27	1603+00			120/240	30 Amp	September/2005	DET-50
32	2588+60	37th Street, East of LaSalle	New	120/240	30 Amp	September/2005	DET-47
DMS-UPS-04/30	2599+00			120/240	100 Amp	September/2005	DET-49, DMS-04
28	2616+00	33rd Street, West of Wentworth	Existing	120/240	30 Amp	September/2005	DET-51
25	1619+15			120/240	30 Amp	September/2005	DET-52
23	1630+00			120/240	30 Amp	September/2005	DET-54
26	2627+60			120/240	30 Amp	September/2005	DET-53
DMS-UPS-08	Chicago River Site			Chicago River Site	Existing	120/240	100 Amp
Comm. Hut	25th Street & Normal	25th Street & Normal	New	120/240	200 Amp	December/2005	Comm. Shelter

Note 1 - The electric utility service and service box for the controller will be installed in 2004 under Contract 62733. The 62583 Contractor will provide the service feed cables from the controller to the existing service box located on the utility service pole and make the necessary connections.

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Controller Name	Station Number	Approximate Service Location	New or Existing Feed	Voltage	Circuit Breaker Size	Month/Year Service is Required	Equipment
DMS-UPS-29	N/A	119th & I-57 (TSC Cabinet E14)	Existing	120/240	100 Amp	June/2005	DMS-29
A2	202+60	West of Wallace, South of I-57	Existing	120/240	30 Amp	April/2005	DET-01, RM-01, HAR-01
A5	99+00	West of Wallace, South of I-57	Existing	120/240	30 Amp	April/2005	DET-02
Controller 'A'	229+00	99th and Yale (South of I-57)	Existing	240/480	2-175 Amp	May/2005	Lighting
71	234+15	LaSalle and South of I-57	Existing	120/240	30 Amp	April/2006	DET-05, DET-06
M1	309+70	East 100th Street & Indiana Ave. (same as controller 'M')	Existing	120/240	30 Amp	April/2006	DET-03, DET-04
M2	2031+25	98th and Wabash	Existing	120/240	30 Amp	April/2005	DET-08, RM-02
69	145+00	North of 97th & S. Lafayette	Existing	120/240	30 Amp	April/2005	DET-07
Controller 'M'	1137+90	East 100th Street & Indiana Ave.	Existing	240/480	2-175 Amp	May/2005	Lighting
Controller 'N'	1167+50	North of 97th & S. Lafayette	Existing	240/480	2-175 Amp	May/2005	Lighting
68	2216+00	94th St., East of State Street	Existing	120/240	30 Amp	April/2005	DET-09, RM-03
67	1217+60	93rd Street, east of LaFayette	New	120/240	30 Amp	April/2005	DET-10
Controller 'O'	2231+61	91st St. East of State Street	Existing	240/480	2-175 Amp	May/2005	Lighting
Controller 'P'	1287+50	North of 83rd St. West of Lafayette	New	240/480	2-175 Amp	March/2005	Lighting
FBS-03	2232+35	89th St., East of State Street	Existing	120/240	30 Amp	June/2006	FBS-03
66	2243+40	90th St. and State St.	Existing	120/240	30 Amp	April/2005	DET-11
65	1250+40			120/240	30 Amp	April/2005	DET-12, RM-04
64	2268+80	86th St., East of State St.	Existing	120/240	30 Amp	April/2005	DET-13, RM-05
DMS-UPS-02	2280+90			120/240	100 Amp	September/2005	DMS-02
63	1273+10	85th St., West of LaFayette	Existing	120/240	30 Amp	April/2005	DET-14
DMS-UPS-30/61	1288+70	81st St., West of Lafayette	Existing	120/240	100 Amp	April/2005	DET-16, DMS-30
60	2310+95	78th St., East of State St.	Existing	120/240	50 Amp	April/2005	DET-18
58	2322+15			120/240	30 Amp	April/2005	DET-19, RM-08
58A	2331+99			120/240	30 Amp	April/2005	DET-19A
57	1324+50	77th St., West of Lafayette	Existing	120/240	30 Amp	April/2005	DET-20
57A	1314+88			120/240	30 Amp	April/2005	DET-20A
FBS-04	1343+00	72nd St., West of Lafayette	Existing	120/240	30 Amp	June/2006	FBS-04
56	2344+30	74th St., East of	Existing	120/240	30 Amp	April/2005	DET-21, RM-

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		State St.					09
54	2355+30			120/240	30 Amp	April/2006	DET-23
55	1348+90	72nd St., West of Lafayette	Existing	120/240	30 Amp	April/2005	DET-22
53	1360+85			120/240	30 Amp	April/2005	DET-24, RM-10
Controller 'R'	2348+50	North of 71st St. East of State Street	New	240/480	2-175 Amp	May/2005	Lighting
Temporary 'R'	2339+79			240/480	2-175 Amp	May/2005	Lighting
50	2380+60	70th St., East of State Street	Existing	120/240	30 Amp	Note 1	DET-28
51	1376+25	68th Street, west of LaFayette	New	120/240	30 Amp	Note 1	DET-26
Comm. Hut	2397+00	North of 67th Street, East of State	New	120/240	200 Amp	July/2005	Comm. Shelter, HAR-02
Comm. Hut		IDOT Maintenance Yard	New	120/240	200 Amp	July/2005	Comm. Shelter
47	1405+15			120/240	30 Amp	April/2005	DET-29
48	2414+00	64th St., East of State Street	Existing	120/240	30 Amp	April/2005	DET-30
46A	2439+10	61st Place, east of Wentworth	New	120/240	30 Amp	June/2005	DET-31A
46	2433+00	61st Place, east of Wentworth	New	120/240	30 Amp	June/2005	DET-31, RM-13
45A	1427+80	60th St., West of Wells St.	Existing	120/240	30Amp	June/2005	DET-32
45	1441+05			120/240	30 Amp	June/2005	RM-13A
43	1449+90			120/240	30 Amp	April/2006	DET-34, FBS-05
FBS-05	2446+00	60th Street, East of Wentworth	New	120/240	30 Amp	January/2007	FBS-05
Controller 'T'	1447+75	South of 59 th Street, West of Wells Street	New	240/480	2-175 Amp	May/2005	Lighting
DMS-UPS-03/44	2455+80	57th Place and LaSalle St.	Existing	120/240	100 Amp	December/2006	DMS-03,DET-33,DET-35
DMS-UPS-31	1476+45	South of 55th Street, West of Wells St.	Existing	120/240	100 Amp	Note 1	DMS-31
39	1493+20	South of 53rd Street, West of Wells Street	New	120/240	30 Amp	April/ 2005	DET-38
40	2524+00	South of 47th Street, West of Wells Street	New	120/240	30 Amp	Note 1	DET-39
38A	2549+50	46th Street, East of LaSalle	Existing	120/240	30 Amp	April/2007	DET-41A
38	2537+90	46th Street, East of LaSalle	Existing	120/240	30 Amp	April/2006	DET-41, RM-17
35A	1552+10	45th Place West of Wentworth	Existing	120/240	30 Amp	April/2007	RM-17A
35	1544+30	45th Place West of Wentworth	Existing	120/240	30 Amp	April/2006	DET-42
33	1561+00	Root Street, West of Wentworth	Existing	120/240	30 Amp	April/2007	DET-43

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31	1575+90			120/240	30 Amp	April/2006	DET-45, RM-19
DMS-UPS-32	1585+15	37th Steet, West of Wentworth	Existing	120/240	100 Amp	December/2006	DMS-32
36	2561+00	Root Street, East of LaSalle	New	120/240	30 Amp	April/2006	DET-44, RM-18
34	2576+00			120/240	30 Amp	April/2006	DET-46
Controller "V"	1566+50	North of Root Street, East of Wentworth	New	240/480	2-175 Amp	September/2005	Lighting
29	1593+50	37th Street, West of Wentworth	New	120/240	30 Amp	April/2005	DET-48
27	1603+00			120/240	30 Amp	April/2005	DET-50
32	2588+60	37th Street, East of LaSalle	New	120/240	30 Amp	April/2005	DET-47
DMS-UPS-04/30	2599+00			120/240	100 Amp	December/2006	DET-49, DMS-04
28	2616+00	33rd Street, West of Wentworth	Existing	120/240	30 Amp	April/2005	DET-51
25	1619+15			120/240	30 Amp	April/2005	DET-52
23	1630+00			120/240	30 Amp	April/2005	DET-54
26	2627+60			120/240	30 Amp	April/2005	DET-53
DMS-UPS-08	Chicago River Site	Chicago River Site	Existing	120/240	100 Amp	June/2005	DMS-08
Comm. Hut	25th Street & Normal	25th Street & Normal	New	120/240	200 Amp	April/2005	Comm. Shelter

Note 1 - The electric utility service and service box for the controller will be installed in 2004 under Contract 62733. The 62583 Contractor will provide the service feed cables from the controller to the existing service box located on the utility service pole and make the necessary connections.

(CTE – 11/29/2004)

ELECTRIC SERVICE INSTALLATION

Description. This item shall consist of all material and labor required to extend, connect or modify the electric services, as herein specified, as shown on the Plans, and as directed by the Engineer, which is over and above the work performed by the utility.

Unless otherwise indicated, the cost for the utility work, if any, will be reimbursed to the Contractor separately under ELECTRIC UTILITY SERVICE CONNECTION. ELECTRIC SERVICE INSTALLATION may apply to the work at more than one service location and each will be paid separately.

Materials. Materials shall be according to the following Articles of Section 1000 – Materials

<u>Item</u>	<u>Article/Section</u>
(a) Electric Service Installation - Lighting.....	1086.01
(b) Electric Service Installation - Traffic Signal.....	1086.02

CONSTRUCTION REQUIREMENTS

General. This work shall be done according to Section 804 of the Standard Specifications.

The Contractor shall provide a pole mounted electric service box for all 120 volt and 120/240 volt services as shown on the Plans and as directed by the Engineer.

Method Of Measurement. Electric Service Installation shall be counted, each.

Basis Of Payment. This work will be paid for at the Contract unit price each for ELECTRIC SERVICE INSTALLATION of the amperage and voltage specified which shall be payment in full for the work specified herein.
(CTE – 10/18/2004)

MODIFY EXISTING ELECTRIC SERVICE INSTALLATION

Description. This item shall consist of modifying an existing Electric Service Installation

Materials. Circuit Breakers shall be thermal magnetic bolt-on type with a minimum interrupt capacity of 10,000 symmetrical amperes at 120 volts. Breakers shall be lockable in the off position for lock out/tag-out compliance.

CONSTRUCTION REQUIREMENTS

General. The Contractor shall extend the new conduit and electric service cable, paid for separately, into the existing electric service box and terminate the cable on existing bus bars. The Contractor shall install an additional 30 amp circuit breaker in the existing electric service box at locations indicated in the Plans.

Method of Measurement. Modify Electric Service Installation shall be counted each.

Basis of Payment. This item shall be paid for at the Contract unit price each for MODIFY EXISTING ELECTRIC SERVICE INSTALLATION which shall be payment in full for the material and work as described herein and should include any miscellaneous hardware necessary for proper installation.

(CTE – 08/27/2004)

CIRCUIT BREAKER, 2-POLE, 50 AMPERE, 240 VOLT IN EXISTING METER PEDESTAL CABINET

Description. This item consists of furnishing and installing a two pole thermal-magnetic circuit breaker in an existing meter pedestal cabinet, at the location shown on the drawings. The circuit breaker will be used to provide power to sign, DMS-08 as shown on the drawings.

Materials. The circuit breaker shall be suitable for mounting to the mounting board in the cabinet and providing power to DMS-08. It shall be a standard UL listed molded case, thermal-magnetic bolt-on type circuit breaker with trip free indicating handles, and have a minimum 10,000 A interrupting rating.

CONSTRUCTION REQUIREMENTS

Installation. The circuit breaker shall be secured to the mounting board inside the surveillance cabinet in a manner and location as approved by the Traffic Systems Center.

All wire terminations to the circuit breaker are also included in this pay item.

Method Of Measurement. This work shall be measured for payment as the number of Circuit Breakers installed and be counted, each.

Basis Of Payment. This item shall be paid at the Contract unit price each for CIRCUIT BREAKER, 2-POLE, 50 AMPERE, 240 VOLT IN EXISTING METER PEDESTAL CABINET, which shall be payment in full for the material and work described herein.

(CTE – 10/15/2004)

GROUND ROD

Description. This item shall consist of furnishing, installing and connecting ground rods for the grounding of service neutral conductors and for supplementing the equipment grounding system via connection at poles or other equipment throughout the system. All materials and work shall be in accordance with Article 250 of the NEC.

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

	<u>Item</u>	<u>Article/Section</u>
(a)	Ground Rod	1087.01(b)
(b)	Copper Ground Wire.....	1087.01(a)
(c)	Access Well.....	1087.01(c)

CONSTRUCTION REQUIREMENTS

General. All connections to ground rods, structural steel or fencing shall be made with exothermic welds. Where such connections are made to insulated conductors, the connection shall be wrapped with at least 4 layers of electrical tape extended 152.4 mm (six inches) onto the conductor insulation.

Ground rods shall be driven so that the tops of the rod are 609.6 mm (24 inches) below finished grade. Where indicated, ground wells shall be included to permit access to the rod connections.

Where indicated, ground rods shall be installed through concrete foundations.

Where ground conditions, such as rock, preclude the installation of the ground rod, the ground rod may be deleted with the approval of the Engineer.

Where a ground field of "made" electrodes is provided, such as at control cabinets, the exact locations of the rods shall be documented by dimensioned drawings as part of the Record Drawings.

Ground rod connection shall be made by exothermic welds. Ground wire for connection to foundation steel or as otherwise indicated shall be stranded uncoated bare copper in accordance the applicable requirements of ASTM Designation B-3 and ASTM Designation B-8 and shall be included in this item. Unless otherwise indicated, the wire shall not be less than No. 2 AWG.

Where connections are made to epoxy coated reinforcing steel, the epoxy coating shall be sufficiently removed to facilitate the exothermic weld.

Method Of Measurement. Ground rods at light poles and ground mounted light towers shall be included in this pay item and shall be counted, each. Ground wires and connection of ground rods at poles shall be included in this pay item. Ground rods installed at handholes, light tower foundations integral with retaining walls, foundations for lighting controllers, and foundations for sign structures shall not be measured for payment but shall be included in the cost of handhole or appropriate foundation pay item.

Basis Of Payment. This item shall be paid at the Contract unit price each for GROUND ROD, of the diameter and length indicated which shall be payment in full for the material and work described herein.

(CTE – 03/26/2004)

UNDERGROUND RACEWAYS

Revise Article 810.03 of the Standard Specifications to read:

“Installation. All underground conduit shall have a minimum depth of 700 mm (30-inches) below the finished grade, or as otherwise indicated on the plans.”

Add the following to Article 810.03 of the Standard Specifications:

“All metal conduit installed underground shall be Rigid Metal Conduit unless otherwise indicated on the plans.”
(CTE – 10/22/2004)

RACEWAYS EMBEDDED IN STRUCTURE

Effective Date: March 10, 2004

Section 810 of the Standard Specifications for Road and Bridge Construction shall be modified as follows:

Add the following to Article 810.03(c):

“Coilable non-metallic conduit shall be machine straightened to remove the longitudinal curvature caused by coiling the conduit onto reels prior to installing in trench, encasing in concrete or embedding in structure. The straightening shall not deform the cross-section of the conduit such that any two measured outside diameters, each from any location and at any orientation around the longitudinal axis along the conduit differ by more than 6 mm (0.25”).” The longitudinal axis of the straightened conduit shall not deviate by more than 20 mm per meter (0.25” per foot” from a straight line.

Section 812 of the Standard Specifications for Road and Bridge Construction shall be modified as follows:

Add the following to Article 812.02:

“(d) Coilable Nonmetallic Conduit....1088.01(c)”

Change Article 812.03(d) to 812.03(e).

Add the following as the new Article 812.03(d):

“(d) Coilable Nonmetallic Conduit. Conduit installation shall be according to Article 810.03(c).”

Add the following paragraph to Article 812.03:

All conduits which extend outside of the structure but are not terminated in a cabinet, junction box, pull box, handhole, post, pole, or pedestal shall extend a minimum of 300 mm (12”) or the length shown on the plans beyond the structure. The end of this extension shall be capped and sealed with a cap designed for the conduit to be capped. The ends of rigid metal conduit to be capped shall be threaded, the threads protected with full galvanizing, and capped with a threaded galvanized steel cap. The ends of rigid nonmetallic conduit and coilable nonmetallic conduit shall be capped with a rigid PVC cap of not less than 3 mm (0.125”) thick. The cap shall be sealed to the conduit using a room-temperature-vulcanizing (RTV) sealant compatible with the material of both the cap and the conduit. A washer or similar metal ring shall be glued to the inside center of the cap with epoxy, and the pull cord shall be tied to this ring.

EXPOSED RACEWAYS

Effective Date: March 1, 2003

Add the following to Article 811.03(a)(3) of the Standard Specifications:

“Where PVC coated conduit is utilized, all conduit fittings, couplings and clamps shall be PVC coated. All other mounting hardware and appurtenances shall be stainless steel.”

Add the following to Article 811.03(b) of the Standard Specifications:

“The personnel installing the PVC coated conduit must be trained and certified by the PVC coated conduit Manufacturer or Manufacturer’s representative to install PVC coated conduit. Documentation demonstrating this requirement must be submitted for review and approval.”

“All conduit fittings, couplings and clamps shall be PVC coated. All other mounting hardware and appurtenances shall be stainless steel.”

Revise Article 1088.01(a) of the Standard Specifications to read:

“Couplings and fittings shall meet ANSI Standard C80.5 and U.L. Standard 6. Elbows and nipples shall conform to the specifications for conduit. All fittings and couplings for rigid conduit shall be of the threaded type.”

Revise Article 1088.01(a)(1) of the Standard Specifications to read:

“Rigid Steel Conduit. Rigid steel conduit shall be galvanized and manufactured according to UL Standard 6 and ANSI Standard C 80.1.”

Revise Article 1088.01(a)(3) of the Standard Specifications to read:

“a. PVC Coated Steel Conduit. The PVC coated rigid metal conduit shall be UL Listed (UL 6). The PVC coating must have been investigated by UL as providing the primary corrosion protection for the rigid metal conduit. Ferrous fittings for general service locations shall be UL Listed with PVC as the primary corrosion protection. Hazardous location fittings, prior to plastic coating shall be UL listed.

b. The PVC coating shall have the following characteristics:

Hardness:	85+ Shore A Durometer
Dielectric Strength:	400V/mil @ 60 Hz
Aging:	1,000 Hours Atlas Weatherometer
Temperature	The PVC F. to Federal Specifications PL-406b, Method <input type="checkbox"/> compound shall conform at 0 2051, Amendment 1 of 25 September 1952 (ASTM D 746)
Elongation:	200%

- c. The exterior and interior galvanized conduit surface shall be chemically treated to enhance PVC coating adhesion and shall also be coated with a primer before the PVC coating to ensure a bond between the zinc substrate and the PVC coating. The bond strength created shall be greater than the tensile strength of the plastic coating.
- d. The nominal thickness of the PVC coating shall be 1 mm (40 mils). The PVC exterior and urethane interior coatings applied to the conduit shall afford sufficient flexibility to permit field bending without cracking or flaking at temperatures above -1°C (30°F).
- e. An interior urethane coating shall be uniformly and consistently applied to the interior of all conduit and fittings. This internal coating shall be a nominal 2 mil thickness. The interior coating shall be applied in a manner so there are no runs, drips, or pinholes at any point. The coating shall not peel, flake, or chip off after a cut is made in the conduit or a scratch is made in the coating.
- f. The PVC conduit shall pass the following tests:

Exterior PVC Bond test RN1:

Two parallel cuts 13 mm (1/2 inch) apart and 40 mm (1 1/2 inches) in length shall be made with a sharp knife along the longitudinal axis. A third cut shall be made perpendicular to and crossing the longitudinal cuts at one end. The knife shall then be worked under the PVC coating for 13 mm (1/2 inch) to free the coating from the metal.

Using pliers, the freed PVC tab shall be pulled with a force applied vertically and away from the conduit. The PVC tab shall tear rather than cause any additional PVC coating to separate from the substrate.

Boil Test:

Acceptable conduit coating bonds (exterior and interior) shall be confirmed if there is no disbondment after a minimum average of 200 hours in boiling water or exposure to steam vapor at one atmosphere. The RN1 Bond Test and the Standard Method for Measuring Adhesion by Tape Test shall be utilized.

Exterior Adhesion. In accordance with ASTM D870, a 6" length of conduit test specimen shall be placed in boiling water. The specimen shall be periodically removed, cooled to ambient temperature and immediately tested according to the bond test (RN1). When the PVC coating separates from the substrate, the boil time to failure in hours shall be recorded.

Interior Adhesion. In accordance with ASTM D3359, a 6" conduit test specimen shall be cut in half longitudinally and placed in boiling water or directly above boiling water with the urethane surface facing down. The specimen shall be periodically removed, cooled to ambient temperature and tested in accordance with the Standard Method of Adhesion by Tape Test (ASTM D3359). When the coating disbonds, the time to failure in hours shall be recorded.

Heat/Humidity Test:

Acceptable conduit coating bonds shall be confirmed by a minimum average of 30 days in the Heat and Humidity Test. The RN1 Bond Test and the Standard Method for Measuring Adhesion by Tape Test shall be utilized.

Exterior Adhesion. In accordance with ASTM D1151, D1735, D2247 and D4585, conduit specimens shall be placed in a heat and humidity environment where the temperature is maintained at 150°F (66°C) and 95% relative humidity. The specimens shall be periodically removed and a bond test (RN1) performed. When the PVC coating separates from the substrate, the exposure time to failure in days shall be recorded.

Interior Adhesion. In accordance with ASTM D3359, conduit specimens shall be placed in a heat and humidity environment where the temperature is maintained at 150°F (66°C) and 95% relative humidity. When the coating disbonds, the time to failure in hours shall be recorded.

TRENCH AND BACKFILL FOR ELECTRICAL WORK

Effective Date: January 1, 2002

Revise the first sentence of Article 815.03(a) of the Standard Specifications to read:

"Trench. Trenches shall have a minimum depth of 760 mm (30 in.) or as otherwise indicated on the plans, and shall not exceed 300 mm (12 in.) in width without prior approval of the Engineer."

Revise Article 1066.05 of the Standard Specifications to read:

"Underground Cable Marking Tape. The tape shall be 150 mm (6 in.) wide; consisting of 0.2 mm (8 mil) polyethylene according to ASTM D882, and ASTM D2103.

The tape shall be red with black lettering or red with silver lettering reading "CAUTION – ELECTRICAL LINE BURIED BELOW".

The tape shall have reinforced metallic detection capabilities consisting of a woven reinforced polyethylene tape with a metallic core or backing."

WIRE AND CABLE

Effective Date: January 1, 2002

Revise the second sentence of the first paragraph of Article 1066.02(a) to read:

“The cable shall be rated at a minimum of 90°C dry and 75°C wet and shall be suitable for installation in wet and dry locations, and shall be resistant to oils and chemicals.”

Revise the second paragraph of Article 1066.02(b) to read:

“Uncoated conductors shall be according to ASTM B3, ICEA S-95-658/NEMA WC70, and UL Standard 44. Coated conductors shall be according to ASTM B 33, ASTM B 8, ICEA S-95-658/NEMA WC70 and UL Standard 44.”

Revise the third paragraph of Article 1066.02(b) to read:

“All conductors shall be stranded. Stranding meeting ASTM B 8, ICEA S-95-658/NEMA WC70 and UL Standard 44. Uncoated conductors meeting ASTM B 3, ICEA S-95-658/NEMA WC70 and UL Standard 44.”

Revise the first sentence of Article 1066.03(a)(1) to read:

“General. Cable insulation designated as XLP shall incorporate cross-linked polyethylene (XLP) insulation as specified and shall meet or exceed the requirements of ICEA S-95-658, NEMA WC70, U.L. Standard 44.”

Add the following to Article 1066.03(a)(1) of the Standard Specifications:

“The cable shall be rated 600 volts and shall be UL Listed Type RHH/RHW/USE.”

Revise the Aerial Electric Cable Properties table of Article 1066.03(a)(3) to read:

Aerial Electric Cable Properties

Size AWG	Stranding	Messenger wire			
		Average Insulation Thickness		Minimum Size AWG	Stranding
		mm	mils		
6	7	1.1	(45)	6	6/1
4	7	1.1	(45)	4	6/1
2	7	1.1	(45)	2	6/1
1/0	19	1.5	(60)	1/0	6/1
2/0	19	1.5	(60)	2/0	6/1
3/0	19	1.5	(60)	3/0	6/1
4/0	19	1.5	(60)	4/0	6/1

Revise the first paragraph of Article 1066.03(b) to read:

“EPR Insulation. Cable insulation shall incorporate ethylene propylene rubber (EPR) as specified and the insulation shall meet or exceed the requirements of ICEA S-95-658, NEMA Standard Publication No. WC70, and U.L. Standard 44, as applicable.”

Add the following to Article 1066.03(b) of the Standard Specifications:

“Cable sized No. 2 AWG and smaller shall be U.L. listed Type RHH/RHW and may be Type RHH/RHW/USE. Cable sized larger than No. 2 AWG shall be U.L. listed Type RHH/RHW/USE.”

Revise Article 1066.04 to read:

“Aerial Cable Assembly. The aerial cable shall be an assembly of insulated aluminum conductors according to Section 1066.02 and 1066.03. Unless otherwise indicated, the cable assembly shall be composed of three insulated conductors and a steel reinforced bare aluminum conductor (ACSR) to be used as the ground conductor. Unless otherwise indicated, the code word designation of this cable assembly is “Palomino”. The steel reinforced aluminum conductor shall conform to ASTM B-232. The cable shall be assembled according to ANSI/ICEA S-76-474.”

Revise the second paragraph of Article 1066.05 to read:

“The tape shall have reinforced metallic detection capabilities consisting of a woven reinforced polyethylene tape with a metallic core or backing.”

Revise Article 1066.08 to read:

“Electrical Tape. Electrical tape shall be all weather vinyl plastic tape resistant to abrasion, puncture, flame, oil, acids, alkalis, and weathering, conforming to Federal Specification MIL-I-24391, ASTM D1000 and shall be listed under UL 510 Standard. Thickness shall not be less than 0.215 mm (8.5 mils) and width shall not be less than 20 mm (3/4-inch).”

LUMINAIRE

Add the following to first paragraph of Article 1067.01(a)(3) of the Standard Specifications:

“The reflector shall not be altered by paint or other opaque coatings which would cover or coat the reflecting surface. Control of the light distribution by any method other than the aforementioned clear protective coating that will alter the reflective properties of the reflecting surface is unacceptable”

Add the following to Article 1067.01(a)(5)a. of the Standard Specifications:

“The ballast shall be a High Pressure Sodium, high power factor, constant wattage auto-regulator, lead type (CWA) for operation on a nominal 240 volt system.”

Revise the second sentence of the second paragraph of Article 1067.01(a)(5)c. of the Standard Specifications:

“The ballast shall be designed to ANSI Standards and shall be designed and rated for operation on a nominal 240 volt system. The ballast shall provide positive lamp ignition at the input voltage of 216 volts. It shall operate the lamp over a range of input voltages from 216 to 264 volts without damage to the ballast. It shall provide lamp operation within lamp specifications for rated lamp life at input design voltage range. Operating characteristics shall produce output regulation not exceeding the following values:

Nominal Ballast Wattage	Maximum Ballast Regulation
750	25%
400	25%
310	26%
250	22%
150	22%

For this measure, regulation shall be defined as the following:

$$\text{Ballast Regulation} = \frac{W_{LampH} - W_{LampL}}{W_{LampN}} \times 100$$

where:

W_{LampH} = lamp watts at +10% line voltage (264v)

W_{LampL} = lamp watts at - 10% line voltage (216v)

W_{lampN} = lamp watts at 240v”

Revise the third sentence of the second paragraph of Article 1067.01(a)(5)c. of the Standard Specifications to read:

“Ballast losses, based on cold bench tests, shall not exceed the following values:

Nominal Ballast Wattage	Maximum Ballast Losses
750	16.0%
400	16.0%
310	19.0%
250	17.5%
150	26.0%

Ballast losses shall be calculated based on input watts and lamp watts at nominal system voltage as indicated in the following equation:

$$\text{Ballast Losses} = \frac{W_{Line} - W_{Lamp}}{W_{Lamp}} \times 100$$

where:

W_{line} = line watts at 240v

W_{lamp} = lamp watts at 240v

Add the following to Article 1067.01(a)(5)c. of the Standard Specifications:

“Ballast output to lamp. At nominal system voltage and a lamp voltage of 100v, the ballast shall deliver a lamp wattage within $\pm 2\%$ of the nominal lamp wattage. Example: *For a 400w luminaire, the ballast shall deliver 400 watts $\pm 2\%$ at a lamp voltage of 100v for the nominal system voltage of 240v.*”

Add the following to Article 1067.01(a)(5)c. of the Standard Specifications:

“Ballast output over lamp life. Over the life of the lamp the ballast shall produce an average output wattage of the nominal lamp rating $\pm 3\%$. Lamp wattage readings shall be taken at 5-volt increments throughout the ballast trapezoid. The lamp wattage values shall then be averaged within the trapezoid and shall be within $\pm 3\%$ of the nominal ballast rating. Submittal documents shall include a tabulation of the lamp wattage vs. lamp voltage readings. Example: *For a 400w luminaire, the averaged lamp wattage reading shall not exceed the range of 388 to 412 watts*”

Revise the first paragraph of Article 1067.01(a)(7) of the Standard Specifications to read:

“Independent testing of luminaires shall be required whenever the quantity of luminaires of a given wattage and distribution, as indicated on the plans, is 50 or more. For each luminaire type to be so tested, one luminaire plus one luminaire for each 50 luminaires shall be tested i.e. 75 luminaires would dictate that 2 to be tested; 135 luminaires would dictate that three be tested.”

Add the following to Article 1067.01(a)(7) of the Standard Specifications:

“The Contractor shall be responsible for all costs associated with the specified testing, including but not limited to shipping, travel and lodging costs as well as the costs of the tests themselves, all as part of the bid unit price for this item. Travel, lodging and other associated costs for travel by the Engineer shall be direct-billed to or shall be pre-paid by the Contractor, requiring no direct reimbursement to the Engineer or the independent witness, as applicable”

Add the following to Article 1067.01(a)(7) of the Standard Specifications:

“d. Engineer Factory Selection and Witness of Manufacturer Testing: At the Manufacturer’s facility, the Engineer shall select the luminaires to be tested and shall be present during the testing process. The Contractor shall schedule travel by the Engineer to and from the Manufacturer’s laboratory to witness the performance of the required tests.”

Revise Article 1067.02(a)(1) of the Standard Specifications to read:

“The lamps shall be of the clear type and shall have a color of 2050° to 2100° Kelvin.”

Add the following table(s) to Article 1067 of the Standard Specifications:

IDOT DISTRICT 1 LUMINAIRE PERFORMANCE TABLE
(FOR LUMINAIRE, SODIUM VAPOR, HORIZONTAL MOUNT, 310 WATT)

GIVEN CONDITIONS		
ROADWAY DATA	Pavement Width	48 (ft)
	Number of Lanes	4
	I.E.S. Surface Classification	R3
	Q-Zero Value	.07
LIGHT POLE DATA	Mounting Height	47.5 ft.
	Mast Arm Length	15 ft.
	Pole Set-Back From Edge of Pavement	20 ft.
LUMINAIRE DATA	Lamp Type	HPS
	Lamp Lumens	37,000
	I.E.S. Vertical Distribution	M
	I.E.S. Control Of Distribution	C
	I.E.S. Lateral Distribution	II
	Total Light Loss Factor	0.7
LAYOUT DATA	Spacing	250 ft.
	Configuration	OPPOSITE
	Luminaire Overhang over edge of pavement	- 5 ft.

NOTE: Variations from the above specified I.E.S. distribution pattern may be requested and acceptance of variations will be subject to review by the Engineer based on how well the performance requirements are met.

PERFORMANCE REQUIREMENTS		
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NOTE: These performance requirements shall be the minimum acceptable standards of photometric performance for the luminaire, based on the given conditions listed above.

ILLUMINATION	Average Horizontal Illumination, E_{AVE}	14.0 Lux
	Uniformity Ratio, E_{AVE}/E_{MIN}	2.0:1
LUMINANCE	Average Luminance, L_{AVE}	0.9 Cd/m ²
	Uniformity Ratio, L_{AVE}/L_{MIN}	1.6:1
	Uniformity Ratio, L_{MAX}/L_{MIN}	2.2:1
	Max. Veiling Luminance Ratio, L_V/L_{AVE}	0.24

IDOT DISTRICT 1 LUMINAIRE PERFORMANCE TABLE
(FOR TEMPORARY LUMINAIRE, SODIUM VAPOR, HIGH MAST HORIZONTAL MOUNT,
400 WATT)

GIVEN CONDITIONS		
ROADWAY DATA	Pavement Width	105 ft. (55 ft. median)
	Number of Lanes	7
	I.E.S. Surface Classification	R3
	Q-Zero Value	.07
LIGHT POLE DATA	Mounting Height	80 ft.
	Mast Arm Length	15 ft.
	Pole Set-Back From Edge of Pavement	20 ft.
LUMINAIRE DATA	Lamp Type	HPS
	Lamp Lumens	50,000
	I.E.S. Vertical Distribution	Medium
	I.E.S. Control Of Distribution	Cutoff
	I.E.S. Lateral Distribution	II
	Total Light Loss Factor	0.7
LAYOUT DATA	Spacing	150 ft.
	Configuration	OPPOSITE
	Luminaire Overhang over edge of pavement	- 5 ft.

NOTE: Variations from the above specified I.E.S. distribution pattern may be requested and acceptance of variations will be subject to review by the Engineer based on how well the performance requirements are met.

PERFORMANCE REQUIREMENTS		
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NOTE: These performance requirements shall be the minimum acceptable standards of photometric performance for the luminaire, based on the given conditions listed above.

ILLUMINATION	Average Horizontal Illumination, E_{AVE}	9 Lux
	Uniformity Ratio, E_{AVE}/E_{MIN}	3.0:1
LUMINANCE	Average Luminance, L_{AVE}	.6 Cd/m ²
	Uniformity Ratio, L_{AVE}/L_{MIN}	3.5:1
	Uniformity Ratio, L_{MAX}/L_{MIN}	6.0:1
	Max. Veiling Luminance Ratio, L_V/L_{AVE}	.30:1

(CTE – 11/29/2004)

LIGHT POLES

Effective Date: March 1, 2003

Revise the fifth sentence of Article 1069.01(b)(2)d of the Standard Specifications to read:

“A 9.525 mm (3/8 in.) – 16 tapped hole shall be provided in the frame for attaching a mechanical grounding connector.”

Revise the third sentence of Article 1069.01(c)(2)b5 of the Standard Specifications to read:

“A 9.525 mm (3/8 in.) – 16 tapped hole shall be provided in the frame for attaching a mechanical grounding connector.”

STAINLESS STEEL JUNCTION BOX

Effective Date: January 1, 2002

Revise the second sentence of the seventh paragraph of Article 1088.04 of the Standard Specifications to read:

“The gasket shall be extruded directly onto the junction box cover.”

UNIT DUCT

Revise the second paragraph of Article 816.03(b) to read:

“The unit duct shall be installed at a minimum depth of 760 mm (30-inches) unless otherwise directed by the Engineer.”

Revise Article 1066.01 to read:

“1066.01 Unit Duct. The unit duct shall be an assembly of insulated conductors which are factory pre-installed in a coilable nonmetallic conduit. The polyethylene duct shall be extruded directly over the cable at the factory in long continuous lengths. The unit duct shall be according to NEC Article 354 and be UL Listed.”

Revise Article 1088.01(c) to read:

“(c) Coilable Nonmetallic Conduit.

Polyethylene Duct. The duct shall be a plastic duct which is intended for underground use and can be manufactured and coiled or reeled in continuous transportable lengths and uncoiled for further processing and/or installation without adversely affecting its properties of performance.

The duct shall be made of high density polyethylene which shall meet the requirements of ASTM D 2447, for schedule 40. The duct shall be composed of black high density polyethylene meeting the requirements of ASTM D 3350, Class C, Grade P33. The wall thickness shall be in accordance with Table 2 for ASTM D 2447.

Duct dimensions shall conform to the following table:

Nom. Duct Diameter		Nom. Outside Diameter		Min. Wall Thickness	
mm	in	mm	in	mm	in
27	1	33.4	1.315	3.4	0.133
35	1.25	42.2	1.660	3.6	0.140
41	1.5	48.3	1.900	3.7	0.145
53	2.0	60.3	2.375	3.9	0.154
76	3.0	88.9	3.500	5.5	0.216
102	4.0	114.3	4.500	6.0	0.237

Performance Tests. Polyethylene Duct testing procedures and test results shall meet the requirements of ASTM D 3485. Certified copies of the test report shall be submitted to the Engineer prior to the installation of the duct. Duct crush test results shall meet or exceed the following requirements:

Duct Diameter		Min. force required to deform sample 50%	
mm	in	N	lbs
27	1	5337	1200
35	1.25	4937	1110
41	1.5	4559	1025
53	2.0	3780	850
76	3.0		
102	4.0		

(CTE – 03/26/2004)

CONDUIT, 3" DIA., POLYETHYLENE

Effective Date: November 10, 2003

Description. This work shall consist of furnishing and installing 3 in schedule 80 HDPE conduits, fittings and accessories, in trench and encased in concrete, pushed in place, or bored and pulled. This specification describes the minimum design, operational, functional and installation requirements for a non-invasive, magneto-inductive vehicle sensor conduit as described herein and as shown in the Plans.

Materials.

Conduit. The flexible electrical plastic duct shall be manufactured to comply with the American Society for Testing and Materials Standards (latest edition) cited by ASTM Designation D 3485, and to the standards of NEMA Publication No. TC-7.

The duct shall be manufactured from black polyethylene complying with ASTM Designation D1248, Type III, Grade 3, Class C with the following exceptions and additions:

1. The Elongation when tested by the procedure in ASTM Designation D-638 shall be a minimum of 300%.
2. The Brittle Temperature when tested by Procedure A in ASTM Designation D-746 shall be -70 degrees C. (-94 degrees F) or below.
3. The environmental Stress Crack Resistance when tested in accordance with ASTM Designation D-1693 shall produce not more than 2 failures per 10 specimens after 48 hours.

Construction. The duct shall be manufactured as polyethylene plastic pipe complying with ASTM Designation D-2104 with the following exceptions and additions:

1. The Outside Diameter, minimum wall thickness, and bending radius shall be as follows:

Nominal Size inches	Outside Diameter inches	Minimum Wall Thickness inches	Minimum Bending Radius inches
3"	3.500 ± 0.012"	0.300 ± 0.036"	40 in.

The duct may be manufactured to the dimensions in the above table, for Schedule 80. The duct must be capable of being bent in the minimum bending radius listed above.

2. When tested in accordance with the procedures and test methods referred to in ASTM Designation D-2104 the test pressures used shall be 75% of the values listed in Tables III, V, VI, VII.
3. The duct shall pass the following tests:
 - a) Freeze-up test:

A 10 ft. length of the duct bent into an upright "U" shape shall be filled with water and then placed in a low temperature cabinet and maintained at -20 degrees C. for twenty-four hours. The duct shall not crack or burst during the test.

b) Compression Test:

The test shall be conducted on three, 6 inch samples of the duct, using equipment set at 2 in. per minute. Samples are placed between 6 in. plates and compressed at the rate of 1/2 in. per minute until the distance between the plates is reduced by 50%, recording the load required to compress the duct. The samples are then removed and allowed to stand for exactly 5 minutes. The load required to compress the sample shall be equal to or greater than that listed below and the duct shall have returned to not less than 85% of its original diameter at the end of the 5 minutes.

<u>Nominal Size (inches)</u>	<u>Load (pounds)</u>
3 in	350 lbs

The duct shall be permanently marked at regular intervals on the outside with the manufacturer's name or trademark.

The manufacturer shall certify that these tests were made and the results conform to specifications, using the apparatus and test methods listed above and shall be submitted to the Engineer for approval, prior to installation of duct.

Couplings shall be high density polyethylene or acetyl butyl styrene drive on pipe fittings.

Concrete. Concrete shall be Class SI complying with Section 503 of the Standard Specifications for Road and Bridge Construction.

CONSTRUCTION REQUIREMENTS

The 3 in Schedule 80, seamless polyethylene conduit shall meet or exceed Section 810 of the Standard Specifications for Road and Bridge Construction, which apply to coilable non-metallic conduit with the following additions and modifications:

1. The centerline of the conduit shall not deviate horizontally or vertically more than .25 inches per foot.
2. At least one end of the conduit shall terminate at a standard size handhole or standard special size handhole and extend three inches into the handhole.
3. The conduit shall be sloped to drain into the handhole.
4. The far end of the conduit shall be capped when terminating or not terminating in a handhole.
5. The encased conduit shall not be reinforced.

The conduit installer shall provide a log of the boring depth, as measured every two feet along the boring distance.

Underground concrete-encased conduit shall be supported on interlocking plastic spacers specifically designed for the purpose, spaced along the length of the run as recommended by the manufacturer. Spacing between raceways within a common duct bank shall be not less than 2 in. The interlocking spacers shall be used at a minimum interval of 8 ft.

Concrete cover overall shall not be less than 3.5 in above the conduit, 3.0 in below the conduit, and a 10 in by 10 in square. Space below the conduit, and concrete fill shall be assured. Care shall be exercised during concrete placement to assure that there are no voids, so that spacers are undisturbed, and so that conduit joints stay secure and unbroken. Concrete shall be deflected during placement to minimize the possible damage to or movement of the conduits.

The Contractor shall ensure the concrete encasement and conduit remains undamaged during construction. One method for ensuring the concrete encasement and conduit remains undamaged during construction is by providing a granular sub-base mound a minimum of 24" high at the center of the microloop conduit installation and extending 50' on each side of the center of the microloop conduit installation. Other methods may be used, as the Contractor deems appropriate and as approved by the Engineer. Any damage to the concrete encasement and conduit during construction shall become the responsibility of the Contractor to repair or replace, as determined by the Engineer.

The Contractor shall ensure that the conduit is continuous, with no break from one handhole to the end cap as shown on the Plans. The Contractor shall test the integrity of the conduit upon completion of the roadway above each conduit. The Contractor shall install sensor carriers for the entire length of the conduit to demonstrate its suitability and correct installation. These carriers shall be removed upon approval of the Engineer and completion of the demonstration.

Method of Measurement. This item shall be measured for payment in feet for CONDUIT PUSHED, 3" DIA., POLYETHYLENE in place. Measurements will be made in straight lines along the centerline of the conduit between ends.

This item shall be measured for payment in feet for CONDUIT ENCASED, CONCRETE, 3" DIA., POLYETHYLENE. Measurements will be made in straight lines along the centerline of the conduit between ends.

Basis of Payment. This work shall be paid for at the Contract unit price per foot for CONDUIT PUSHED, 3" DIA., POLYETHYLENE of the type and diameter specified, which shall include conduit, labor and miscellaneous materials required to make a complete and operational installation as specified herein and as directed by the Engineer.

This work shall be paid for at the Contract unit price per foot for CONDUIT ENCASED, CONCRETE, 3" DIA., POLYETHYLENE of the type and diameter specified, which shall include conduit, labor and miscellaneous materials required to make a complete and operational installation as specified herein and as directed by the Engineer.

REINFORCED CONCRETE DUCTBANK

Description. This item shall consist of forming and finishing a reinforced concrete ductbank including spacers, rebar and all required formwork as detailed on the plans and specified herein.

Execution. Construction of the ductbank shall be in accordance with Section 810 of the Standard Specifications. Refer to plan sheets for details.

The engineer shall inspect the ductbank and verify location of reinforcing rebar, conduit spacers and duct joints prior to placing of concrete. The Contractor shall be responsible for coordinating the Engineer's inspection and obtaining his approval.

Concrete used in ductbank shall be Class SI meeting the requirements of the Standard Specifications for Road and Bridge Construction Section 1020 and shall be tested in accordance with the applicable requirements of the Standard Specifications.

Basis of Payment. This item shall be paid for at the Contract unit price per foot for CONDUIT ENCASED, REINFORCED CONCRETE of the diameter and quantity specified, which shall be payment in full for the material and work described herein.
(CTE – 03/04/2004)

MAINTENANCE OF LIGHTING SYSTEMS

Effective Date: March 1, 2003

Replace Article 801.12 of the Standard Specifications with the following:

Effective the date the Contractor's activities (electrical or otherwise) at the job site begin, the Contractor shall be responsible for the proper operation and maintenance of all existing and proposed lighting systems which are part of, or which may be affected by the work until final acceptance or as otherwise determined by the Engineer.

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

Existing lighting systems, when depicted on the plans, are intended only to indicate the general equipment installation of the systems involved and shall not be construed as an exact representation of the field conditions. It remains the Contractor's responsibility to visit the site to confirm and ascertain the exact condition of the electrical equipment and systems to be maintained.

Maintenance of Existing Lighting Systems

Existing lighting systems. Existing lighting systems shall be defined as any lighting system or part of a lighting system in service prior to this Contract. The Contract drawings indicate the general extent of any existing lighting, but whether indicated or not, it remains the Contractor's responsibility to ascertain the extent of effort required for compliance with these specifications and failure to do so will not be justification for extra payment or reduced responsibilities.

Extent of Maintenance.

Partial Maintenance. Unless otherwise indicated, if the number of circuits affected by the Contract is equal to or less than 40% of the total number of circuits in a given controller and the controller is not part of the Contract work, the Contractor needs only to maintain the affected circuits. The affected circuits shall be isolated by means of in-line waterproof fuse holders as specified elsewhere and as approved by the Engineer.

Full Maintenance. If the number of circuits affected by the Contract is greater than 40% of the total number of circuits in a given controller, or if the controller is modified in any way under the Contract work, the Contractor shall maintain the entire controller and all associated circuits.

Maintenance of Proposed Lighting Systems

Proposed Lighting Systems. Proposed lighting systems shall be defined as any lighting system or part of a lighting system which is to be constructed under this Contract. The Contractor shall be fully responsible for maintenance of all items installed under this Contract. Maintenance shall include, but not be limited to, any equipment failures or malfunctions as well as equipment damage either by the motoring public, Contractor operations, or other means. The potential cost of replacing or repairing any malfunctioning or damaged equipment shall be included in the bid price of this item and will not be paid for separately.

Lighting System Maintenance Operations. The Contractor's responsibility shall include all applicable responsibilities of the Electrical Maintenance Contract, State of Illinois, Department of Transportation, Division of Highways, District One. These responsibilities shall include the maintenance of lighting units (including sign lighting), cable runs and lighting controls. In the case of a pole knockdown or sign light damage caused by normal vehicular traffic, the Contractor shall promptly clear the lighting unit and circuit discontinuity and restore the system to service.

Responsibilities shall also include weekly night-time patrol of the lighting system, with patrol reports filed immediately with the Engineer and with deficiencies corrected within 24 hours of the patrol. Patrol reports shall be presented on standard forms as designated by the Engineer. Uncorrected deficiencies may be designated by the Engineer as necessitating emergency repairs as described elsewhere herein.

The following chart lists the maximum response, service restoration, and permanent repair time the Contractor will be allowed to perform corrective action on specific lighting system equipment.

INCIDENT OR PROBLEM	SERVICE RESPONSE TIME	SERVICE RESTORATION TIME	PERMANENT REPAIR TIME
Control cabinet out	1 hour	4 hours	7 Calendar days
Hanging mast arm	1 hour to clear	na	7 Calendar days
Radio problem	1 hour	4 hours	7 Calendar days
Motorist caused damage or leaning light pole 10 degrees or more	1 hour to clear	4 hours	7 Calendar days
Circuit out – Needs to reset breaker	1 hour	4 hours	na
Circuit out – Cable trouble	1 hour	24 hours	21 Calendar days
Outage of 3 or more successive lights	1 hour	4 hours	na
Outage of 75% of lights on one tower	1 hour	4 hours	na
Outage of light nearest RR crossing approach, Islands and gores	1 hour	4 hours	na
Outage (single or multiple) found on night outage survey or reported to EMC	na	na	7 Calendar days
Navigation light outage	na	na	24 hours

- Service Response Time - amount of time from the initial notification to the Contractor until a patrolman physically arrives at the location.
- Service Restoration Time – amount of time from the initial notification to the Contractor until the time the system is fully operational again (In cases of motorist caused damage the undamaged portions of the system are operational.)
- Permanent Repair Time – amount of time from initial notification to the Contractor until the time permanent repairs are made if the Contractor was required to make temporary repairs to meet the service restoration requirement.

Failure to provide this service will result in liquidated damages of \$500 per day per occurrence. In addition, the Department reserves the right to assign any work not completed within this timeframe to the Electrical Maintenance Contractor. All costs associated to repair this uncompleted work shall be the responsibility of the Contractor. Failure to pay these costs to the Electrical Maintenance Contractor within one month after the incident will result in additional liquidated damages of \$500 per month per occurrence. Unpaid bills will be deducted from the cost of the Contract. Repeated failures and/or a gross failure of maintenance shall result in the State's Electrical Maintenance Contractor being directed to correct all deficiencies and the resulting costs deducted from any monies owed the Contractor.

Damage caused by the Contractor's operations shall be repaired at no additional cost to the Contract.

Operation of Lighting. The lighting shall be operational every night, dusk to dawn. Duplicate lighting systems (such as temporary lighting and proposed new lighting) shall not be operated simultaneously. Lighting systems shall not be kept in operation during long daytime periods. The Contractor shall demonstrate to the satisfaction of the Engineer that the lighting system is fully operational prior to submitting a pay request. Failure to do so will be grounds for denying the pay request.

Basis of Payment. Maintenance of lighting systems shall be paid for at the Contract unit price per calendar month or fraction thereof for MAINTAIN LIGHTING SYSTEM, which shall include all work as described herein.

ELECTRIC CONNECTION TO SIGN STRUCTURE

Effective Date: October 1, 2002

Description. This item shall consist of furnishing all material and work required to connect the extension of a lighting circuit at the base of a sign structure. The feeder, up to the sign structure as shown on the drawings or as directed by the Engineer will be paid for separately.

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

<u>Item</u>	<u>Article/Section</u>
(a) Electric Raceway Material.....	1088
(b) Conductors	1066.02
(c) Insulation	1066.03

Disconnect Switch. The disconnect switch shall be 600 volt, 3-pole, 30 ampere, fusible, with solid neutral in a NEMA 4X stainless steel enclosure, complete with 20 ampere, 600 volt, dual element time delay 4L Class R fuses having a UL listed interrupting rating of not less than 200,000 rms symmetrical amperes at rated voltage.

CONSTRUCTION REQUIREMENTS

General. This item shall include fusing at the base of the structure, a disconnect switch adjacent to the sign panels and shall also include the wiring, raceways, fittings and the like between the base fusing and the disconnect switch and from the disconnect switch to the sign luminaires, all as depicted on the Plans, as specified herein and as directed by the Engineer. Sign luminaires will be paid separately

Basis of Payment. This work shall be paid for at the Contract unit price each for ELECTRIC CONNECTION TO SIGN STRUCTURE.

LIGHT TOWER, INSTALL ONLY

Effective Date: April 21, 2004

Description of Work. This work shall consist of accepting, storing, transporting, installing, and testing light towers that are to be furnished to IDOT under a separate Contract. The Contractor shall coordinate the delivery of light towers, associated hardware and sub-assemblies with the

supplier. Where light towers are to include the installation of CCTV camera assemblies on the luminaire ring, this work is to be coordinated with the work in CCTV DOME CAMERA HIGH MAST TOWER INSTALLATION.

Materials. Light Towers installed under this Contract will be purchased by IDOT under Contract # 62582

Materials shall be according to the following Articles of Section 1000

- (a) Supply Light Pole/Unit Identification as per Article # 1069.02
- (b) The Contractor shall furnish two flexible cords, new and in boxes, each 50 ft. long, of the same construction as the power cord described in the second paragraph of Article 1069.04(o) of the Standard Specifications. Each cord shall have one male and one female pin and sleeve connector as described in Article 1069.04(p) of the Standard Specifications, each installed on an end of the cord, to provide power to test the operation of the luminaires in the lowered position.
- (c) The Contractor shall furnish matched flexible power cord and the heat shrink boot for connecting feeder to the power distribution box.
- (d) The Contractor shall furnish all supports, blocking lumber, shelving, and other material required to store the light tower components in compliance with the light-tower manufacturer's written instructions and this special provision.
- (e) The Contractor shall furnish all materials required for installation as described under Shipment and Installation that are not furnished elsewhere.

Submittals and Certifications. The Contractor shall furnish a letters signed by authorized representatives of both the light tower manufacturer and the anchor rod supplier confirming the coordination between them to ensure the adequacy of the anchor rod assemblies, as described in Article 835.03(f) of the Standard Specifications. Light towers shall not be installed before the Engineer is in receipt of both letters. The letters shall specify any differentiation between the anchor bolt assemblies required to coordinate them with the proper tower heights.

The Contractor shall furnish a letter of intent to provide the services of an authorized representative of the light tower manufacturer during installation and to provide specified installation certification as described in Article 835.03(h) of the Standard Specifications.

During construction, the hand hole door shall be secured with padlock at all the time.

The Contractor shall request written instructions for the shipment and storage of the light tower components from the light tower manufacturer, including but not limited to blocking and support, environmental requirements and any periodic lubrication or turning required to prevent corrosion, fretting, sagging, or other storage-related problems. The Contractor shall provide three copies of both the request and the reply from the manufacturer to the Engineer.

The Contractor shall furnish proof of insurance for all material owned by the Department that will be stored at the storage location. The storage location and limit of liability shall be specified in the proof of insurance, and the Department shall be clearly identified as an additional insured. If more than one location is to be used for storage, then each location shall be specifically identified in the proof of insurance.

The Contractor shall provide the Engineer with a list of all storage locations to be used to store the light tower components. If any of the locations used are not the Contractor's own property, a fully signed and executed copy of the lease agreement shall be furnished to the Engineer for each leased storage area.

Transport. Transportation of the light tower shall comply with Article 835.04 of the Standard Specifications. The Contractor shall transport the light tower components from the location within IDOT District 1 where the manufacturer will deliver the light tower components to the Contractor's storage location. The Contractor shall transport the light towers required for each phase, stage and sub-stage of construction. Tower shaft sections shall not be transported to the work site more than two weeks prior to when they are to be installed, and only when a suitable lay-down location is available on site and approved by the Engineer. All components shall be shipped in fully enclosed vans or trailers, with the exception of the shaft sections, which shall be shipped in accordance with the light tower manufacturer's written instructions. The Contractor shall perform all loading and unloading in accordance with the manufacturer's written instructions.

Receiving and Handling. The Contractor may, as approved by IDOT, take direct delivery of the towers from the supplier or pick-up the towers from the IDOT storage facility. The Contractor shall unload/load and examine the towers and the sub-assemblies in the presence of the Engineer and after accepting them shall transport, handle and store (as applicable) in complete compliance with the manufacturer's recommendations. The Contractor shall be held responsible for preservation of the condition of each tower and sub-assembly, as it was at the time of acceptance, until the Final Acceptance Inspection.

The Contractor shall store all towers from the time of delivery until the towers are delivered to the site for installation. The Contractor may store the tower shafts on State ROW as approved by the Engineer and as per manufacturer's requirements. The cost of this storage is included in this pay item; no separate payment will be made. The Engineer, or the Engineer's representative, shall be given complete access to any and all storage locations within 24 hours of such access being requested.

The Contractor shall maintain an inventory list of the towers and the associated sub-assemblies stored at each location, including the work site. The inventory list shall include at a minimum the manufacturer's model numbers, and the serial numbers if applicable, of each unit stored, the date of arrival at the location, and a description of where it is located at the site so that it can be readily located or retrieved without searching. The list shall also include towers that have been removed from inventory at that location. Each removed tower shall be listed with all the information previously described, plus the date it was removed and location to which it was transported. This list shall be maintained current at all times, and a current copy stored at the Contractor's supervisor's office at the work site. Surplus towers and/or assemblies, if any, shall be turned over to the IDOT resident engineer who will be responsible for proper disposition of units.

The storage location for the towers may be the same as for the luminaires components, as identified elsewhere in these Contract Documents. Storage location patrols and inventory reports may be combined for the luminaires and light tower components if they are stored in the same location. The Contractor shall also note any deterioration of the tower components or their packaging, and any leaks or other problems with the storage building's exterior envelope. The Contractor shall also inspect the security of the site and report any deficiencies. The Contractor shall furnish the Engineer with a monthly Storage Location Inspection Report.

All tower components, except for the shaft sections, shall be stored in an interior location, with full protection from wind, precipitation and freezing temperatures. The Engineer, or the Engineer's representative, shall be given complete access to any and all storage locations within 24 hours of such access being requested.

The Contractor shall mark each and every carton or box containing these tower components in permanent ink in letters not less than 1 inch high, "PROPERTY OF THE ILLINOIS DEPARTMENT OF TRANSPORTATION, CONTRACT # 62582 Material not packaged in cartons or boxes shall bear the same label on a durable, water-resistant tag, attached to the material by a cable tie or other durable means.

Installation. Light tower shipment and installation shall comply with Article 835.04 of the Standard Specifications. Requirements for shipment shall apply whether the shipment is from the manufacturer, from IDOT storage location or from the Contractor's storage location.

The Contractor shall get approval from the resident engineer for positioning the tower such that the location of the hand hole is in proper position with respect to the direction of the traffic. The Contractor shall furnish a letter of certification from the light tower manufacturer's authorized representative stating that each tower, identified by location and by serial number, has been installed in full compliance with the manufacturer's written and other instructions and that the manufacturer's warranty is valid. Multiple towers may be included in a single letter of certification as long as each tower is individually and uniquely identified therein.

Prototype Light Tower Installation. The first light tower to be installed on the project shall be erected and assembled under the supervision of the light tower manufacturer's authorized representative, and subject to inspection by the Engineer. No other light towers shall be erected until the prototype tower has been erected, completely assembled, tested, certified by the manufacturer's authorized representative as complying in full with the manufacturer's requirements for erection and assembly, and approved by the Engineer. The prototype light tower shall serve as a reference for the proper erection and assembly and the standard of workmanship to be used in the erection and assembly of all other light towers.

Method of Measurement. LIGHT TOWER, of the height specified, INSTALL ONLY will be counted per each light tower installed as described herein and certified by the light tower manufacturer's authorized representative as having been correctly installed.

Basis of Payment. LIGHT TOWER, of the height specified, INSTALL ONLY will be paid at the Contract unit price each, which shall be payment in full for all material, labor, storage, transport, equipment, tools, and certifications.

LIGHT TOWER FOUNDATION

Description. This item shall consist of forming and finishing a light tower foundation for a ground mounted light tower and all required hardware as detailed in the plans and specified herein.

Execution. Construction of the light tower foundation shall be in accordance with Section 837 of the Standard Specifications and District One Electrical Specifications. Refer to plan sheets for details.

The Engineer shall inspect foundation form work and verify location of anchor rods and conduit sleeves prior to the placement of concrete. The Contractor shall be responsible for coordinating the Engineer's inspection and obtaining his approval.

Basis of Payment. This item shall be paid for at the Contract unit price feet for LIGHT TOWER FOUNDATION, of the diameter specified, which shall be payment in full for the work described herein.

(CTE – 10/28/2004)

LIGHTING FOUNDATION REMOVAL, PARTIAL

Description. This item consists of removing and disposing of an existing lighting foundation and backfilling the excavated areas as specified herein, as shown on the Plans and as directed by the Engineer.

General Requirements. General requirements must be in accordance with Section 801 of the Standard Specifications, and in accordance with 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.

The void caused by the removal of a foundation in soil or grass must be backfilled in accordance with the TRENCH AND BACKFILL FOR ELECTRICAL WORK pay item.

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 each for LIGHTING FOUNDATION REMOVAL, PARTIAL, which shall be payment in full for the work described herein.

(CTE – 03/26/2004)

LIGHT TOWER SERVICE PAD

Description. This work shall consist of the construction of light tower service pads. The service pads shall be built to the lines and grades and dimension shown on the plans. The work shall include the concrete, protective coat, sub-base, epoxy coated rebar, and welded wire fabric

required for the installation of the service pad. When shown on the plan a 9" concrete curb or a concrete retaining wall shall be integrally constructed with the service pad. The work to provide the curb and retaining wall will be paid for separately in accordance with the Standard

Specifications and is not included in this pay item. This work shall be done according to Section 606 of the Standard Specifications with the following revisions:

Revise Article 606.14 of the Standard Specifications to read:

Basis of Payment. Light tower service pads integral with retaining walls will be paid for at the Contract unit price per square foot for LIGHT TOWER SERVICE PAD, 6" and LIGHT TOWER SERVICE PAD, SPECIAL, which shall be payment in full the material and work described herein.

No additional compensation will be allowed for furnishing and compacting 6" of CA-6 sub-base, providing and finishing Class SI concrete including protective coat, providing reinforcement bars, providing welded wire fabric, backfilling, and restoring slopes for the concrete pad as indicated in the plans or as directed by the Engineer.
(CTE – 11/29/2004)

UTILITY TRANSFORMER PAD, 4"

Description. This item shall consist of furnishing and installing a concrete pad for a ground mounted utility transformer as shown on Commonwealth Edison Company (COMED) Standard Drawing C5288, as shown on the plans and as directed by COMED or the Engineer. All work shall be done in accordance with COMED Standards and requirements.

All excavation, site preparation, formwork, concrete, steel reinforcement, conduit sleeves, grounding, subgrade materials, backfill, and grading work required to install the pad shall be included in this pay item.

Basis of Payment. This work will be paid for at the Contract unit price each for UTILITY TRANSFORMER PAD, 4", which shall be payment in full for the material and work described herein.
(CTE – 08/18/2004)

RELOCATE EXISTING JUNCTION BOX

Description. This item shall consist of removing and relocating an existing junction box where and when indicated on the plans and as directed by the Engineer.

Materials. Materials shall comply with Article 813.02 of the Standard Specifications.

Removal. The existing junction box shall be disconnected and removed. Existing conduit and cables shall be removed as required.

Any damage sustained to the junction box during the removal operations shall be repaired, or replaced in kind, to the satisfaction of the Engineer at the Contractor's expense.

Reinstallation. The existing junction box shall be reinstalled as shown on the plans and as directed by the Engineer. The new conduit (if required) and electric cables shall be connected to the power supply cables so the lighting unit connected to the reinstalled junction box becomes operational the same evening without interruption. Temporary wiring will be permitted at the discretion of the Engineer.

Temporary wiring will not be paid for separately but shall be included in the cost for this Pay Item. New conduit and wire will be paid for under the appropriate Pay Items for new work.

Basis of Payment. This item shall be paid at the Contract unit price each for RELOCATE EXISTING JUNCTION BOX, which shall be payment in full for the work described herein.
(CTE – 10/16/2004)

REMOVE EXISTING JUNCTION BOX

Description. This item shall consist of removing and disposing of an existing junction box where and when indicated on the plans and as directed by the Engineer.

General. When indicated junction boxes and all associated hardware and appurtenances shall become the property of the Contractor and shall be disposed of off the project site.

No removal work shall be permitted without approval from the Engineer. Exposed conduit shall be removed back to the last connection point unaffected by the removal work. Existing cables shall be removed back to the last splice point unaffected by the removal work.

Method of Measurement. Each junction box (and appurtenant equipment) which is removed and disposed of as indicated, shall be counted as a unit for payment.

Basis of Payment. This work shall be paid for at the Contract unit price each for REMOVE EXISTING JUNCTION BOX.
(CTE – 03/26/2004)

LUMINAIRE, INSTALL ONLY

Effective Date: April 21, 2004

Description. This item shall consist of accepting delivery of a luminaire purchased under a separate Contract, storing a luminaire until installed, and installing a luminaire, as specified herein, and as indicated. The luminaire will be furnished and under a separate Contract and it shall be the responsibility of the Contractor to coordinate delivery with the Engineer and Supply Contractor as applicable. The Contractor shall accept delivery, unload and if necessary store the luminaire until it is installed. It shall also be the Contractor's responsibility to furnish a lamp of the specified type and wattage for each luminaire installed.

Materials. As required, shall be according to the following Articles of Section 1000

Item	Article/Section
(a) Lamps	1067.02

The luminaires installed under this Contract will be purchased by IDOT under Contract # 62647.

CONSTRUCTION REQUIREMENTS

Receiving and Handling. The Contractor may, as approved by IDOT, take direct delivery of the luminaires from the supplier or pick-up the luminaires from the IDOT storage facility. The Contractor shall unload/load and examine the luminaires in the presence of the Engineer and

after accepting them shall transport, handle and store (as applicable) the luminaires in complete compliance with the manufacturer's recommendations. The Contractor shall be held responsible for preservation of the condition of each luminaire, as it was at the time of acceptance, until the Final Acceptance Inspection.

The Contractor shall store all luminaires from the time of delivery until the luminaires are delivered to the site for installation. The cost of this storage is included in this pay item; no separate payment will be made. All luminaires shall be stored in an interior location, with full protection from wind, precipitation and freezing temperatures. All luminaires shall be stored in single location. The Engineer, or the Engineer's representative, shall be given complete access to any and all storage locations within 24 hours of such access being requested.

The Contractor shall maintain an inventory list of the luminaires stored at each location, including the work site. The inventory list shall include at a minimum the manufacturer's model numbers, and the serial numbers if applicable, of each luminaire stored, the date of arrival at the location, and a description of where it is located at the site so that it can be readily located or retrieved without searching. The list shall also include luminaires that have been removed from inventory at that location. Each removed luminaire shall be listed with all the information previously described, plus the date it was removed and location to which it was transported. This list shall be maintained current at all times, and a current copy stored at the Contractor's supervisor's office at the work site. All the surplus luminaires shall be turned over to the IDOT resident engineer who will be responsible for proper disposition of units.

The storage location for the luminaires may be the same as for the light tower components, as identified elsewhere in these Contract Documents. Storage location patrols and inventory reports may be combined for the luminaires and light tower components if they are stored in the same location.

Installation. Each luminaire shall be installed: (1) According to the luminaire manufacturer's recommendation. (2) As per Article 821.05 and (3) As indicated on the plans.

Method of Measurement. Luminaires shall be counted, each installed.

Basis of Payment. This item shall be paid at the Contract unit each for LUMINAIRE, of the type and wattage indicated, INSTALL ONLY, which shall be payment in full for all labor, materials, transportation, storage, tools, equipment and any other to complete the luminaire installation.

WOODEN POLE REMOVAL

Description. This item consists of removing an existing temporary wood pole. The wood pole shall become property of the Contractor and shall be removed from the site.

Pole holes shall be backfilled according to Section 815.

Method of Measurement. Units measured for payment will be counted on a per-pole basis, regardless of pole material, mounting height, and installation depth.

Basis of Payment. This work will be paid for at the Contract unit price each for WOODEN POLE REMOVAL.
(CTE – 03/26/2004)

FLUORESCENT LUMINAIRE FOR SIGN LIGHTING

Effective Date: March 25, 2004

Description. This item shall consist of furnishing, testing as required, and installing a luminaire suitable for illumination of roadway signage as specified herein.

Materials. Materials shall be according to the following:

Housing. The outer housing shall be constructed from 1.6 mm (0.064 inch) thick 3003-H14 aluminum or 300 series stainless steel with a minimum thickness of 0.048". The housing shall have a full length hinge, of the same material as the housing.

Lens and Frame. The lens frame shall be made of extruded aluminum, or stainless steel as described, and have a continuous extruded neoprene gasket seal to insure weatherproofing. The frame shall have a concealed retaining latch which locks the door open for servicing and shall include a safety chain. The frame shall have spring loaded toggle action latches. The lens shall be made of clear 3 mm (0.125 inch) thick acrylic.

Lamp Holders. The lamp holders shall be end mounted, spring loaded, self-sealing, and self-aligning.

Reflector. The reflector shall be made of 0.5 mm (0.020 inch) minimum thickness specular aluminum.

Wiring. All wiring connections in the fixture shall terminate on molded phenolic, barriers type, heavy duty, terminal blocks rated for a maximum current of 30 amperes and maximum voltage of 3,300 volts. The terminal block shall accommodate No. 10 AWG wire and shall be legibly color marked to suit the ballast wire colors. All wiring, terminal blocks, and ballast shall be fully enclosed within the fixture so none of the above parts are exposed when relamping.

Ballast. The ballast be an electronic ballast capable of starting two T8 fluorescent lamps as described herein. Manufacturer must have a 15 year history of designing and manufacturing electronic ballasts for the North American market. Ballast must be manufactured in a facility Certified to ISO 9002 Quality System Standards.

Physical Requirements. The ballast must have permanently connected leads integral to the ballast, color coded to ANSI C82.11.

Performance Requirements. The ballast shall have a ballast factor of .85-.92. The ballast shall have a maximum input wattage (ANSI) of 140 watts. The Ballast Efficacy Factor shall be greater than or equal to 0.67. The ballast shall be capable of starting and operate the specified lamps at a minimum temperature of -20 degrees Fahrenheit. The Ballast must be designed and UL Listed to operate the number and type of lamps as indicated.

Electrical Performance Requirements. The ballast Total Harmonic Distortion shall be less than 10%. The lamp current crest factor shall not exceed 1.6. The Power Factor shall be greater than 90%. The ballast output frequency shall be greater than 20kHz and less than 30kHz or greater than 42kHz. Ballast output shall not be between 30kHz and 42kHz for any lamp combination.

The ballast must operate between 230-250V(240V nominal), 60Hz. The ballast must maintain light output at +/- 10% during a voltage fluctuation of +/- 10%.

Regulatory Requirements. The ballast shall meet ANSI C82.11 limits for Total Harmonic Distortion (THD). The ballast shall meet ANSI 62.41 Category A standards for Transient Voltage protection. The ballast shall be UL Class P, Type 1 Outdoor. The ballast shall not contain any Polychlorinated Byphenols (PCBs) in accordance with US law.

Lamps. Fluorescent lamps for sign lighting shall T8, high output, Type F72T8/HO with an average rated life of 18,000 hours and a mean lumen output of 5,490 lumens. The lamp shall have a color temperature of 4100° K, and a CRI of 85. All fluorescent lamps shall be capable of starting and operating at a minimum temperature of - 30° C (-20° F) and shall be of a low mercury content design.

CONSTRUCTION REQUIREMENTS

Installation. Each luminaire shall be mounted on the sign walkway structure with stainless steel hardware and with at least 3 points of attachment. The mounted luminaire or mounting hardware shall not extend above the bottom of the sign or below the bottom of the walkway support.

The center-to-center spacing of the luminaires will be determined by the Engineer. The end sections shall not exceed one-half the spacing between luminaires.

The mounting shall provide the correct position of the luminaire as recommended by the manufacturer and shall be able to withstand 130 km/h (80 mph) winds with a 1.3 gust factor. The sign lighting installation shall include a service disconnect with lockable exterior handle mounted within reach from the walkway.

Disabling brightness shall be shielded from traffic approaching either the front or back of the sign.

The mounted luminaire or mounting hardware shall not extend above the bottom of the sign or below the bottom of the walkway support.

Coordination. Sign structures will be furnished and installed in various Civil Contracts. The Contractor for Contract 62583 shall coordinate with other Contractors to ensure that the luminaires and wiring are properly installed on the sign truss before the truss is installed on the sign supports under the Civil Contract. This coordination will not be paid for separately but will be considered in the costs of FLUORESCENT LUMINAIRE FOR SIGN LIGHTING.

Basis of Payment. This work shall be paid for at the Contract unit price each for FLUORESCENT LUMINAIRE FOR SIGN LIGHTING.

TEMPORARY LIGHTING CONTROLLER, INSTALL ONLY

Description. This item shall consist of furnishing all material and work required to install an existing lighting controller in a temporary location as shown on the plans and as directed by the Engineer.

CONSTRUCTION REQUIREMENTS

General. This item shall include the removal of an existing lighting controller and installation of the lighting controller in a temporary location. The removal of the foundation shall not be included in this item but shall be paid for separately under REMOVAL OF LIGHTING CONTROLLER FOUNDATION.

Prior to removal of the existing lighting controller all temporary connections required to connect the lighting controller in its' new location to the roadway lighting system shall be in place and ready for connection. All existing cables shall then be disconnected at the lighting controller and the lighting controller shall be removed from the foundation and be installed in the new temporary location. The foundation or supporting structure for the lighting controller in the temporary location shall be as shown on the drawings and shall be furnished and installed under this item. The temporary controller shall then be connected to the temporary power and lighting feeder cables to restore the lighting system to normal operation. The Contractor will have 8 hours to disconnect the existing lighting circuits, relocate the existing controller in the temporary location and reconnect the lighting circuits. The roadway lighting system must remain in operation from dusk to dawn at all times.

Basis of Payment. This work shall be paid for at the Contract unit price each for TEMPORARY LIGHTING CONTROLLER (INSTALL ONLY), which shall be payment in full for the work described herein.
(CTE – 03/26/2004)

REMOVE EXISTING UNDERPASS LUMINAIRE, AND SALVAGE

Modify Article 842.07 of the Standard Specifications to read:

“Basis of Payment. This work will be paid for at the Contract unit price each for REMOVE EXISTING UNDERPASS LUMINAIRE, SALVAGE; or REMOVAL OF LIGHTING UNIT, SALVAGE; or REMOVAL OF LIGHTING UNIT, NO SALVAGE; REMOVAL OF POLE FOUNDATION of the type specified.”

(CTE – 03/26/2004)

AERIAL CABLE REMOVAL

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

No removal work shall be permitted without approval from the Engineer. Aerial cables with messenger, mounting hardware and associated apparatus 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 – 03/26/2004)

CONDUIT ATTACHED TO STRUCTURE

Description. This item consists of furnishing and installing conduits, fittings, and accessories, attached to a concrete wall or concrete structure as specified herein, as shown on the Plans, and as directed by the Engineer.

Materials. Materials must be according to the following Articles of Standard Specifications Section 1000 – Materials:

<u>Item</u>	<u>Requirement</u>
(a) PVC Coated Galvanized Steel Conduit.....	Standard Specifications, Article 1088(a)(3)
(b) Liquid Tight Metal Flexible Conduit	Standard Specifications, Article 1088.01(a)(4)
(c) Expansion Fittings for Raceways	Standard Specifications, Article 1088.02

General Requirements. General requirements must be in accordance with Section 801 of the Standard Specifications.

Location. Conduits will be installed at locations as shown diagrammatically on the Plans. Conduits must 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 must be in accordance with Article 811.03(b) of the Standard Specifications.

Method of Measurement. Conduit attached to structure 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. Liquid-tight flexible metal conduit will not be measured for payment, but will be considered as included in the price conduit attached to structure.

Basis of Payment. This work will be paid for at the Contract unit price per foot for CONDUIT ATTACHED TO STRUCTURE, of the size and type specified, which shall be payment in full for the material and work described herein.
(CTE – 03/26/2004)

UNDERPASS LUMINAIRE, HIGH PRESSURE SODIUM VAPOR

Description. This item shall consist of furnishing, testing as required, and installing a luminaire suitable for roadway underpasses as specified herein.

General. The luminaire shall be optically sealed, mechanically strong and easy to maintain.

All wiring within the fixture shall have a minimum temperature rating of 125° C. In addition, the unit shall be designed to allow for a maximum supply wire rating of 90° C.

All hardware of the housing, reflector, and ballast assembly shall be captive.

The luminaire shall be UL Listed for Wet Locations.

The underpass luminaire shall be suitable for lighting a roadway underpass at approximate mounting height of 4.877 meters (16 feet) from a position suspended directly above the roadway.

The luminaire shall be certified by the U.L. testing laboratory to meet the IP66 criteria of the International Electrotechnical Commission Standard 529.

Housing. The housing shall be stainless steel and be made of 16 gauge minimum thickness stainless steel, Type 304, #2B finish.

Since the installed location of the luminaires has severe space limitations that prohibit servicing the luminaire from the top or side of the fixture, the luminaire must be serviceable from the bottom of the housing when in the installed position. Both ballast and optical compartments must be serviceable from the bottom of the fixture. Fixtures which open from the top or sides are not acceptable.

The housing shall have a maximum width of 355.6 mm (14").

All internal and external hardware, unless specifically specified otherwise, shall be made of stainless steel.

Stainless Steel Housing. The stainless steel housing, and lens frame shall be made of 16 gauge minimum thickness stainless steel, Type 304 #2B.

All housing and frame components shall be cut with a laser with a positioning accuracy of +/- .004" for assembly accuracy and machine welded to minimize irregularities in the weld joint.

All seams in the housing enclosure shall be welded by continuous welding. Stainless steel weld wire shall be used for all welds. A sample weld shall be submitted for review and approval.

The luminaire lens shall be flush, within 0.122", of the lens frame.

The lens frame shall be flat and the frame and luminaire housing shall not have any protruding flanges.

The lens frame assembly shall consist of a one-piece 16 gauge 304 stainless steel external frame with the lens facing toward the housing and a 16 gauge 304 stainless internal frame with the legs facing away from the housing. The internal frame shall have seam welded corners for added strength. The two panels will sandwich the glass lens and be fastened together with the use of no less than 10 #10 stainless steel fasteners.

The ballast door frame shall consist of a one-piece 16 gauge 304 stainless steel external door with the legs facing toward the housing and an 18 gauge 304 stainless steel internal door with the legs facing away from the housing. The two elements will be welded together.

The lens frame and the door frame shall each be secured through the use of two stainless steel draw latches secured to the fixture housing.

When in open position, it shall be possible to un-hinge and remove the lens frame for maintenance. The lens frame hinge shall be stainless steel and designed so that there must be a conscious action of the maintenance personnel to remove the lens frame. The frame hinging method shall not be designed so that bumping the frame accidentally could allow the frame to fall to the roadway surface. The removal method must be accomplished without the use of tools or hardware. The hinge pin shall be a minimum of 0.250" in diameter. The pin shall be spring loaded and retractable with a safety catch to hold the pin in the retracted position for ease of maintenance.

The ballast and all electrical equipment shall be mounted to a removable aluminum chassis with a minimum thickness of 0.125". The chassis shall be held in place with captive stainless steel hardware that can be removed without the use of tools. The hardware shall include a bracket that can be loosened and shifted to allow the chassis to pivot away from fastened position for removal. The chassis shall include a heavy-duty 3 pole terminal block to accommodate #6 conductors and a KTK 5 amp fuse with HPC fuse holder or approved equal. Quick-connect power distribution terminal blocks shall be a molded thermoset plastic, rated 70A, 600V and have 3 poles, each with (4) .250 quick connect terminals. Operating temperature rating to be 1500C. Input wire size shall accommodate #2 - #14 AWG. Torque rating shall be 45 in/lb. Maximum. Agency approvals shall be UL E62622; CSA LR15364.

Ballast compartment surfaces shall be deburred and free of sharp edges, points or corners that may come in contact with installers or service personnel.

The housing shall be divided into two compartments, one for the ballast and one for the optical assembly. The optical chamber shall be sealed from the environment and separated from the ballast compartment with a welded and sealed stainless steel divider. The wire portal between compartments shall be sealed so as to prevent air exchange through the portal. There shall be an internally mounted breather mechanism to allow internal and external air pressure to equalize without permitting dust or water into the unit.

Gasketing. The junction between the lens frame and the ballast housing door and the housing shall be sealed with a one-piece vulcanized or molded high temperature solid silicone rubber gasket with the equivalent of a 60 Shore A durometer rating. The gasket between the lens frame and the luminaire housing shall be securely attached by mechanical means, such a retaining lip to prevent the movement of the gasket. The gasket may not be secured by adhesive means exclusively. The lens and ballast housing doors shall be designed and constructed so they seal to the gasket on a flat surface. The frame shall not seal to the gasket using the edge of leg on a doorframe. The lens shall be sealed inside of the lens frame with the use of a one-piece solid silicone rubber gasket with ribbed flanges and a rating of 60 Shore A Durometer. The junction between conduit connections to the luminaire and the lens frame junction to the housing shall withstand entry of water when subjected to a water jet pressure of 207 kPa (30 lbs. Per sq. inch), tested under laboratory conditions. Submittal information shall include data relative to gasket thickness and density and the means of securing it in place.

Mounting Brackets. The brackets shall be properly sized to accommodate the weight of the luminaire with calculations or other suitable reference documentation submitted to support the material choice.

The luminaire shall have an opening in the housing for installation (by others) of a 1 inch diameter flexible conduit. The location of the opening will be determined by the Engineer during the shop drawing review.

Lamp Socket. The lamp socket shall be a 4KV pulse rated mogul type, porcelain glazed enclosed, and be provided with grips, or other suitable means to hold the lamp against vibration. The rating of the socket shall exceed the lamp starting voltage, or starting pulse voltage rating.

If the lamp socket is of the sealed removable type, proper alignment of the socket shall be provided and molded into the socket assembly and indicated in a contrasting color.

If the lamp socket is adjustable, the factory setting must be indicated legibly in the luminaire housing.

The lamp shall be held in place with the socket and wire cage so that the centerline of the lamp is aligned no more than 1/4" from the alignment of the focal point of the reflector.

The lamp shall be held in place from vibration with a fabricated wire cage which securely holds the lamp to prevent loosening from the socket or damage due to vibration of the structure the luminaire is attached to. The wire holder shall not come in direct contact with the glass of the lamp, but shall be insulated by a glass fiber insulation means rated for 450°C and UL E86619 listed to prevent deterioration on the lamp. The wire holder shall be designed with a torsion arm that allows for the removal of the lamp without the removal of the wire harness.

ANSI Identification Decal. A decal, complying to ANSI standard C136-15 for luminaire wattage and distribution type, shall be factory attached permanently to the luminaire. The information contained in the decal shall enable a viewer, from the ground level, to identify the lamp wattage and type of luminaire distribution.

Optical Assembly. Lens and Lens Frame. The lens shall be made of crystal clear, impact and heat resistant tempered glass a minimum of 0.25" thick. The lens shall be held in such a manner as to allow for its expansion and Contraction, due to temperature variation. The lens shall be a flat glass design.

Reflector. The main reflector shall be made from a pre-anodized aluminum sheet of such grade quality that the reflecting surface shall have a smooth, specular finish and the reflecting surface shall have a dense protective coating of oxide not less than 7.5 mg/in², applied by the anodic oxidation process.

The reflector surfaces parallel to the direction of the main beam plane shall be constructed of specular 0.020" thick pre-anodized lighting grade hammertone textured aluminum.

The reflector shall be attached with no fewer than three machine screws or bolts. It shall not be possible to misalign the reflector in either the vertical or horizontal planes.

The reflector shall be secured with a stainless steel aircraft cable during maintenance operations.

If the reflector has multiple light distribution positions, each position must have positive stop/mounting with the original factory distribution identified.

The luminaire shall be photometrically efficient. Luminaire efficiency, defined by the I.E.S. as "the ratio or luminous flux (lumens) emitted by a luminaire to that emitted by the lamp or lamps used within", shall not be less than 67%. Submittal information shall include published efficiency data.

The reflector, the refractor or lens, and the entire optical assembly shall not develop any discoloration over the normal life span of the luminaire.

The reflector shall not be altered by paint or other opaque coatings which would cover or coat the reflecting surface. Control of the light distribution by any method other than the reflecting material and the aforementioned clear protective coating that will alter the reflective properties of the reflecting surface is unacceptable.

Ballast. The ballast shall be a High Pressure Sodium, high power factor, lead type, Isolated Regulator Ballast (CWI) or a Constant Wattage Auto-regulator (CWA), for operation on a nominal 240 volt system.

The ballast shall be designed to furnish proper electrical characteristics for starting and operating a high pressure sodium vapor lamp of the specified rating at ambient temperatures of -29 degrees to +40 degrees C. The ballast windings shall be adequately impregnated and treated for protection against the entrance of moisture, insulated with Class H insulation, and able to withstand the NEMA standard dielectric test.

The ballast shall include an electronic starting assembly. The starter assembly shall be comprised of solid state devices capable of withstanding ambient temperatures of 85 degrees C. The starter shall provide timed pulsing with sufficient follow-through current to completely ionize and start all lamps. Minimum amplitude of the pulse shall be 2,500 volts, with a width of one (1) microsecond at 2,250 volts, and shall be applied within 20 electrical degrees of the peak of the open circuit voltage wave with a repetition rate as recommended by the lamp manufacturer for the 60 cycle wave. The lamp peak pulse current shall be a minimum of 0.2 amperes. Proper ignition shall be provided over a range of input voltage from 216 to 264 volts. The starter component shall be field replaceable and completely interchangeable with no adjustment necessary for proper operation. The starter component shall have push-on type electrical terminations to provide good electrical and mechanical integrity and ease of replacement. Terminal configuration shall preclude improper insertion of plug-in components. The starter circuit board shall be treated in an approved manner to provide a water and contaminant-resistant coating.

The ballast shall have an overall power factor of at least 0.9 when operated under rated lamp load.

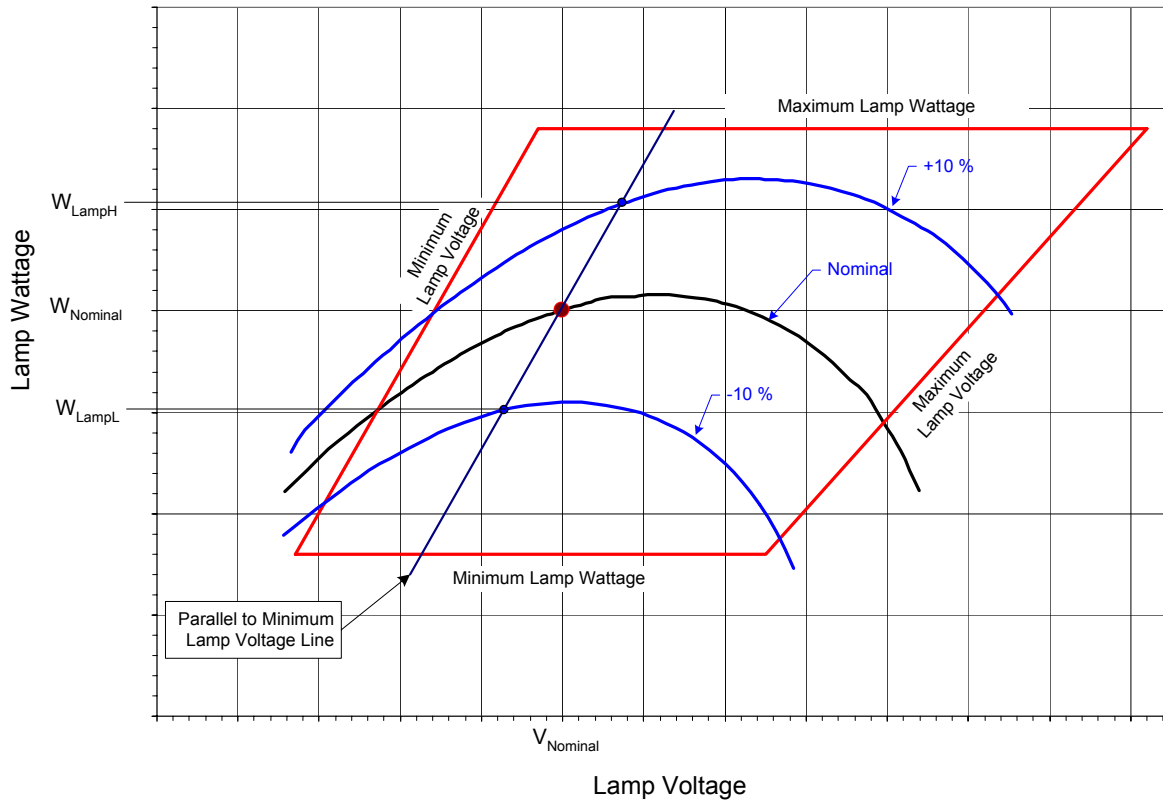
The ballast shall withstand a 2,500 volt dielectric test between the core and windings without damage to the insulation.

The ballast shall not subject the lamp to a crest factor exceeding 1.8 and shall operate the lamp without affecting adversely the lamp life and performance.

The ballast shall be designed to ANSI Standards and shall be designed and rated for operation on a nominal 240 volt single phase grounded neutral system. The ballast shall provide positive lamp ignition at the input voltage of 216 volts. It shall operate the lamp over a range of input voltages from 216 to 264 volts without damage to the ballast. It shall provide lamp operation within lamp specifications for rated lamp life at input design voltage range. Operating characteristics shall produce output regulation not exceeding 20% For this measure, regulation shall be defined as the following values:

Nominal Ballast Wattage	Maximum Ballast Regulation
750	25%
400	25%
310	26%
250	22%
150	22%
70	17%

For this measure, regulation shall be defined as the ratio of the lamp watt difference between the upper and lower operating curves to the nominal lamp watts; with the lamp watt difference taken within the ANSI trapezoid at the nominal lamp operating voltage point parallel to the minimum lamp volt line:



$$\text{Ballast Regulation} = \frac{W_{LampH} - W_{LampL}}{W_{LampN}} \times 100$$

where:

W_{LampH} = lamp watts at +10% line voltage (216v)

W_{LampL} = lamp watts at - 10% line voltage (264v)

W_{lampN} = lamp watts at 240v

Ballast losses, based on cold bench tests, shall not exceed the following values:

Nominal Ballast Wattage	Maximum Ballast Losses
750	16.0%
400	16.0%
310	19.0%
250	17.5%
150	26.0%
70	34.0%

Ballast losses shall be calculated based on input watts and lamp watts at nominal system voltage as indicated in the following equation:

$$\text{Ballast Losses} = \frac{W_{Line} - W_{Lamp}}{W_{Lamp}} \times 100$$

where:

W_{line} = line watts at 240v

W_{lamp} = lamp watts at 240v

Ballast output to lamp. At nominal system voltage and a lamp voltage of 52v, the ballast shall deliver a lamp wattage within $\pm 4\%$ of the nominal lamp wattage. For a 70w luminaire, the ballast shall deliver 70 watts $\pm 4\%$ at a lamp voltage of 52v for the nominal system voltage of 240v.

Ballast output over lamp life. Over the life of the lamp the ballast shall produce an average of the nominal lamp rating $\pm 5\%$. Lamp wattage readings shall be taken at 5-volt increments throughout the ballast trapezoid. The lamp wattage values shall then be averaged within the trapezoid and shall be within $\pm 5\%$ of the nominal ballast rating. Submittal documents shall include a tabulation of the lamp wattage vs. lamp voltage readings.

The ballast shall be integral to the luminaire. The ballast components shall be mounted on a removable door or on a removable mounting pad. The ballast tray or mounting door shall be manufactured with dissimilar metal conflicts kept to a minimum.

Ballast wiring and lamp socket wiring shall be connected by means of keyed plugs. Upon unplugging the ballast wiring the entire ballast assembly shall be removable for maintenance. The plugs shall not be interchangeable to avoid improper connection of the assemblies.

The mounting adjustments and wiring terminals shall be readily accessible. The removable door or pad shall be secure when fastened in place and all individual components shall be secure upon the removable element. Upon ballast assembly removal, each component shall be readily removable for replacement.

The luminaire shall be completely wired. All wiring connections within the luminaire shall be made with insulated compression connectors or insulated terminal blocks. An insulated terminal block shall be provided to terminate the incoming supply wires. The terminal block shall be rated for 600 volts and shall accommodate wire sizes from #10 to #6 AWG. The use of "wire nuts" is unacceptable. A ground terminal shall be provided for the connection of a ground wire.

Ballast and lamp Leads shall not be smaller than #16 AWG conductors rated at a minimum temperature rating of 90° C.

All wires shall be coded by tagging and/or color coding for proper identification. A complete legible permanently attached wiring diagram (no smaller than 3" x 4" with a min. font size of 8 pts.) coordinated with the wire identifications shall be displayed at the convenient location on the interior of the luminaire. The wiring diagram shall be oriented so that it is right side up and readable when the luminaire is in the installed position.

The ballast shall not be excessively noisy. Noticeable noisy ballasts, as determined by the Engineer, shall be replaced at no additional cost to the State.

The ballast shall provide lamp operation within lamp specifications for the rated lamp life at the input design voltage range. It shall have a 6 month operation capability with a cycling lamp.

Submittal information shall include manufacturer's literature and data to confirm compliance with all specified requirements including an ANSI Standard Ballast Characteristic Graph (Trapezoid) diagram, with all items clearly identified.

Photometric Performance. The luminaire photometric performance shall produce results equal to or better than those listed in the included Luminaire Performance Table. Submittal information shall include computer calculations based on the controlling given conditions which demonstrate achievement of all listed performance requirements. The computer calculations shall be done according to I.E.S. recommendations and the submitted calculations shall include point-by-point illuminance, luminance and veiling luminance as well as listings of all indicated averages and ratios as applicable. Acceptable programs to perform the calculations are: Micro-Site-Lite, Lumen Micro, and AGI32. The program used to perform the calculations shall be identified on the submittal. The submittal data shall also include all photometric calculations files (for either Micro-Site-Lite, Lumen Micro or AGI32) with the proposed photometric data on a CD ROM. The performance requirements shall define the minimum number of decimal places used in the calculations. Rounding of calculations shall not be allowed.

In addition to computer printouts of photometric performance, submittal information shall include: Descriptive literature; an Isofootcandle chart of horizontal lux (footcandles); Utilization curve; Isocandela diagram; Luminaire classification per ANSI designation; Candlepower values at every 2.5 degree intervals; Candlepower tables are to be provided on 3.5" diskette or CD ROM in the IES format as specified in IES publication LM-63.

**IDOT DISTRICT 1 LUMINAIRE PERFORMANCE TABLE #1
5 Lane Cross Section**

GIVEN CONDITIONS		
ROADWAY DATA	Pavement Width	18.3 m (60 ft)
	Number of Lanes	5
	I.E.S. Surface Classification	R3
	Q-Zero Value	.07
LIGHT POLE DATA	Mounting Height	4.8 m (16 ft)
	Mast Arm Length	0 m (0 ft)
	Pole Set-Back From Edge of Pavement	0.6 m (2 ft)
LUMINAIRE DATA	Lamp Type	HPS
	Lamp Lumens	6,300
	I.E.S. Vertical Distribution	Medium
	I.E.S. Control Of Distribution	Cutoff
	I.E.S. Lateral Distribution	n/a
	Total Light Loss Factor	0.60
LAYOUT DATA	Spacing	9.1 m (30 ft)
	Configuration	Opposite Side
	Luminaire Overhang over edge of pavement	-0.6 m (-2 ft)

NOTE: Variations from the above specified I.E.S. distribution pattern may be requested and acceptance of variations will be subject to review by the Engineer based on how well the performance requirements are met.

PERFORMANCE REQUIREMENTS		
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NOTE: These performance requirements shall be the minimum acceptable standards of photometric performance for the luminaire, based on the given conditions listed above.

ILLUMINATION	Ave. Horizontal Illumination, E_{AVE}	18 Lux (Min)	26 Lux (Max)
	Uniformity Ratio, E_{AVE}/E_{MIN}	3:1 (Max)	
LUMINANCE	Average Luminance, L_{AVE}	1.2 Cd/m ² (Min)	1.8 Cd/m ² (Max)
	Uniformity Ratio, L_{AVE}/L_{MIN}	3:1 (Max)	
	Uniformity Ratio, L_{MAX}/L_{MIN}	5:1 (Max)	
	Veiling Luminance Ratio, L_V/L_{AVE}	0.30:1 (Max)	

IDOT DISTRICT 1 LUMINAIRE PERFORMANCE TABLE #2
4 Lane Cross Section

GIVEN CONDITIONS		
ROADWAY DATA	Pavement Width	14.6 m (48 ft)
	Number of Lanes	4
	I.E.S. Surface Classification	R3
	Q-Zero Value	.07
LIGHT POLE DATA	Mounting Height	4.8 m (16 ft)
	Mast Arm Length	0 m (0 ft)
	Pole Set-Back From Edge of Pavement	0.6 m (2 ft)
LUMINAIRE DATA	Lamp Type	HPS
	Lamp Lumens	6,300
	I.E.S. Vertical Distribution	Medium
	I.E.S. Control Of Distribution	Cutoff
	I.E.S. Lateral Distribution	n/a
	Total Light Loss Factor	0.60
LAYOUT DATA	Spacing	10.7 m (35 ft)
	Configuration	Opposite Side
	Luminaire Overhang over edge of pavement	-0.6 m (-2 ft)

NOTE: Variations from the above specified I.E.S. distribution pattern may be requested and acceptance of variations will be subject to review by the Engineer based on how well the performance requirements are met.

PERFORMANCE REQUIREMENTS		
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NOTE: These performance requirements shall be the minimum acceptable standards of photometric performance for the luminaire, based on the given conditions listed above.

ILLUMINATION	Ave. Horizontal Illumination, E_{AVE}	18 Lux (Min) 26 Lux (Max)
	Uniformity Ratio, E_{AVE}/E_{MIN}	3:1 (Max)
LUMINANCE	Average Luminance, L_{AVE}	1.2 Cd/m ² (Min) 1.8 Cd/m ² (Max)
	Uniformity Ratio, L_{AVE}/L_{MIN}	3:1 (Max)
	Uniformity Ratio, L_{MAX}/L_{MIN}	5:1 (Max)
	Veiling Luminance Ratio, L_V/L_{AVE}	0.30:1 (Max)

**IDOT DISTRICT 1 LUMINAIRE PERFORMANCE TABLE #3
3 Lane Cross Section**

GIVEN CONDITIONS		
ROADWAY DATA	Pavement Width	10.9 m (36 ft)
	Number of Lanes	3
	I.E.S. Surface Classification	R3
	Q-Zero Value	.07
LIGHT POLE DATA	Mounting Height	4.8 m (16 ft)
	Mast Arm Length	0 m (0 ft)
	Pole Set-Back From Edge of Pavement	1.5 m (5 ft)
LUMINAIRE DATA	Lamp Type	HPS
	Lamp Lumens	6,300
	I.E.S. Vertical Distribution	Medium
	I.E.S. Control Of Distribution	Cutoff
	I.E.S. Lateral Distribution	n/a
	Total Light Loss Factor	0.60
LAYOUT DATA	Spacing	13.7 m (45 ft)
	Configuration	Opposite Side
	Luminaire Overhang over edge of pavement	-1.5 m (-5 ft)

NOTE: Variations from the above specified I.E.S. distribution pattern may be requested and acceptance of variations will be subject to review by the Engineer based on how well the performance requirements are met.

PERFORMANCE REQUIREMENTS		
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NOTE: These performance requirements shall be the minimum acceptable standards of photometric performance for the luminaire, based on the given conditions listed above.

ILLUMINATION	Ave. Horizontal Illumination, E_{AVE}	18 Lux (Min)	36 Lux (Max)
	Uniformity Ratio, E_{AVE}/E_{MIN}	3:1 (Max)	
LUMINANCE	Average Luminance, L_{AVE}	1.2 Cd/m ² (Min)	1.8 Cd/m ² (Max)
	Uniformity Ratio, L_{AVE}/L_{MIN}	3:1 (Max)	
	Uniformity Ratio, L_{MAX}/L_{MIN}	5:1 (Max)	
	Veiling Luminance Ratio, L_V/L_{AVE}	0.30:1 (Max)	

IDOT DISTRICT 1 LUMINAIRE PERFORMANCE TABLE #4
2 Lane Cross Section

GIVEN CONDITIONS		
ROADWAY DATA	Pavement Width	7.3 m (24 ft)
	Number of Lanes	2
	I.E.S. Surface Classification	R3
	Q-Zero Value	.07
LIGHT POLE DATA	Mounting Height	4.8 m (16 ft)
	Mast Arm Length	0 m (0 ft)
	Pole Set-Back From Edge of Pavement	0.6 m (2 ft)
LUMINAIRE DATA	Lamp Type	HPS
	Lamp Lumens	6,300
	I.E.S. Vertical Distribution	Medium
	I.E.S. Control Of Distribution	Cutoff
	I.E.S. Lateral Distribution	n/a
	Total Light Loss Factor	0.60
LAYOUT DATA	Spacing	9.1 m (30 ft)
	Configuration	Single Side
	Luminaire Overhang over edge of pavement	-0.6 m (-2 ft)

NOTE: Variations from the above specified I.E.S. distribution pattern may be requested and acceptance of variations will be subject to review by the Engineer based on how well the performance requirements are met.

PERFORMANCE REQUIREMENTS		
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NOTE: These performance requirements shall be the minimum acceptable standards of photometric performance for the luminaire, based on the given conditions listed above.

ILLUMINATION	Ave. Horizontal Illumination, E_{AVE}	18 Lux (Min)	26 Lux (Max)
	Uniformity Ratio, E_{AVE}/E_{MIN}	3:1 (Max)	
LUMINANCE	Average Luminance, L_{AVE}	1.2 Cd/m ² (Min)	1.8 Cd/m ² (Max)
	Uniformity Ratio, L_{AVE}/L_{MIN}	3:1 (Max)	
	Uniformity Ratio, L_{MAX}/L_{MIN}	5:1 (Max)	
	Veiling Luminance Ratio, L_V/L_{AVE}	0.30:1 (Max)	

IDOT DISTRICT 1 LUMINAIRE PERFORMANCE TABLE #5
1 Lane Cross Section

GIVEN CONDITIONS		
ROADWAY DATA	Pavement Width	4.8 m (16 ft)
	Number of Lanes	1
	I.E.S. Surface Classification	R3
	Q-Zero Value	.07
LIGHT POLE DATA	Mounting Height	4.8 m (16 ft)
	Mast Arm Length	0 m (0 ft)
	Pole Set-Back From Edge of Pavement	1.5 m (5 ft)
LUMINAIRE DATA	Lamp Type	HPS
	Lamp Lumens	6,300
	I.E.S. Vertical Distribution	Medium
	I.E.S. Control Of Distribution	Cutoff
	I.E.S. Lateral Distribution	n/a
	Total Light Loss Factor	0.60
LAYOUT DATA	Spacing	10.6 m (35 ft)
	Configuration	Single Side
	Luminaire Overhang over edge of pavement	-1.5 m (-5 ft)

NOTE: Variations from the above specified I.E.S. distribution pattern may be requested and acceptance of variations will be subject to review by the Engineer based on how well the performance requirements are met.

PERFORMANCE REQUIREMENTS		
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NOTE: These performance requirements shall be the minimum acceptable standards of photometric performance for the luminaire, based on the given conditions listed above.

ILLUMINATION	Ave. Horizontal Illumination, E_{AVE}	18 Lux (Min)	26 Lux (Max)
	Uniformity Ratio, E_{AVE}/E_{MIN}	3:1 (Max)	
LUMINANCE	Average Luminance, L_{AVE}	1.2 Cd/m ² (Min)	1.8 Cd/m ² (Max)
	Uniformity Ratio, L_{AVE}/L_{MIN}	3:1 (Max)	
	Uniformity Ratio, L_{MAX}/L_{MIN}	5:1 (Max)	
	Veiling Luminance Ratio, L_V/L_{AVE}	0.30:1 (Max)	

Independent Testing.

- A. Independent testing of luminaires shall be required whenever the quantity of luminaires of a given wattage and distribution, as indicated on the plans, is 50 or more. For each luminaire type to be so tested, one luminaire plus one luminaire for each 50 luminaires shall be tested. Example: *A plan quantity of 75 luminaires would dictate that 2 to be tested; 135 luminaires would dictate that three be tested.*

- B. The Contractor shall be responsible for all costs associated with the specified testing, including but not limited to shipping, travel and lodging costs as well as the costs of the tests themselves, all as part of the bid unit price for this item. Travel, lodging and other associated costs for travel by the Engineer shall be direct-billed to or shall be pre-paid by the Contractor, requiring no direct reimbursement to the Engineer or the independent witness, as applicable.
- C. Commitment to test. The Vendor shall select one of the following options for the required testing with the Engineer's approval:
1. Engineer Factory Selection for Independent Lab: The Contractor may select this option if the luminaire manufacturing facility is within the state of Illinois. The Contractor shall propose an independent test laboratory for approval by the Engineer. The selected luminaires shall be marked by the Engineer and shipped to the independent laboratory for tests.
 2. Engineer Witness of Independent Lab Test: The Contractor may select this option if the independent testing laboratory is within the state of Illinois. The Engineer shall select, from the project luminaires at the manufacturer's facility or at the Contractor's storage facility, luminaires for testing by the independent laboratory.
 3. Independent Witness of Manufacturer Testing: The independent witness shall select from the project luminaires at the manufacturer's facility or at the Contractor's storage facility, the luminaires for testing. The Contractor shall propose a qualified independent agent, familiar with the luminaire requirements and test procedures, for approval by the Engineer, to witness the required tests as performed by the luminaire manufacturer. The independent witness shall:
 - Have been involved with roadway lighting design for at least 15 years.
 - Not have been the employee of a luminaire or ballast manufacturer within the last 5 years.
 - Be a member of IESNA in good standing.
 - Provide a list of professional references.
 4. Engineer Factory Selection and Witness of Manufacturer Testing: The Contractor may select this option if the manufacturing facility is within the state of Illinois. At the manufacturer's facility, the Engineer shall select the luminaires to be tested and shall be present during the testing process. The Contractor shall schedule travel by the Engineer to and from the Manufacturer's laboratory to witness the performance of the required tests.

In all cases, the selection of luminaires shall be a random selection from the entire completed lot of luminaires required for the Contract. Selections from partial lots will not be allowed. The selection of the testing option shall be presented with the information submitted for approval. The proposed independent laboratory or independent witness shall be included with that information. The selection of the testing option shall be presented with the information submitted for approval. The proposed independent laboratory or independent witness shall be included with that information.

- D. The testing performed shall include photometric, electrical, heat and water jet testing.
- E. Photometric testing shall be in accordance with IES recommendations except that the selected luminaire(s) shall be tested as manufactured without any disassembly or modification and, as a minimum shall yield an isofootcandle chart, with max candela point and half candela trace indicated, an isocandela diagram, maximum plane and cone plots of candela, a candlepower table (house and street side), a coefficient of utilization chart, a luminous flux distribution table, and complete calculations based on specified requirements and tests.
- F. Electrical testing shall conform to NEMA and ANSI standards and as a minimum, shall yield a complete check of wiring connections, a ballast dielectric test, total ballast losses in watts and percent of input, a lamp volt-watt trace, regulation data, a starter test, lamp current crest factor, power factor (minimum over the design range of input voltage at nominal lamp voltage) and, a table of ballast characteristics showing input amperes, watts and power factor, output volts, amperes, watts and lamp crest factor as well as ballast losses over the range of values required to produce the lamp volt-watt trace. Ballast test data shall also be provided in an electronic format acceptable to the Engineer to demonstrate compliance with sections 9.7, 9.8, 9.9 and 9.10.
- G. Heat Testing. Heat testing shall be conducted to ensure that the luminaire complies with UL 1572. An ambient temperature of 40 degrees centigrade (104 degrees F) shall be used for the test.
- H. Water spray test. The luminaires must pass the following water spray test.:
- A spray apparatus consisting of four spray nozzles set at an angle of 30 degrees from the vertical plane space 30 inches apart on a 2 inch pipe, each delivering 12 gallons of water per minute at a minimum of 100 psi at each nozzle in a 90 degree cone. A water pressure gauge shall be installed at the first nozzle.
- The luminaires shall be mounted in a ceiling configuration and with each nozzle set a distance of 18 inches below the fixture in the vertical plane and 18 inches away in the horizontal plane from the fixture lens, apply spray for a duration of 3 minutes at a minimum of 100 psi. When opened, the fixture shall not show any signs of leakage.
- The above test shall be repeated in the opposite horizontal plane from the fixture lens with no signs of leakage.
- The summary report and the test results shall be certified by the independent test laboratory or the independent witness, as applicable, and shall be sent by certified mail directly to the Engineer. A copy of this material shall be sent to the Contractor and luminaire manufacturer at the same time.
- I. Should any of the tested luminaires of a given distribution type and wattage fail to satisfy the specifications and perform according to approved submittal information, the luminaire of that distribution type and wattage shall be unacceptable and be replaced by alternate equipment meeting the specifications with the submittal and testing process repeated in their entirety; or corrections made to achieve required performance. In the case of corrections, the Vendor shall advise the Engineer of corrections made and shall request a repeat of the specified testing and, if the corrections are deemed reasonable by the

Engineer, the testing process shall be repeated. The number of luminaires to be tested shall be the same quantity as originally tested. Luminaires which are not modified or corrected shall not be re-tested without prior approval from the Engineer.

Coordination shall be the Vendor's responsibility. Failure to coordinate arrangements and notice shall not be grounds for additional compensation or extension of time.

Submittal information shall include a statement of intent to provide the testing as well as a request for approval of the chosen laboratory.

Installation.

- A. Underpass luminaires shall be either attached to structures (such as piers, etc.) or suspended from structures (such as bridge decks) as indicated or implied by the configuration on the Plans. Mounting, including all hardware and apparent items, shall be included as part of this item.
- B. Unless otherwise indicated, suspended underpass luminaires shall be installed one-inch above the lowest underpass beam and shall be mounted using vibration dampening assemblies. All mounting hardware shall be corrosion resistant and shall be stainless steel unless otherwise indicated.
- C. The Engineer reserves the right to select the final light distribution pattern, luminaire aiming angle and change it as deemed necessary to produce the proper pavement luminance.
- D. Surface mounted luminaires, all luminaires not mounted on suspension rods, shall have one-inch thick stainless steel spacers installed between the luminaire and the deck or wall.

Guarantee. The Vendor shall provide a written guarantee for materials, and workmanship for a period of 6 months after final acceptable of the lighting system.

Documentation. All instruction sheets required to be furnished by the manufacturer for materials and supplies and for operation of the equipment shall be delivered to the Engineer.

The manufacturer shall have been incorporated for at least five years and shall have at least five years in the design and manufacturing of roadway underpass lighting. The manufacturer shall provide evidence of financial strength to finance the production of the project by submitting the name of at least three projects completed in the previous calendar year of greater than \$250,000 each. All steel used in the project shall be certified to be provided domestically, and all fixture components used shall be manufactured domestically.

Method of Measurement. Luminaires shall be counted, each.

Basis of Payment. This item shall be paid at the Contract unit price each for UNDERPASS LUMINAIRE, of the wattage specified, HIGH PRESSURE SODIUM VAPOR, STAINLESS STEEL HOUSING, which shall be payment in full for the work described herein.
(CTE – 10/22/2004)

DISCONNECT SIGN LIGHTING AND REMOVE WIRING TO NEAREST SPLICE

Description. This item shall consist of the disconnection, removal, and disposal of the existing electric connection to the sign lighting. Removal of the existing sign luminaire(s) will be included with removal of sign structures in other Contracts.

Construction Requirements. Disconnection of the existing sign lighting electric connection shall meet the requirements according to Section 845.02 of the Standard Specifications.

Removal. The Contractor must disconnect the existing power feed to the sign lighting units and remove the wiring back to the nearest location where the sign lighting is spliced to the roadway lighting circuit. The Contractor must provide all materials and labor required to maintain operation of the existing lighting circuit.

No removal work shall be permitted without approval from the Engineer. Abandoned underground electric cables shall be removed with conduit and duct to a depth of 1 foot below ground level and the hole shall be backfilled. Cables in unit duct may be removed from the duct and become property of the Contractor. The empty duct shall be removed to 1 foot below ground level and the hole backfilled.

All equipment and material removed as part of this item shall become property of the Contractor and shall be removed from the site.

Basis of Payment. This work shall be paid for at the Contract unit price each for DISCONNECT SIGN LIGHTING AND REMOVE WIRING TO NEAREST SPLICE.
(CTE – 10/22/2004)

LIGHTING CONTROLLER, RADIO CONTROL DUPLEX TYPE WITH SCADA AND VIDEO POWER

Description. This item shall consist of all material and work required to assemble, install, test and verify operation of a radio controlled lighting controller with SCADA. The item shall also include all modifications required to provide 120 volt power to video cameras as shown on the plans and specified herein.

General. This item shall be constructed in accordance with Section 825 of the Standard Specifications except as follows:

Replace Article 1068.01(c)(2) of the Standard Specifications with the following:

“(2) Finished enclosures: All aluminum enclosures shall be finished.

Surface Preparation: The cabinet, doors and all other parts to be painted will be submerged in each tank of a 3 step iron phosphate conversion technique. After phosphatizing the parts shall be passed through an oven and baked to eliminate any moisture.

Finish coat: Shall be polyester powder paint applied electrostatically to a minimum thickness of 2 mils and baked at 375 degrees for 20 minutes.

Submittal data submitted for approval shall address the requirement for the paint manufacturer's certification and shall include a standard, single source paint warranty by the paint manufacturer or the controller manufacturer to the Department."

Revise the first sentence of Article 1068.01(e)(4) of the Standard Specifications to read:

"Contactors shall be electrically operated, mechanically held as specified, with the number of poles required for the service and with operating coil voltage as indicated. The contactor shall have an in-line drive operating mechanism."

Add the following to Article 825 of the Standard Specifications:

Radio Control Equipment - Hardware

Receiver Decoder: The radio control module consists of a radio transceiver, digital decoder, and an input/output interface which allows centralized remote radio control of the lighting controller turn-on and turn-off functions. The radio control module must be capable of operation consistent with the existing radio control system, a Motorola MOSCAD Central Station.

The existing control system currently operates over 240 discrete lighting controllers via a securely coded proprietary data scheme. For this reason, the control module must consist of a Motorola MOSCAD-L Modular Remote Unit, model F6843, (small housing), with no less than the following options:

Motorola Designation Description

F6843 (VHF)

F6844 (UHF)* CPU MOSCAD-L **

V436 Mixed I/O

V251 240 VAC Power Supply

Z857AA Surge Protection

** includes (1) three slot module, (1) MOSCAD-L CPU with firmware, (1) mixed I/O module, (1) VHF or UHF MTS 2000 Radio* with DPSK Radio Interface port 3, (1) AC Power Supply/Charger, (1) 3Ah battery, installed in a 14.63 " X 11" X 8.75" NEMA 4 enclosure with instruction manual.

* As directed by the Engineer

The manufacturer's designation by no means relieves the Contractor of providing a fully functional radio system as described herein.

The Radio Control Module shall be programmed for the following operational parameters:

- Transceiver Frequency: to be specified by Engineer

- Carrier Squelch Receive
- Communications Failure Preset:: Normally Open
- Individual Station address: As specified by the Engineer

Antenna:

A thick mount antenna for use (up to ½”) mounting surfaces. The antenna shall be mounted by screw adapter (no magnet mounts). The low profile antenna mount shall be equivalent to Allen Telecom – KE 794 antenna Mount Low Profile. Accompanying antenna shall be equivalent to Allen Telecom ASP-7495 (Mosaic BroadBand Low Profile – VHF-UHF ¼ wave 150-512 MHz. Accompanying cable connector from Radio to Antenna shall be of appropriate length and not containing excessive slack.

The antenna shall be centers on the top of the control cabinet. The antenna cable shall be dressed and trimmed for minimal length, allowing sufficient slack of removal of the radio connection for replacement or testing without disruption to the installation. The antenna connector shall be properly soldered to the cable assembly. Great care shall be exercised in the assembly of the antenna connector: excessive heat will destroy the inner insulation, insufficient heat will produce a cold solder connection on the outer shield.

I/O Module:

All MOSCAD motherboard cards shall be configured and installed as per manufacturer's specifications and IDOT specification Lighting SCADA 397. Modules include but are not limited to; CPU, Mixed I/O. All digital inputs terminated on the mixed I/O card shall be dry. Termination points for all digital input points will be reflected on lighting controller wiring diagram or additional wiring schematic provided by the engineer. All digital outputs received from the Mixed I/O card shall be rated at 240 VAC 2A. All digital outputs shall be connected to interposing relays prior to being integrated into the lighting controller wiring logic. The digital outputs shall maintain a momentary closure for approximately 2 seconds.

All wiring termination points shall be tagged using the nomenclature given on the wiring diagram.

Intra-module wiring shall be no less than 18 AWG stranded wire, color coded (American) consistent with battery polarity, and signal. The wire connection to the interpose relays shall be no greater than 14 AWG stranded. All wires connected to the radio modules shall be dressed and tinned prior to insertion, (crimp on connectors will not be allowed for use in the radio system).

A terminal strip separate from the integral radio module and power supply shall be provided to interface power and signal conductors to the lighting controller. Terminals and wiring shall be labeled in accordance with the drawings, and dressed to allow service. The radio module shall be provided with constant 240 VAC power. Power for the MOSCAD system shall be provided by the control power breaker. This is to allow the system to be energized at all times.

Null covers shall be provided for the slots not used. All analog inputs shall be 4-20 mA. All I-O wiring including analog and digital shall be wired as per the enclosed table.

MOSCAD System Control Relay Assembly:

The Contractor shall mount and wire four (4) relays as shown in the wiring diagram. The relays shall be 240V sealed type and, unless otherwise indicated shall have contacts rated at not less than 25 amperes at 240 volts. The power relay for activating the lighting contactors shall have contacts rated to handle the contactor inrush. The relays shall be wired to a marked terminal strip.

Analog Inputs and Transducers:

The panel shall include one voltage transducer for monitoring the line voltage and one current transducer for monitoring the neutral current. Their outputs shall be 4-20 mA DC each and shall be wired to channels 1 and 2 of the Mixed I/O module as shown. The voltage transducer shall be Scientific Columbus Model # VT110 – PAN7 – A4-2 for 480/240 volt single phase systems. The current transducers shall be Kirchler Technologies Model # AT2-420-24L-FT. Both analog inputs shall be wired using shielded cable. Transducer terminals shall be implemented with protective shields for safety.

Radio Control Equipment – MOSCAD Programming

This work shall consist of having the MOSCAD system manufacturer design, implement and test a new RTU on the Lighting SCADA System on all system terminals.

All software work shall be completed by the manufacturer or approved factory licensed sales and service company for the MOSCAD equipment. All licensing shall be provided by the entity completing the work. Licenses are to be held by IDOT.

MOSCAD RTU Configuration And Programming:

The State will provide the Contractor with the software for the MOSCAD configuration. The Contractor shall install the provided software into the MOSCAD unit utilizing a MOSCAD Manufacturer certified VAR.

MOSCAD Service/Client Wonderware Programming:

The Contractor shall advise the Engineer in writing 30 days in advance of when the State supplied software configuration will be required.

MOSCAD FIU CPU Programming:

If RTU exists as an Intrac site, it will have to be setup as a MOSCAD site (MOSCAD CPU). If RTU is a new site, it will have to be configured as a MOSCAD site (MOSCAD CPU).

Site configuration, map implementation, screen tagging and other related software configurations shall be included in this item, described elsewhere.

Submittals:

The Motorola VAR shall submit 3 copies of the RTU software, for approval by the IDOT Engineer. Submittal shall consist of RTU; ladder programming, quiescent telemetry and MOSCAD-L configuration files. Submittal will be reviewed by the Engineer and returned noting changes and/or comments.

Staging:

Manufacturer recommendation is for all Central Configuration programming be completed prior to the initial check out/PM of the MOSCAD unit in the field. This is to assure/confirm 2 way radio communications from the field RTU to the Central.

The MOSCAD system shall be tested in conjunction with the controller inspection, prior to field installation. The turn-on and turn-off function shall be tested ten (10) consecutive times utilizing actual signals originating from District 1 Headquarters. Any failures must be cleared before the controller is delivered to the job site.

Testing:

As part of final acceptance testing, all individual I/O points and internal status alarms shall be tested for proper operation and transmission. The transmission shall be confirmed at both the IDOT District 1. H.Q. And the Electrical Maintenance Contractor's dispatch facility. This full MOSCAD system start-up shall be completed with the Engineer present.

A checklist consisting of testing all physical I/O points and COS alarm reporting shall be submitted to the Engineer. This testing shall confirm all I/O messaging in the field is being received at the Central. In conjunction, Central system must be checked for receiving of appropriate alarms triggered in the field.

Acceptance Transition:

After the appropriate testing has been completed and approved by the Engineer, the new MOSCAD shall be monitored for up to 2 weeks for proper operation. If any problems are to arise, all changes shall be completed at no extra cost. "

Method of Measurement. Each lighting controller shall be counted as a unit for payment.

Basis of Payment. This work will be paid for at the Contract unit price each for LIGHTING CONTROLLER, RADIO CONTROL DUPLEX TYPE WITH SCADA AND VIDEO POWER, which shall be payment in full for the controller work, complete, as specified herein.
(CTE – 07/07/2004)

REMOVE CONDUIT ATTACHED TO STRUCTURE

Description. This item shall consist of disconnecting, removing and disposing of existing conduit attached to structure as specified herein, as shown on the plans and as directed by the Engineer.

General. Where indicated the existing conduit attached to structure, all associated mounting hardware, existing cables in the conduit, and appurtenances shall be removed and become the property of the Contractor and shall be disposed of off the project site.

No removal work shall be permitted without approval from the Engineer. Existing cables shall be disconnected and removed back to the last splice point unaffected by the removal work. The work to disconnect, remove, and dispose of the existing cables in the conduit shall be included in this pay item.

Existing conduit attached to structure may be removed from existing junction boxes to remain. A threaded insert plug shall be inserted to close up any opening, in an existing junction box, created by the removal of an existing conduit. The plugs shall be rated for wet locations. The work required to furnish and install the plugs shall be included in this pay item.

Method of Measurement. The removed conduit attached to structure will be measured for payment in feet in place. Measurements will be made in straight lines along the centerline of the conduit, horizontally, between changes in direction and to the centers of junction boxes. Vertical conduit will not be measured for payment.

Basis of Payment. This work shall be paid for at the contract unit price per foot for REMOVE CONDUIT ATTACHED TO STRUCTURE, which shall be payment in full for the material and work described herein.
(CTE – 10/25/2004)

TRAFFIC SURVEILLANCE SYSTEM

Description.

General. The Traffic Surveillance System shall be a fully integrated system that polls the 2070 Lite controllers in the field cabinets, retrieves the processed data, reformats it, and transfers it to the extended network to store the data in the Advanced Traffic Management System (ATMS) database.

The work shall include, but not be limited to furnishing, configuring, testing, and installing various subsystem equipment and connections at two proposed new communications huts, and the Traffic Systems Center in Oak Park.

Each defined subsystem shall be a self-contained assembly of rack-mounted components as indicated, integrated and coordinated as required for the defined functionality, complete with all interfaces and interconnecting cabling, suitable for advanced shop staging and testing, as defined elsewhere herein, with other subsystem assemblies. Each shall be installed at its indicated location and connected to power and communications circuits as indicated and as required.

It is not the intent of these specifications to minutely detail the construction of the desired system, but to clearly identify major system components, the system architecture, and to define the performance and functionality that the system shall provide. The Contractor shall provide all

equipment, cables, and adapters; patch panels, racks, shelves, drawers and accessories; and other materials and supplies required to produce the desired performance and functionality with the major components and the system architecture as defined, even if they are not specifically identified or implied in the Contract Documents. The Contractor shall provide all labor, programming, configuration, and testing required to produce the desired performance and functionality with the major components and the system architecture as defined and with existing State owned equipment in the Traffic Systems Center.

Materials.

Equipment Racks. Equipment racks shall conform to EIA-310 Standard for Cabinets, Racks, Panels, and Associated Equipment and accept equipment designed to mount in standard 19" wide with vertical heights in multiples of 44.65 mm (1.75") ("U") without modification or adaptation of either the rack or the equipment to be mounted therein. The racks shall be furnished without casters or rollers. The rack dimensions shall be a minimum of 1931 mm (76") high, 864 mm (34") deep, and a maximum of 610 mm (24") wide. The rack shall accommodate a total of 40U (70") of vertical equipment. All rack components, excluding handles, hinges or other components made from corrosion-resistant materials or furnished with a plated or anodized coating, shall be fabricated from a steel of 20 gauge minimum, and primed and painted using an electrostatically applied polyester or enamel coating after welding is completed. A solid top shall be part of the frame, and the sides shall be solid, removable and lockable. The front and back of the rack shall have heavy-gauge doors of perforated metal, protecting the components in the rack but permitting the enclosed equipment to be viewed and allowing ventilation air to enter. The front and back doors shall be lockable. Both front and back doors shall open to a full 90 degree angle from the face of the rack, and shall permit equipment to be inserted and removed from the rack without tilting it from the installed orientation. Front and back doors of racks installed side to side shall be able to open fully and simultaneously. Equipment rack shall be APC Model AR500HD or approved equal.

Equipment racks shall be equipped with all hardware required to mount standard 19" rack mounted equipment, and where a camera PTZ selector-controller is required, a pull-out shelf designed for use with such a controller shall be furnished as part of the equipment rack. Where equipment in the rack requires the use of a keyboard, mouse, or both, the rack shall be furnished with a pull out shelf for the keyboard, mouse, or both. Pull-out shelves for equipment control shall be mounted at a working height of 812 to 1067 mm (34 to 42").

Power Wiring. All 120 VAC distribution wiring that is entirely within the communication hut shall be made with NEC Type THHN/THWN cable rated for 600V, with a minimum wire gauge of 12 AWG. All conduit shall be a minimum of electrical metallic tubing (EMT), and all EMT conduit fittings shall be compression, not set-screw type. Outlet and junction boxes shall all be galvanized steel with galvanized steel faceplates or covers. All switches, receptacles, and other wiring devices shall be industrial specification grade.

Two 20-Ampere circuits from the UPS panel shall be dedicated to each equipment rack, and provide a minimum of 3 duplex receptacles per circuit at evenly spaced intervals for the entire height of the each rack.

Plug Strips may be used within the equipment racks, but shall not reduce the number of duplex receptacles required per circuit . The plug strip housing shall be all metal and shall mount in the rack using the standard 19" rack and occupy no more than 1 U in height. Plug Stips shall be Tripp-Lite PDU-1220 or approved equal.

Power Supplies for equipment requiring other than 120 VAC shall be manufactured by or approved in writing for that use by the manufacturer of the equipment they are to serve. Power supplies shall be rack-mounted, shall be bolted, or otherwise mechanically attached to shelving designed for mounting in the equipment rack. Connections between the power supplies and the equipment they serve shall be made with PVC-jacketed cables. Unjacketed individual conductors shall not be permitted.

Coaxial connectors shall be BNC or as required by the equipment to which the cables connect. The connectors shall be attached to the cable by crimping or by a cord-grip clamping action. Connectors shall be plated for corrosion resistance and good electrical connections. Connectors shall be Amphenol part number 31-70000 or approved equal.

Communications Cable and Connectors. Ethernet Cable shall be ANSI/TIA/EIA-568-B.2 Category 5e, UL verified to Category 5e, 4 twisted pair, 24 AWG bare copper with polyolefin insulation. The cable shall be unshielded with polyvinyl chloride (PVC) insulation. The cable shall be Belden part number 1500A or approved equal. The terminations shall be crimp-on RJ-45, Ideal Industries 85-396 or approved equal.

Single mode fiber optic terminations inside the communication huts shall be made with Amphenol 942 series terminations or approved equal, or as required in the fiber optic cable special provision, whichever is more stringent.

Cable Identification Materials. All cables, fiber optic cables, and individual conductors and fiber strands when broken out from a cable assembly shall be uniquely labeled in accordance with the Contractor's interconnection diagram. Labels shall be computer-printed and shall be waterproof and non-smearing. Labels shall be polyester adhesive wrap labels produced by the W. H. Brady company or approved equal.

Ethernet Device Server Equipment. The Contractor shall furnish industrially hardened, Ethernet device servers satisfying the following:

- The device server shall be a multi-port serial-to-Ethernet server, specifically designed to operate in harsh environments.
- The Ethernet server shall operate within specifications over the temperature range of -40° to 85° C. The server shall operate with relative humidity of 95%, non-condensing.
- The Ethernet server shall have four RS-232 ports, two 100BaseT ports, and two 100BaseFX ports.
- The optical ports shall satisfy the following:
 - Shall be designed to operate into single mode cable with physical core of 8-9 microns
 - Shall provide a nominal output power of -16 dBm, receive sensitivity of -32 dBm, and link power budget of 16 dB.
 - Shall operate at 1310 nm (nominal)
- Ethernet ports shall be full duplex.

- Ethernet switch management shall include:
 - Enhanced Rapid Spanning Tree (IEEE 802.1w) for fault tolerance with rapid recovery times
 - Quality of Service (IEEE 802.1p) for real-time traffic
 - Port rate limiting: 128 kbps, 256 kbps, 512 kbps, 4 Mbps, and 8 Mbps
 - VLAN (IEEE 802.1q) for traffic segregation with double tagging
 - IGMP Snooping for multicast filtering
 - Port configuration, status, statistics, mirroring, and security
 - Loss of link management for link pulse control on fiber ports
 - Web-based, Telnet, CLI management interfaces
 - SNMP v2 and RMON
 - Diagnostics with logging and alarm
- Shall include a power supply compatible with 120 VAC. The power supply shall be compatible with the environment specified for the device server
- The device server shall be DIN rail or panel mounted.
- The server shall comply with the following IEEE standards:
 - 802.3—10BaseT
 - 802.3u—100BaseTX, 100BaseFX
 - 802.3x—Flow Control
 - 802.3d—MAC Bridges
 - 802.1d—Spanning Tree Protocol
 - 802.1p—Class of Service
 - 802.1q—VLAN Tagging
 - 802.1w—Rapid Spanning Tree Protocol

The server shall comply 47 CFR, Part 15, Type A and be UL listed.

The Contractor shall interface the Database Server in the TSC to the controllers in the field cabinets to provide a transparent flow of data to and from the field controllers. This can be accomplished by providing a software driver to allow the ATMS to communicate directly to the field controllers or by using an intermediate front end processor to translate data from the field controllers into a format compatible with the ATMS.

Front End Processors. The Contractor shall furnish front end processors consisting of hardened personal computers. These computers shall be installed in the communications huts as identified on the plans. The computers shall meet or exceed the following minimum requirements:

- 2.8GHz Pentium 4
- 400/533MHz FSB
- Up to 2GB DDRAM SDRAM
- COM1: 1 x RS232
- COM2: 1 x RS232/422/485
- 2 x USB 1.1/2.0 channels
- 10/100baseT Ethernet
- 10 ISAbus legacy slots plus 4 PCI (revision 2.2) slots
- 80Gbyte ATA100 hard disk drive
- CDRW/DVD drive
- 450W PFC PSU
- Hardware monitoring for system/CPU temperature
- Operating temperature range 5°C to +45°C (41°F to 113°C)

The computer shall comply 47 CFR, Part 15, Type A and be UL listed.

Software. The Contractor shall provide software to interface the existing ATMS to the new field controllers and ramp metering. Residing in either the FEP or the ATMS as an upgrade, the new software will replicate the functions of the current centralized system to minimize impacts to the current central software system (ATMS). The combined controller, FEP, and ATMS software should support the following functionality:

- For Detectors
 - Collect volume and occupancy data from all detectors
 - Collect speed data from all detector loop pairs
 - Perform low level filtering of the data to eliminate short detector pulses and bridge short detector dropouts resulting in a more accurate view of the detector data
 - Provide a real time output of detector data to the ATMS for viewing as a wave chart
- For Ramp Metering
 - Support several modes of operation including
 - Time of Day /Time of Year table driven rates (a table with rates based on time of day and time of year)
 - A local traffic responsive mode (a method to select rates based on the local mainline traffic conditions)
 - An external override mode (from central)
 - Support current ramp metering functionality including:
 - Startup operations
 - Failure testing
 - Fallback operations for failed equipment
 - Queue override operations
 - Signal control and flasher control
 - Testing for proper ramp metering operations
- General features including
 - Real time viewing of signal states
 - Real time viewing of detector states
 - Handshaking with central will fallback operations upon communication failures
 - Provide real time output of signal state to the ATMS for viewing on the operator interface

The backbone of the communication software must support Ethernet with TCP/IP and UDP/IP standards. The core of the controller's communication API must be able to operate in a connected, and a connectionless operating paradigm. Each controller must operate as a server in the TCP/IP connection model.

The data delivered must include mainline detectors, ramp detectors, and ramp meter system. In addition the data must include all the information required to show the status, operational state, and collected data over time. The polling cycle dictates the time in which normal operational data is either pulled via request, or pushed. The data will be collected or sent in real-time within that cycle.

The Contractor shall supply software for the ramp meter controllers to provide the following capability:

Controller Configuration Data. For each mainline detector, including speed traps, the data collector must be able to report the following on request:

- General
 - Controller Device Identifier
 - Location
 - Wave Form Diagnostics Port
 - Configuration/Set and Polling Port
 - Real-Time Ramp Meter Port
 - Poll Cycle Time in Seconds
 - Communication Loss Threshold (Longest time without data before autonomous mode)
- Inputs
 - Detector Device ID
 - Detector Type [Mainline, Trap, Queue, Demand, Passage, Lamp Confirmation]
 - Input Pin/Offset
 - Minimum Pulse Width For Drops
 - Maximum Bridge Gap
 - Detector Length
 - Maximum No Data Time[in minutes]
 - Maximum Intermitted Fails[in cycles]
- Outputs
 - Lamp Device ID
 - Location
 - Type [Lamp, Beacon]
 - Output Pin/Offset
- Device Configuration for Mainlines
 - Mainline ID
 - Location
 - Device IDs [Mainline, Trap]
 - Trap Distance
 - Lane Number
 - Average Vehicle Length Threshold (tunable parameter)
- Device Configuration for Ramps
 - Ramp ID
 - Location
 - Start Threshold
 - Maximum Rate
 - Minimum Rate
 - Device IDs [Queue, Demand, Passage, Lamp Confirmation, Lamp, Beacon]
 - Mainline ID {for LTR}

MAINLINE DATA

For each mainline/trap Detector the data collector must be able to report these parameters on request in respect to the polling cycle.

- Device Identifier
- Volume – Number of Vehicles since last polling cycle
- Occupancy – The current amount of time the Detector is on, during the cycle.
- Speed – The Speed of vehicle traffic, reported in a distance tuned trap, or a vehicle length tuned single Detector configuration.
- Bridge – The number of times a cycle was bridged
- Drop – The number of times a cycle was dropped
- Average Vehicle Length – Either tuned, or recorded in a trap configuration.
- Detector Status – The status of the Detector as either normal, intermitted, or failed.

RAMP METER DATA

For each ramp meter the data collector must be able to report these parameters in respect to the polling cycle.

- Ramp Identifier
- Passage, Demand, Queue Volume
- Passage, Demand, Queue Occupancy
- Lamp Cycles
- Meter Rate Set [The rate as dictated by the source]
- Meter Rate Operational [The rate as dictated by the mode]
- Rate Source (by priority) – [Local Fixed, External, LTR, TOY, TOD]
- Queue Occupancy Threshold – Tuned Threshold where it will reach a flush state
- Ramp Status – [Off, Initializing, Flushing, Running, Failed, Disabled]
- Detector Status – The status of the Detector as either normal, intermitted, or failed.

REAL: TIME DETECTOR VIEWING

For each Detector the user must have the ability to witness the on and off cycles of each mainline or ramp meter detector in the system. This can be reported at no more than a one second latency. That means that the controller must report at no more than one second the activity of the Detector being shown. The controller must be able to show all Detectors activities at one time. This is broadcast over a connectionless interface (UDP). The parameters are:

- Offset Millisecond
- On/off
- Device identifier

Real-time Ramp Meter Operation Data. For each ramp the user must have the ability to view the real-time operational state of the ramp. This can be reported at no more than a 250 millisecond latency. That means that the controller must report at no more than 250 milliseconds the activity of the ramp being shown. The controller must be able to show all ramps activities at one time. This is broadcast over a connectionless interface (UDP). The parameters are:

- On/off state of each Detector [Queue, Demand, Passage], and lamp confirmation if present.
- Ramp Status – [Off, Initializing, Flushing, Running, Failed]
- Device identifier

Local Traffic Responsive Parameter/Operation Data. The controller shall report the local traffic responsive parameter and running operation data.

Time of Day Operation Data. The controller shall report the time of day running operation data, including:

- Day of week
- Start Hour, Minute
- End Hour, Minute
- Rate
- Ramp ID

Time of Year Operation Data. The controller shall report the time of year running operation data, including:

- Month
- Day
- Start Hour, Minute
- End Hour, Minute
- Rate
- Ramp ID

Controller Configuration/Set Operation Requirements

The controller must support the ability to alter its operation and configuration “on the fly”. This means the update of the parameters to run ramp meters, and adjust the operation of mainline Detector sets. The following parameters dictate the information that is necessary for the controller to operate as an autonomous unit in a stand-alone manner.

Controller Configuration Data. For each mainline/trap Detector the data collector must be able to reconfigure the parameters described on request.

Mainline Data. For each mainline/trap Detector the data collector must be able to report these parameters on request in respect to the polling cycle, including:

- Device Identifier
- Reset Failed Counters

Ramp Meter Data. For each ramp meter the data collector must be able to report these parameters in respect to the polling cycle, including:

- Ramp Identifier
- Manual Rate
- Enable/Disable

Wave Form Data. The controller shall allow waveform data reporting to be turned on and off, which its corresponding deliverable data will be sent on the real-time port.

- On/off reporting
- Device identifier

Real-time Ramp Meter Operation Data. The controller shall allow real-time reporting to be turned on and off, which its corresponding deliverable data will be sent on the real-time port.

- On/off reporting
- Device identifier

Local Traffic Responsive Parameter/Operation Data. The local traffic responsive mode of operation replicates the LTR function in the ATMS with the exception that only the local mainline station is used. The algorithm takes the smoothed mainline data and uses a table lookup for metering rates. These rates are smoothed and used for the final metering rate. In addition, logic is present to:

- Turn metering on and off during selected times or consistent with TOD operation
- Choose minimum rates based on the absolute minimum or the current TOD rate
- Disable LTR mode when the mainline data is failed

The controller shall allow the configuration of the local traffic responsive parameters and running operation data including:

- Rate and data smoothing parameters
- Mainline Occupancy to Rate table
- Turn on/off threshold parameters
- Minimum rate selection strategy

Time of Day Operation Data. The controller shall allow configuration of the time of day running operation data, including:

- Day of week
- Start Hour, Minute
- End Hour, Minute
- Rate
- Ramp ID

Time of Year Operation Data. The controller shall allow the configuration of the time of year running operation data primarily for holidays.

- Month
- Day
- Start Hour, Minute
- End Hour, Minute
- Rate
- Ramp ID

Installation.

General. The system shall be provided as a complete, integrated whole, grouped into installed location subsystems that are unique for each indicated location. Certain locations, such as I-94 at I-55, shall be provided with communications hut facilities under separate pay items, as indicated, in this contract. Other locations, such as I-57 at I-94, have existing huts or buildings and the CCTV Distribution System items shall be installed within these existing facilities.

All wiring, cabling and other provisions necessary to connect and integrate components within each location package shall be included with the respective system package. The system, in addition to being coordinated with camera items specified elsewhere herein, shall be coordinated and integrated, complete with Shop Staging Tests, System Documentation and Training, Installed Testing and Commissioning, as well as Maintenance of Existing CCTV.

The installation shall comply with the National Electrical Code. All interior 120-volt power wiring shall be in electrical metallic tubing, unless otherwise indicated. Except for permitted plug strips, receptacles shall be duplex receptacles, industrial specification grade, in metal boxes with metal covers.

Interconnecting Wiring. All wiring, cabling, and other provisions necessary to connect the installed system package to power panelboards, fiber optic patch panels, grounding systems, etc. at each nodal location shall also be included as part of each respective location sub-system package.

All wiring and cabling, including fiber optic cabling, shall be suitably labeled, using the designation scheme developed by the Bureau and approved by the Engineer.

Prototyping Facility. The Contractor shall develop a prototyping facility at the TSC. This facility shall consist of one front end processor, two model 2070 Lite controllers, one loop detector assembly, and a loop simulator. This facility shall be used to validate the software and system design.

Product information and shop drawings shall be submitted for approval in detail. The submittal shall include, but not be limited to:

- Product information on all components, highlighted to indicate specification compliance. Product information that applies to more than a single specific model or variation, and may list optional equipment or features, shall clearly indicate the model, variation and options selected.
- All warranty information.
- Shop Drawings of assemblies of Equipment, with layout and dimensions.
- Interconnection wiring diagrams, indicating all component and cabling identification.

Interconnection wiring diagrams shall be of such detail that a competent electrician unfamiliar with the equipment is able to properly select and terminate all wiring required for proper system operation.

- Installation drawings, detailing dimensioned placement at facilities and all connections.
- Description of location and arrangements for Shop Staging Tests.

All information shall be submitted in both hardcopy and electronic format on CD-ROM.

TABULATION OF MAJOR RACK-MOUNTED EQUIPMENT

The table that follows this special provision summarizes the quantity of major CCTV components required at each location. This list does not include power or power distribution components, cabling, patch panels, or other equipment that may or may not be mounted in the equipment racks. It also does not include equipment not paid for in these pay items that might be mounted in equipment racks.

Method of Measurement. Each individual subsystem shall be counted for payment when furnished and installed, connected, field tested and accepted. A 25% payment will be allowed when all sub-systems are assembled, delivered to the shop staging location and approved for testing by the Engineer. An additional 25% payment will be allowed when all sub-systems have been connected in simulation and successfully passed shop staging testing as approved by the Engineer. An additional 25% payment will be allowed for individual sub-systems as they are installed and made operational. The final 25% payment will be allowed when all sub-systems have been installed, connected and passed installed operational testing, and when all documentation has been completed, delivered and approved by the Engineer. Normal retainage will apply to all payments.

Basis of Payment. The TRAFFIC SURVEILLANCE SYSTEM, although operating as an integrated whole, will be paid on the basis of the system elements installed at each individual location as follows:

TRAFFIC SURVEILLANCE SYSTEM, TRAFFIC SYSTEMS CENTER
TRAFFIC SURVEILLANCE SYSTEM, I-57 AT I-94
TRAFFIC SURVEILLANCE SYSTEM, I-55 AT I-94

TABULATION OF MAJOR RACK-MOUNTED EQUIPMENT

Equipment	TSC	I-94/I-57	I-94/I-55
Front End Processor	1	1	1
Ethernet Device Servers		4	4
Equipment Racks	1	1	1
Model 2070 Controller	2		

* Not included in these pay items.
(EK – 11/29/2004)

MAINTENANCE OF TRAFFIC SURVEILLANCE

Description. Effective the date that the Contractor's activities (electrical or otherwise) at the job site begin, the Contractor shall be responsible for the proper operation and maintenance of all existing and proposed traffic surveillance systems which are located within the limits of improvement until they are removed or rendered inoperable by the planned construction activities of the project or as otherwise determined by the Engineer.

Existing Traffic Surveillance systems, when depicted in information furnished by the State to the Contractor, 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 inspect, confirm, and ascertain the exact condition of the surveillance equipment and systems to be maintained. The request for the maintenance inspection shall be made no less than seven (7) calendar days prior to the desired inspection date.

Maintenance of Existing Traffic Surveillance. Existing Traffic Surveillance systems shall be defined as any Traffic Surveillance system or part of a Traffic Surveillance system in service prior to this Contract or installed under the concurrent Contract 62733. It is the Contractor's responsibility to ascertain the extent of effort required for compliance with this specification, and failure to do so will not be justification for extra payment or reduced responsibilities.

The Contractor shall be fully responsible for maintenance of all items in service within the limits of improvement at the time work under this Contract begins. Maintenance shall include, but not be limited to, any equipment failures or malfunctions as well as equipment damage either by the motoring public, Contractor operations, or other means. The potential cost of replacing or repairing any malfunctioning or damaged equipment shall be included in the bid price of this item and will not be paid for separately.

The Contractor shall notify the Engineer if equipment that is scheduled for removal within three calendar months has failed or been damaged. The Engineer will determine if repairs are necessary or if the equipment shall be removed without repair or replacement.

Maintenance of Proposed Traffic Surveillance. Proposed Traffic Surveillance systems shall be defined as any Traffic Surveillance system or part of a Traffic Surveillance system which is to be constructed under this Contract. The Contractor shall be fully responsible for maintenance of all items installed under this Contract. Maintenance shall include, but not be limited to, any equipment failures or malfunctions as well as equipment damage by the motoring public, Contractor operations, or other means. The potential cost of replacing or repairing any malfunctioning or damaged equipment shall be included in the bid price of this item and will not be paid for separately.

Traffic Surveillance System Maintenance Operations. The Contractor's responsibility shall include maintaining the surveillance equipment system in good working order, including all controller enclosures and their contents, cables, conduits, and detection loops. The Contractor shall act to correct system deficiencies within 12 hours of notification by the Engineer or by the IDOT Traffic Systems Center.

Responsibilities shall include weekly patrol of the Traffic Surveillance 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.

Damage caused by the Contractor's operations shall be repaired at no additional cost to the Contract. Damage caused by operations in other Contracts shall be repaired by the Contractor at no additional cost to the State.

Elimination of Traffic Surveillance Systems. The Contractor shall coordinate with other Contractors to determine when their planned activities will prevent the operation of each detector loop, or when traffic will be routed away from the loop and not returned prior to the demolition of the detector loop of its lead-in cable. The Contractor shall notify the Engineer not less than one week prior to the deactivation of a detector loop or group of detector loops. For detector loops that are actively sensing traffic, the Contractor shall disconnect the loop lead-in cable at the controller cabinet not less than 24 hours prior to when other planned construction activities will damage the loop or its lead-in cable. Once all detector loops that connect to a particular surveillance cabinet have been deactivated, that surveillance cabinet shall be promptly removed. Removal of surveillance cabinets is paid for under a separate pay item.

The Engineer may at any time determine that part or all remaining surveillance equipment shall no longer be maintained. Upon such determination, the Contractor shall disconnect all detector loops that remain in operation, and proceed to remove the remaining surveillance cabinets.

Basis Of Payment. Maintenance of existing traffic surveillance systems shall be paid for at the Contract unit price per calendar month or fraction thereof for MAINTENANCE OF EXISTING TRAFFIC SURVEILLANCE, which shall include all work as described herein. Failure of the Contractor to maintain existing traffic surveillance systems in good working order to the satisfaction of the Engineer will be cause for denying the pay request.

(EK – 11/29/2004)

TEMPORARY DYNAMIC MESSAGE SIGN SYSTEM

Description. This work shall consist of furnishing all labor, equipment, and materials required to ensure that the existing Dynamic Message Signs (DMS) at 57th St (STA. 4456+90 NB) and at 37th St (STA. 2597+10 NB) remain operational for the duration of this Contract as directed by the Engineer. This work shall also include the removal and salvage of equipment temporarily installed as required to provide continuous operation of each existing DMS.

This work shall include, but shall not be limited to, the installation, removal, and salvage of the following temporary DMS equipment as shown on the plans:

Wood Pole (60' @ 57th St, 50 ft @ 37th St)
Pole Mounted Type A DMS Controller Cabinet
DMS controller salvaged from Existing in-ground DMS controller cabinet
Conduit Risers and required Fittings
Steel Pole Bands
Telephone Service (37th St)
Aerial Messenger cable and Pole-mounted cable attachments
Power, telephone, and DMS control cables

Materials. All materials used for the Temporary DMS system shall be in accordance with the appropriate section of the Standard Specifications as follows:

Temporary wood poles shall be taken from state stock material in storage at the IDOT Rodenburg Maintenance Yard in Schaumburg. The Contractor shall make arrangements with the Engineer not less than seven (7) business days in advance for pick-up of a pole or poles. The Contractor is responsible for handling, transport, and installation of the pole. Poles shall be installed in ground to a depth no less than 20% of the length of the pole, and shall otherwise be installed in conformance with Article 808.03 of the Standard Specifications. The system components shall be mounted to the wood poles at the locations as shown in the plans or as directed by the Engineer.

<u>Item</u>	<u>Section</u>
Wood Poles	808
Conduit (underground)	810
Conduit (exposed)	811
DMS Controller Cabinet	863
Cable	873

Removal and Salvage. Removal of existing temporary DMS equipment shall meet the requirements of Section 895 of the Standard Specifications.

All of the existing temporary DMS equipment noted above is to be removed and salvaged. All salvaged materials shall be delivered to the Department at a location within District 1 as designated by the Engineer.

Underground electric cables and conduit not designated for permanent use as shown on the plans shall be removed by the Contractor to a depth of 300mm (1 ft) below ground level and abandoned. Electric cables in conduit not designated for permanent use as shown on the plans may be removed from the duct and may become the property of the Contractor.

CONSTRUCTION REQUIREMENTS

Prior to the commencement of any work on the existing DMS structures at 57th St and 37th St, the Department's Electrical Maintenance Contractor (EMC) shall inspect each DMS and shall provide written verification to the Engineer that the existing DMS housing, DMS internal components, and DMS support structure are in good working order and functioning properly. The verification shall include the date, time, and name of person providing the verification. The Engineer shall be in attendance at each inspection.

Immediately upon receipt of the written verification from the EMC, the Engineer shall notify the Contractor in writing that the responsibility for maintaining the existing DMS shall immediately shift from the EMC to the Contractor.

The existing DMS controller cabinet and cabinet foundation shall be removed by others (Contract 62733 (2B) for the structure at 37th St, and Contract 62586 (9B) for the structure at 57th St). The Contractor shall coordinate with the Traffic Systems Engineer (708-524-2145) to obtain the DMS controller cabinet components to be installed in the pole-mounted temporary DMS controller cabinet at each location as shown on the plans.

The Contractor shall perform all work required to provide the temporary DMS installation as shown on the plans and as directed by the Engineer. The work shall be performed such that the DMS shall be operational as continuously as possible.

Upon completion of the installation of the temporary DMS system configuration at 57th St and at 37th St as shown on the plans, the Engineer shall inspect all involved components to ensure that the entire Temporary DMS system is in good working order and functioning properly. Upon approval and acceptance of each temporary DMS installation, the Engineer shall provide written notification to both the Contractor and the EMC that maintenance of the temporary DMS installation shall shift back to the EMC effective immediately. The date and time of the shift in responsibility shall be as directed by the Engineer. The EMC shall then maintain the temporary installation at each location until the installation of the new DMS in the vicinity of each existing DMS is completed as directed by the Engineer and as coordinated with the future paving Contractor(s).

Once the new DMS has been installed in the vicinity of each existing structure and is operational as determined by the Engineer, the Engineer shall notify the EMC in writing that maintenance of the temporary DMS system at each location is no longer required. At that point, the Contractor shall remove and salvage the temporary DMS equipment listed above. All equipment required for the permanent surveillance system as shown on the plans shall remain in place.

At the 37th St and 57th St DMS locations, in addition to the temporary DMS equipment to be removed and salvaged, the existing DMS housing and support structure shall be removed, and the existing internal DMS components shall be removed and salvaged. The removal of the DMS housing and support structure, and the salvage of the internal DMS components will be paid for separately. The existing DMS support structure foundation at each location will be removed by others as indicated on the plans.

Any damage resulting from the removal and transportation of the existing temporary DMS equipment (and associated items) designated for removal and salvage as noted above, shall be repaired or replaced in-kind, at the Contractors expense, to the satisfaction of the Engineer. The Engineer in conjunction with the Traffic Systems Engineer will be responsible for determining the extent of the damage and the suitability of repair or replacement.

No removal work shall be permitted without first notifying, and obtaining approval from, both the Engineer and Traffic Systems Engineer (708-524-2145) within 72 hours of commencing removal operations.

The existing temporary DMS equipment designated for removal and salvage (as noted above) is to be delivered and unloaded at a storage facility of the Department's located within District 1, as designated by the Engineer. The Contractor shall contact the Traffic Systems Engineer (708-524-2145) to coordinate delivery of the existing equipment. All existing temporary DMS equipment shall be delivered within 30 days of the removal operations.

The Contractor shall provide 5 copies of a list of existing equipment that is to remain the property of the Department, including model and serial numbers, where applicable. Existing controllers and peripheral equipment from the same location shall be boxed together (equipment from different locations shall not be mixed) and all boxes and controller cabinets shall be clearly marked and labeled with the location from which they were removed.

If necessary, the Contractor shall safely store and arrange for pick-up of all existing equipment to be returned to agencies other than the Department. The Contractor shall package the equipment and provide all necessary documentation as stated above.

Method of Measurement. Temporary DMS system equipment to be installed, removed and delivered to the Department's storage location located within District 1 as designated by the Engineer shall be measured as a lump sum price.

Basis of Payment. Payment for the installation of all items required for the operation of the temporary DMS system at 57th St and at 37th St as indicated in the plans will be made at the lump sum price for TEMPORARY DYNAMIC MESSAGE SIGN SYSTEM. This price shall be payment in full for all work done to install temporary DMS equipment as indicated in these special provisions.

Payment for the removal and salvage of all items installed for the temporary operation of the DMS system at 57th St and 37th St (except those items required for use in the permanent surveillance system as indicated in the plans) will be made at the lump sum price for TEMPORARY DYNAMIC MESSAGE SIGN SYSTEM, REMOVE AND SALVAGE.

Payment for the removal of the existing DMS housing and support structure, and the salvage of the existing internal DMS components at each location will be made separately.
(EK - 08/20/2004)

TEMPORARY VEHICLE DETECTION SYSTEM

Description. This item shall consist of furnishing, installing, relocating and maintaining a Temporary Surveillance Vehicle Detection System. This system shall consist of five individual

elements: Temporary Detection Station; Temporary Detection Hub; Temporary Detection Hub, Relocate; Temporary Detection System, Remove and Salvage; and Temporary Detection System Monthly Maintenance.

The temporary vehicle detection system will emulate the induction loops that are being removed by the roadway construction and substitute for them until ultimately they can be replaced with new microloops. The system will use a hub, located at the site of an existing loop-detector station. This hub will use spread spectrum radios to communicate upstream and downstream with radar vehicle detectors at temporary detector stations. The radar detectors will be configured to emulate the loop detectors and provide dry contact switch closures through the radios to the hub. At the hub, the switch closures will be connected to existing or relocated tone transmitters on a telephone circuit to the Traffic Systems Center (TSC).

Since the temporary detection hubs will be collocated at existing surveillance facilities, it is anticipated that these sites will have access to 120 VAC power. The new temporary detection stations, however will be isolated from the existing system and will not have access to normal power service. These installations will use solar power for the radar detectors and radios. In addition, it may be necessary to provide new temporary power or additional telephone circuits to some temporary traffic detection hubs, as indicated on the plans.

All work will require close coordination with the TSC staff and the Engineer.

Materials. The Contractor shall furnish the following components and subsystems that can be configured as Temporary Detection Hubs and Temporary Detection Stations.

Solar Power Assembly. The solar arrays shall be made in North America and have a 20-year factory warranty. Each solar array shall provide a minimum of 85 watts of peak power. The solar arrays shall be UL listed, FM Class I, Div II, Group C&D approved.

The array mount shall attach to the side of the pole with stainless steel fasteners. The array mount shall be aluminum alloy or stainless steel. The array shall be capable of withstanding 125-mph winds.

A solar charge regulator shall be provided that is UL listed, and rated for a minimum of 10 amperes continuous current, with solid state, low voltage disconnect. The solar charge regulator shall be sealed with internal temperature compensation, lightning protection, reverse polarity protection, and LED indicators. The solar charge regulator shall be FM Class I, Div. II, Groups ABCD and have the CE mark.

The Contractor shall supply batteries that are 12V, gel-electrolyte, non-spillable, and maintenance-free units. The batteries shall have a minimum rating of 120 ampere-hours.

Enclosure. Enclosures shall be .125" aluminum with stainless steel hardware. The enclosures shall have #2 Corbin Lock on an insulated door. There shall be separate compartments for the batteries and for the electronics. The minimum enclosure dimensions shall be 43.875" X 16.5" X 10.25".

The enclosure shall have two shelves minimum with 1.00" x 2.00" opening cutout in shelf. The lower compartment shall have a 13.00" x 15.00" back panel .125" thick. The upper and middle

compartments shall be vented by louvers on each side. The door shall be equipped with a door stop mechanism to stop the door at 90° and 180°. The cabinet shall have a plastic sheet holder which shall contain the wiring and as-built diagrams specific to the site.

Radar Vehicle Detector

General. All equipment and component parts furnished shall be new, be of the latest design and manufacture, and be in an operable condition at the time of delivery and installation. All parts shall be of high quality workmanship, and no part or attachment shall be substituted or applied contrary to the manufacturer's recommendations and standard practices.

The design shall prevent reversed assembly or improper installation of connectors, fasteners, etc. Each item of equipment shall be designed to protect personnel from exposure to high voltage during equipment operation, adjustments and maintenance.

The designed Mean Time Between Failures (MTBF) of the radar vehicle detector unit, operating continuously, shall be 10 years or longer.

The manufacturer of the radar vehicle detector shall provide at least three (3) references to show that the Radar Vehicle Detector product has been deployed in operational systems of similar scope and size for over three (3) years. The contractor shall be responsible for providing all materials to install and place into the operation (Mounting brackets, connector backshells) which will be part of the bid price of the item.

Environmental Conditions And Protection. Except as stated otherwise herein, the equipment shall meet all its specified requirements in the following environments:

- Ambient temperature range of -37 to +74 degrees C
- Relative humidity from 5 to 95%, non-condensing

The design shall be inherently temperature compensated to prevent abnormal operation. The circuit design shall include such compensation as is necessary to overcome adverse effects due to temperature in the specified environmental range.

Except as may be otherwise stated herein for a particular item, no item, component, or subassembly shall emit a noise level exceeding the peak level of 55 dBA when measured at a distance of one meter away from its surface.

The microwave radar detector shall be resistant to vibration in accordance with IEC 68-2-30 (test Fc), NEMA TS-1 (Section 2.1.12), or approved equivalent.

The microwave detector shall be resistant to shock in accordance with IEC 68-2-27 (test EA), NEMA TS-1 (Section 2.1.13), or approved equivalent.

Radar Transmitter. The microwave radar detector shall transmit in the frequency band of 10.525 +/-25 MHz or other FCC approved spectral band. It shall comply with the limits for a Class A digital device, pursuant to 47CFR, Part 15 or the appropriate Spectrum Management Authority. Transmitter power shall not exceed 10 milliwatts. The Contractor shall resolve any issues with interference.

Beam Coverage. The Radar Vehicle Detector shall cover an area defined by an oval shaped beam and its maximum detection range shall be as follows:

- Elevation Beam Width (Half-power) 40 degrees
- Azimuth Beam Width (Half-power) 15 degrees
- Range 10 to 200 feet

Detection Zones. The radar detector shall provide a minimum of eight detection zones. The range limits of each zone shall be user-defined with a 7-ft. resolution.

Functional Characteristics. The Radar Vehicle Detector shall be a true presence detector. It shall be suitable for mounting on roadside poles or on overhead structures and provide the following:

- Presence of moving or stopped vehicles in its detection zones, provided as duration of contact closure to existing controllers
- Traffic data shall be available simultaneously with detection zone contact closures

Measurement Accuracy. The detector shall identify vehicle presence within each detection zone with a 95% accuracy or greater, independent of the vehicle's direction of travel through the detection zone.

The maximum permissible error shall be 5% in the detection of the direction and magnitude of radial speed and 10% in the case of transverse speed.

Physical. The microwave radar detector shall be enclosed in a rugged weatherproof box and sealed to protect the unit from wind up to 90 mph, dust and airborne particles, and exposure to moisture (NEMA type 3R enclosure). The maximum weight of the microwave radar detector assembly shall be 2.2 kg (5 pounds).

Electrical. The Radar Vehicle Detector unit shall be operable from 12-24 VAC/DC. At the or 95-135 VAC @ 60 Hz. Power supply shall be obtained from the power distribution assembly within the controller cabinet, solar array or any convenient power source.

Power dissipation shall not exceed 4.5W or an average of 6.0 Watts for Radar Vehicle Detector equipped with an internal Spread Spectrum modem.

Mounting Bracket. The Contractor shall supply a mounting assembly to secure the Radar Vehicle Detector to the pole. The mounting assembly shall have all coated steel, stainless steel, or aluminum construction, and shall support a load of 20 pounds. The mounting assembly shall incorporate a ball-joint, or other approved mechanism, that can be tilted in both axis, then locked into place, to provide the optimum area of coverage. The mounting bracket shall allow replacement of a unit without the need for re-aiming.

Cable. Connection between the RADAR VEHICLE DETECTOR and the cabinet equipment shall be provided by a single cable, terminated in an MS connector.

The cable shall provide power to the unit, and contain eight output contact closure wire pairs. The insulation of the conductors shall be rated at 300V AC/DC. A junction box or cabinet to house the data interface connector must be located within sight of the desired detection zones in order to initially set up the sensor or to alter the set-up at a later date.

The cable shall be UV-resistant and provide nine (9) twisted pairs of stranded AWG #20 or #22 wire with a common shield rated at 300V with a temperature rating of 105° C.

The MS connector pins must be crimped to the cable conductors, assembled into the connector shell, and tested prior to the installation and pulling of cable on the site.

For the solar array, power wiring shall be 10AWG, stranded copper, double insulated, sunlight resistant, 600V 90C rated cable.

Electrical Isolation And Surge Protection. The contact closures and serial port shall be optically isolated. Power lines and serial port shall be surge protected within the unit.

Software. Contractor shall provide the Department with 10 licensed copies or a multiple user license for the Radar Vehicle Detector software to set up, calibrate, and monitor the Radar Vehicle Detector. Contractor shall be responsible to provide his own computer to set up and calibrate the Radar Vehicle Detector or Master Radio Controller sites.

Spread Spectrum Radio Transceivers.

Technology	Frequency Hopping, Spread Spectrum Radio
Frequency band	900 MHz or 2.4 GHz, license exempt ISM bands
Mode	Point-to-point operation
Hopping pattern	64 pseudo-random sequences selectable
Transmitter power	1 mW, 10 mW, 100 mW, or 1 W user-selectable
Antenna	Yagi Antenna
Range	Up to 20 miles depending on power and propagation
Licensing	FCC rules Part 15 approval. License free operation in the US
Temperature Range	37° to +70° C
Power Consumption	2.2 watts maximum

Wood Poles. Temporary wood poles shall be 50-foot wood poles furnished from state stock material in storage at the IDOT Rodenburg Maintenance Yard in Schaumburg. The contractor shall make arrangements with the Engineer not less than seven (7) business days in advance for pick-up of a pole or poles. The contractor is responsible for handling, transport, and installation of the pole. Poles shall be installed in ground to a depth no less than 10 feet, and shall otherwise be installed in conformance with Article 808.03 of the Standard Specifications. The system components shall be mounted to the wood poles at the locations as shown in the plans or as directed by the Engineer.

Installation. The Contractor shall identify locations for the temporary detection stations and temporary detection hubs based on the plans. These locations shall be marked and coordinated with the Engineer, allowing for changes in the roadway design that were created after the plans for this project were finalized.

Based upon a tentative approval for the proposed locations, the Contractor shall use portable test equipment to verify the signal propagation and measure the existing noise levels over the proposed frequency spectrum of the spread spectrum modems at the proposed locations. The Contractor shall provide the Department a Radio Site Survey of the construction zone to determine the optimum radio band to operate the Wireless Transfer System. The Radio Site Survey will also determine the feasibility of the suggested radar vehicle detector locations and data collection sites listed in this specification. It shall be the Contractor's responsibility to verify

each locations viability and make any alternate site recommendations to the Department, should the viability of a particular site be in question. The final locations shall be picked based on the Radio Site Survey. The cost of the Radio Site Survey shall be included in the cost of the Detector Locations and Data Collection Location pay items.

Detector Locations. The contractor shall install Radar Vehicle Detectors, RADAR VEHICLE DETECTOR units, at a maximum of 18 locations. The locations as indicated in the plans are suggested locations. The final locations will be determined by the Radio Site Survey and as directed by the Engineer.

The detector locations shall include following hardware:

- Wood Pole (State Furnished)
- Radar Vehicle Detector
- 900 MHZ Spread Spectrum Radio
- Solar Panels
- Solar Charge Regulator
- Batteries
- Cabinet/Enclosure to house batteries and electronics
- Yagi antenna
- All related connection cables, conduit, brackets, and other items incidental to the construction of the Temporary Surveillance System

Data Collection Locations: The Contractor shall install Temporary Detection Hubs in existing or proposed state cabinets at five locations. The data collection sites shall include the following hardware:

- Wood pole (State Furnished)
- 900 MHz Spread Spectrum Radios
- Yagi Antennas
- GSC Rigid conduit from wood pole to cabinet
- All related connection cables, conduit, brackets and other items incidental to the construction of the Temporary Surveillance System

The RADAR VEHICLE DETECTOR shall be mounted in a side-fired configuration on a State-furnished, 50 foot wooden pole at the locations specified in the plans, using the supplied mounting brackets. The brackets shall be attached with approved $\frac{3}{4}$ inch wide, .025-inch thick, stainless steel bands.

The contractor shall install the detector unit on the pole at the nominal height of 21 feet above the road surface so that the masking of vehicles is minimized and that all detection zones are contained within the specified elevation angle as suggested by the manufacturer. The radar vehicle detector's detection zones shall be set up using the provided licensed software and the Contractor's Notebook PC.

Each Temporary Detection Hub communicates to a maximum of four Temporary Detection Stations using point-to-point, spread spectrum radios. The Contractor shall assign the radios to specific channels based on:

- The assessment of propagation and noise measurements during the initial site assessment
- Mitigation of interference between links

The Contractor shall install the cabinets, detectors, and transceivers at the Stations and Hubs approved by the engineer. The Contractor shall interface the transceivers to the radar detectors at the Stations and the transceivers to the Tone Telemetry equipment at the Hubs.

If required, the Contractor shall provide additional phone circuits and relocate additional tone equipment to the Hub. The additional phone circuits are paid for under a separate pay item. The tone equipment will be relocated from other cabinets under REMOVE AND SALVAGE EXISTING TSC EQUIPMENT.

The Contractor maps one of the Hub's eight dry contacts to each detection zone of the RADAR VEHICLE DETECTOR sensors in the system. At the TSC, the Contractor shall cross-connect the incoming closures to the nearest incoming ATMS FEP detector input. (All of the existing detector equipment is cross-connected to the IDF in the Intermediate Distribution Frame (IDF). As these tone detectors are eliminated by the road construction, they can be used for the temporary detection system by cross-connecting them to the incoming telephone circuits in the telephone room and cross-connecting their outputs to the proper FEP inputs.)

When all equipment is installed and connected, the Contractor shall test and demonstrate the performance and accuracy of the installed detectors. This test shall match observed and detected vehicles, as well as the ability of the Advance Traffic Management System to collect and use the data for travel times. The accuracy of the travel times is not an issue for the Contractor, provided the detectors are reporting the vehicles' presence correctly.

TEMPORARY DETECTION SYSTEM, REMOVAL AND SALVAGE

Removal. Removal of the temporary detection system shall meet the requirements of Section 895 of the Standard Specifications.

All of the temporary detection equipment is to be removed upon completion of the project. All equipment shall be salvaged and delivered to the Department at a location within District 1 as designated by the Engineer.

CONSTRUCTION REQUIREMENTS

Any damage resulting from the removal and transportation of the temporary detection equipment (and associated items) designated for removal and salvage as indicated in the plans, shall be repaired or replaced in-kind, at the Contractors expense, to the satisfaction of the Engineer. The Engineer in conjunction with the TSC Engineer will be responsible for determining the extent of the damage and the suitability of repair or replacement.

No removal work shall be permitted without first notifying, and obtaining approval from, both the

Engineer and Traffic Systems Engineer (708-524-2145) at least 72 hours prior to commencing the removal operations. An inspection and approval by the Engineer in conjunction with the Traffic Systems Engineer will take place before any associated proposed temporary surveillance is approved for operation.

The temporary detection equipment designated for removal and salvage as indicated in the plans, is to be delivered and unloaded at a storage facility of the Department's located within District 1, as designated by the Engineer. The Contractor shall contact the Traffic Systems Engineer (708-524-2145) to coordinate delivery of the existing surveillance equipment. All temporary detection equipment shall be delivered within 30 days of the removal operations.

The Contractor shall provide five (5) copies of a list of equipment that is to remain the property of the Department, including model and serial numbers, where applicable. Temporary detection equipment from the same location shall be boxed together (equipment from different locations shall not be mixed) and all boxes and controller cabinets shall be clearly marked and labeled with the location from which they were removed.

If necessary, the Contractor shall safely store and arrange for pick-up of all existing equipment to be returned to agencies other than the Department. The Contractor shall package the equipment and provide all necessary documentation as stated above.

TEMPORARY DETECTION SYSTEM MONTHLY MAINTENANCE

This item shall consist of maintaining the Radar Vehicle Detector Sites and Data Collection Site in place as described herein. The energy charges for the operation of the traffic surveillance installation shall be paid for by others.

Full maintenance responsibility shall start as soon as the general contractor has completed the installation to the Engineer's satisfaction and data is received and verified by the Traffic Systems Engineer. The contractor shall maintain the radar Vehicle Detector Locations and Data Collection installations located within the contract limits.

Maintenance procedures: The General Contractor shall perform the following maintenance procedures for existing installation designated to remain in operation during construction.

Immediate corrective action shall mean on site response within four hours.

The Contractor shall:

1. Patrol and inspect each detector location and data collection site every month for general operation of Radar Vehicle Detector sensors and radio to insure that they are functioning properly, check control cabinet, solar panels, RVD mounting and work shall be logged on the Surveillance Inspection and Repair Check List.
2. Provide immediate corrective action to replace damaged or malfunctioning components at Radar Vehicle Detector sites, and data collection sites. All replacement components shall meet the guidelines set forth in the equipment specifications or meet the approval of the Engineer. Contractor shall repair or replace all defective equipment from any cause whatsoever.

3. Maintain in stock at all time a sufficient amount of materials and equipment to provide effective temporary and permanent repairs.
4. Provide immediate corrective action when any part or parts of the system fail to function properly.
5. Replace defective or damaged equipment.
6. A record tag shall be attached to each individual piece of equipment with the date originally installed by the Engineer. The interval between successive dates of cleaning shall not exceed one year. Any component which fails in a manner which affects the intended operation of any installation shall be repaired before it is returned to service. The Contractor shall be required to maintain the existing type of equipment during the period of time that the original equipment is being repaired.
7. Respond to all calls from the Department within eight hours after notification and provide immediate corrective action. When equipment has been damaged or becomes faulty beyond repair, the Contractor shall replace it with new and identical equipment. The cost of furnishing and installing the replaced equipment shall be borne by the contractor at no additional charge to the State. The contractor may institute action to recover damages from a responsible third party. If at any time the Contractor fails to perform all work as specified herein to keep the temporary detection system installation in proper operating condition or if the Engineer cannot contact the Contractor's designated personnel, the Engineer shall have the State's Electrical Maintenance Contractor perform the work required. The State's Electrical Maintenance Contractor shall bill the Contractor for the total cost of the work. The Contractor shall pay this bill within thirty (30) days of the date of the receipt of the invoice or the cost of such work shall be deducted from the amount due the Contractor.
8. All dispatch tickets reporting malfunctions shall be responded to within eight hours, and immediate corrective action shall be taken to correct the problem. The Contractor shall report back via telephone their findings and clear any dispatch tickets. If follow-up work is necessary, it shall commence within 10 days of notice, and permanent repairs shall be completed within 45 days.
9. The Contractor shall maintain all devices and appurtenances at the radar Vehicle Detector Sites including but not limited to Spread Spectrum Transceivers, Cabinets, Power and Phone Connections, Interconnecting Cables, Wood Poles, Antennas.
10. The Contractor shall maintain all devices and appurtenances at the Temporary Detection Hubs including but not limited to Spread Spectrum Transceivers, Cabinets, Power and Phone Connections, Interconnecting Cables, Wood Poles, Antennas. The Department shall be responsible to maintain the Tone Telemetry FSK units at the Hubs and TSC.
11. The Contractor shall be responsible for moving the TEMPORARY DETECTION HUBS per the charts in the plans and specifications for the Temporary Detection System. The Contractor shall recalibrate system components to the Engineer's satisfaction before declaring the site operational.

12. The Contractor shall be responsible for recalibration of radar vehicle detector units or realignment and setup of the spread spectrum transceivers should the system become out of adjustment.
13. The Contractor shall be responsible for the Maintenance of the Solar Power Systems for the Radar Vehicle Detectors. The Contractor shall follow the recommendations set forth by the manufacturer and submit to the Engineer the maintenance recommendations in the submitted catalog cuts. Battery checks and replacements as necessary shall be included in the cost of the maintenance pay item.
14. The Contractor shall be responsible to repair or replace damaged equipment as a result of vehicular damage. The cost of repaired or replacement equipment shall be included in the cost of the TEMPORARY DETECTION SYSTEM MONTHLY MAINTENANCE.
15. The Department shall be responsible for maintenance of the Tone Telemetry, rack and Telemetry DC power supplies. The Contractor shall maintain the Contact Closure Connections as well as power and phone connections to the rack in the Hubs.

Method of Measurement. TEMPORARY DETECTION SYSTEM, REMOVE AND SALVAGE with components delivered to the Department's storage location located in District 1 as designated by the Engineer, and associated removals to be disposed of by the Contractor, shall be measured as a lump sum price.

TEMPORARY DETECTION SYSTEM MONTHLY MAINTENANCE shall be measured for payment per each calendar month of service.

TEMPORARY DETECTION STATION, TEMPORARY DETECTION HUB, and TEMPORARY DETECTION HUB, RELOCATE shall be measured per each detection station installation, hub installation, or hub relocation.

Basis of Payment. Payment for the removal and salvage of all items designated for removal and salvage as indicated in the plans will be made at the lump sum price for TEMPORARY DETECTION SYSTEM, REMOVE AND SALVAGE. This price shall be payment in full for all work done to remove and salvage temporary detection equipment as indicated in these special provisions.

This item shall be paid for at the per calendar month contract unit price for TEMPORARY DETECTION SYSTEM MONTHLY MAINTENANCE, which price shall be payment in full for all materials, equipment, and labor needed to perform the work described herein.

The following items shall be paid for at the contract unit price each: TEMPORARY DETECTION STATION, TEMPORARY DETECTION HUB, and TEMPORARY DETECTION HUB, RELOCATE, which price shall include all materials, equipment, and labor needed to perform (EK – 08/30/2004)

GROUNDING OF ITS SUBSYSTEMS

The grounding of ITS subsystems shall meet the requirements of Section 807 of the Standard Specifications. In addition, amend Article 807.01 of the Standard Specifications to include:

General. All ITS subsystems (ramp metering system, dynamic message sign system, system detector stations, etc.), associated equipment, and appurtenances shall be properly grounded in strict conformance with the NEC and as shown on the Plans.

The grounding electrode system shall include a ground rod installed with each concrete foundation for all grounding applications. An additional ground rod will be required at locations where measured resistance exceeds 25 ohms. Ground rods are included in the applicable foundation pay item and will not be paid separately.

Testing shall be according to Section 801.11 of the Standard Specifications:

- a) The grounded conductor (neutral conductor) shall be white color-coded. This conductor shall be bonded to the equipment-grounding conductor only at the Electric Service Installation. All power cables shall include one neutral conductor of the same size.
- b) The equipment-grounding conductor shall be green color-coded. The following is in addition to Section 801.14 of the Standard Specifications
 - (1) Equipment grounding conductors shall be XLP insulated No. 6, unless otherwise noted on the Plans, and bonded to the grounded conductor (neutral conductor) only at the Electric Service Installation. The equipment-grounding conductor is paid for separately and shall be continuous. The Earth shall not be used as the equipment-grounding conductor.
 - (2) Equipment grounding connectors shall be bonded, using a Listed grounding conductor, to all ramp meters, DMS, and detector pole cabinets, handholes, and other metallic enclosures throughout the ITS subsystems, except where noted herein. A Listed electrical joint compound shall be applied to all conductor terminations, connector threads, and contact points.
 - (3) All metallic and non-metallic raceways containing ITS circuit runs shall have a continuous equipment grounding conductor, except raceways containing only detector loop lead-in circuits, circuits under 50 volts and/or fiber optic cable will not be required to include an equipment grounding conductor.
- c) The grounding electrode conductor shall be similar to the equipment-grounding conductor in color-coding (green) and size. The grounding electrode conductor is used to connect the ground rod to the equipment grounding conductor and is bonded to ground rods via exothermic welding, Listed pressure connectors, Listed clamps or other approved Listed means.

Basis of Payment. This work will not be paid for directly but shall be considered as included in the various items of work associated with ITS and shall be included in the unit prices for these items.

(EK – 08/19/2003)

CONCRETE FOUNDATION, TYPE 1

Description. Concrete foundations shall be constructed to support ITS equipment cabinets (Type 1 foundations) at locations as indicated on the Plans. This work shall include installing any necessary hardware (entering conduits, bolts, anchor rods, grounding, etc.) as shown on the Plans. This work shall also include any topsoil, fertilizing, seeding, and mulching of the distributed areas in accordance with Sections 211, 250, and 251 of the Standard Specifications.

Materials. Type 1 concrete foundations shall be according to materials defined in Article 836.02 of Section 836 of the Standard Specifications. All anchor bolts shall be in accordance with Section 1006.09 of the Standard Specifications except that all anchor bolts shall be hot dipped galvanized the full length of the anchor bolt including the hooks. Anchor bolts shall provide bolt spacing as shown in the Plans and as required by the cabinet manufacturer.

The Type 1 concrete foundations shall also be fabricated in accordance with Section 1070 of the Standard Specifications. These concrete foundations shall be fabricated from material new and unused in any previous application. The manufacturer shall provide a Certificate of Compliance that the materials are new and meet the specified requirements in accordance with the Standard Specifications and as shown on the Plans.

CONSTRUCTION REQUIREMENTS

The Engineer will determine the final placement of the Type 1 concrete foundations. Type 1 concrete foundation dimensions shall be in accordance with those dimensions shown in the Plans on the detail sheet "Concrete Foundation, Type 1 (Model 334 Cabinet) Detail". The foundation shall be located as required in order to avoid existing and relocated utilities. The top of the foundation shall be finished level. Shimming of the appurtenance to be attached will not be permitted.

Prior to pouring the foundation, the Contractor shall check the Plans for the specific number, size, and direction of conduit entrances required at the given location. All conduits in the foundation shall be installed rigidly in place before concrete is deposited in the form. Bushings shall be provided at the ends of the conduit. Anchor rods and ground rod shall be set in place before the concrete is deposited by means of a template constructed to space the anchor rods according to the pattern of the bolt holes in the base of the appurtenance to be attached. The appurtenance shall not be erected on the foundation until the bases have cured for at least (7) days. The Concrete shall cure according to Article 1020.13 of the Standard Specifications.

Method of Measurement. Concrete foundations shall be measured for payment in feet of the concrete foundation in-place installed in accordance with the total length of concrete foundation

required for Type 1 foundations as indicated on the Plans and as directed by the Engineer. Extra foundation depth, beyond the directive of the Engineer, will not be measured for payment.

Basis of Payment. Payment will be paid for at the Contract unit price per feet (meter) of CONCRETE FOUNDATION, TYPE 1, of the diameter and length indicated. The price shall include payment in full for all necessary excavation, backfilling, disposal of unsuitable material,

form work, furnishing, installing, and testing all materials (entering conduits, bolts, anchor rods, grounding, etc.) within the limits of the foundation. Any topsoil, fertilizing, seeding, and mulching of the distributed areas as well as all associated labor is to be included in this Contract unit price.

(EK – 03/19/2004)

ROD AND CLEAN EXISTING CONDUIT

Description. This work shall consist of cleaning existing conduit embedded in concrete and clearing any obstructions in the conduit before pulling cable through existing conduit.

CONSTRUCTION REQUIREMENTS

All existing conduits embedded in concrete shall be cleared of loose material, thoroughly cleaned of any accumulation of silt, debris, or foreign matter of any kind, and tested to detect obstructions, and alignment and deformation problems before pulling cable.

Before installing any cable, the Contractor shall rod the conduits to determine if conduits are free of foreign obstructions. Rodding consists of pulling a test mandrel through the conduit section to remove any obstructions. The diameter of the test mandrel should be slightly larger than the outer diameter of the cable or the pulling eye, whichever is larger.

Conduits suspected or found to contain particles of earth, sand, gravel, etc. should be cleaned by pulling a stiff bristled wire brush through the conduit.

The cleaning and testing operations shall be conducted for each conduit section between adjacent pull boxes, a section at a time for the entire route. Where obstructions are indicated, the Contractor shall remove the obstructions and retest that section of conduit. The Contractor shall remove and replace conduit that has alignment or deformation defects. Removal and replacement of conduit shall be paid for under a separate Pay Item. Cleaning and testing of existing conduit embedded in concrete shall be performed by the Contractor and witnessed by the Engineer.

Method of Measurement. This item shall be measured for payment in feet in place. Measurements will be made in straight lines along the centerline of the conduit between ends and changes in direction. Vertical conduit will be measured for payment. The vertical distance required for breakaway devices, barrier wall, concrete pedestals, etc., and the depth of any burial will be measured.

Basis Of Payment. This work will be paid for at the Contract unit price per foot for ROD AND CLEAN EXISTING CONDUIT of the type and size specified.

(EK – 03/19/2004)

COMMUNICATIONS VAULT

Description. Work under this item shall consist of constructing a communications vault (specified as a 'Type C1' handhole in the plans) including a vault lid, in accordance with the details shown on the Plans and as provided herein.

Materials. The communications vault and vault lid shall be constructed of polymer concrete material, and shall be gray in color.

The communications vault shall be 30 inches x 48 inches and shall have an effective height of 57 inches, including one 24-inch tall stackable vault and one 36 inch stackable vault with 3 inch overlap.

The communications vault lid shall withstand AASHTO H 20 loading and shall have a permanently recessed logo that reads "IDOT COMMUNICATIONS". The communications vault lid shall have two ½-in x 4-in pull slots. The lid surface shall have a coefficient of friction of 0.50 in accordance with ASTM C-1028.

The Contractor shall install manufacturer-approved gasketing between the lid and the top 24-inch deep stackable vault to prevent water from entering the communications vault.

The communications vault lid shall be secured to the vault with two 3/8-inch NC stainless steel penta-head bolts and washers to lock the lid. In addition, a "lock tool" shall be provided for communications vault entry.

A fiber optic cable support assembly shall be recommended by the manufacturer and approved by the Engineer for fiber optic cable and splice enclosures used in the vault. Each support assembly shall consist of multiple brackets, racks, and/or rails required to suspend the required surplus cabling and any splice enclosures required.

The support assembly shall be made from or coated with weather resistant material such that there is no corrosion of the supports. The support assemblies shall be anchored to the vault using stainless steel hardware.

The fiber optic cable support assemblies shall be included in the Contract unit price for the communications vault.

Void areas between openings and conduit shall be filled with self-curing caulking consisting of a permanent, flexible rubber which is unaffected by sunlight, water, oils, mild acids or alkalis. The caulking shall be mildew resistant and non-flammable. The material shall provide a permanent bond between the conduit entering the vault and the polymer concrete. The caulking shall be gray in color.

CONSTRUCTION REQUIREMENTS

Communications Vault shall be installed in accordance with applicable requirements of Section 800 of the Standard Specifications and as provided herein.

A manufacturer-approved knockout punch driver shall be used to provide openings in the vaults for conduit, or the required openings may be machined at the time of stackable vault fabrication. Voids between entering conduits and punch driven or machined openings shall not exceed ½-inch.

Any void areas shall be caulked from the interior and exterior of the communications vault. The caulk shall be allowed to fully cure per the manufacturer's specifications, prior to backfilling.

The communications vault shall be placed on 12 inches of coarse aggregate, CA-5 Class A, as specified in Section 1004 of the Standard Specifications. Seal and flash test the vault per the manufacturer's recommendations.

A minimum of 50 feet of excess cable shall be coiled in each communications vault containing splices to allow moving the splice enclosure to the splicing vehicle.

Unit Duct Entry. A 4" coilable nonmetallic conduit (CNC) stub shall be provided at handholes that receive communications duct bundles as shown on the Plans. The CNC shall be according to Article 1088.01 (c) of the Standard specifications.

Basis of Payment. COMMUNICATIONS VAULT will be paid for at the Contract unit price each. This price shall be payment for furnishing and installing all materials, for all excavation, backfilling, and for disposal of surplus material.
(EK – 10/16/2004)

HEAVY DUTY HANDHOLE

Effective Date: June 1, 1994

Revised Date: November 10, 2003

Description. This item shall consist of furnishing the materials and constructing a heavy-duty handhole, or a heavy-duty handhole special, cast in place, complete with frame and cover. The handhole shall be constructed in accordance with the following requirements and conforming in all respects to the lines, grades, and dimensions shown on the Plans or as directed by the Engineer.

Materials. All materials shall conform to the requirements of Article 1088.10 of the Standard Specifications. All handholes shall be constructed of Class SI concrete meeting the requirements of the Standard Specifications for Road and Bridge Construction Section 1020. Ground rod materials shall conform to the requirements of Article 806.02 of the Standard Specifications.

CONSTRUCTION REQUIREMENTS

Handholes of the type specified shall be constructed in accordance with the details shown on the Plans and conform to the following requirements:

1. Concrete: Concrete construction shall be done in accordance with the provisions of Concrete for Structures and Incidental Construction contained in the Standard Specifications for Road and Bridge Construction Section 503.
2. Placing Castings: Castings shall be set accurately to the finished elevation so that no subsequent adjustment will be necessary. Castings shall be set flush with a sidewalk or pavement surfaces. When installed in an earth shoulder away from the pavement edge, the top surface of the casting shall be 1 in above the finished surface of the ground.
3. Backfilling: Any backfilling necessary under a pavement, paved shoulder, and sidewalk or within 2 ft of the pavement edge shall be made with sand or stone screenings.

4. **Forming:** Forms will be required for the inside face of the handhole wall, and across all trenches leading into the handholes excavation. The ends of conduits leading into the handhole shall fit into a conduit bell, which shall fit tightly against the inside form and the concrete shall be carefully placed around it so as to prevent leakage.
5. **French Drain:** A french drain conforming to the dimensions as shown on the Plans shall be constructed in the bottom of the handhole excavation.
6. **Steel Hooks:** Each handhole shall be provided with four galvanized steel hooks of appropriate size, one on each wall of the handhole.
7. **Frame and Cover:** The outside of the cover shall contain a recessed ring Type "G" for lifting and a legend "IDOT TSC" cast-in.
8. **Grounding:** A 5/8" x 10' ground rod shall be installed in each handhole. All grounding conductors shall be attached to this rod using a mechanical clamp. The handhole cover shall also be attached to this ground rod.
9. **Cleaning:** The handhole shall be thoroughly cleaned of any accumulation of silt, debris, or foreign matter of any kind, and shall be free from such accumulations at the time of final inspection.
10. **Unit Duct Entry:** A 4" coillable nonmetallic conduit (CNC) stub shall be provided at handholes that receive communications duct bundles as shown on the Plans. The CNC shall be according to Article 1088.01 (c) of the Standard specifications.

Basis of Payment. This work will be measured and paid for at the Contract unit price each for HANDHOLE; HEAVY DUTY HANDHOLE; or CONCRETE HEAVY DUTY HANDHOLE (SPECIAL) of the size specified, which price shall be payment in full for all necessary excavating, backfilling, disposal of surplus material and form work, frame and cover, and furnishing all materials.

CABINET MODEL 334

Description. Work under this item shall consist of furnishing and installing a Model 334 cabinet for field equipment including fiber optic communications, ramp meter and system detector stations, and dynamic message signs as shown on the Plans and as hereinafter provided.

Materials.

General. Cabinet, Model 334 shall be a durable, weatherproof enclosure, constructed of 3/16-inch thick aluminum or 1/8-inch thick aluminum lined with bullet resistant fiberglass panels that shall be UL Listed and tested for UL752 Level 3 with a nominal thickness of 1/2-inch maximum, and a nominal weight of 5.0 pounds per square foot maximum. The cabinet shall have nominal outside dimensions of 66 inches high X 24 inches wide X 30 inches deep. Cabinet, Model 334 shall consist of the following components: double door each equipped with a lock for front and rear cabinet entry, housing, mounting cage, power distribution assembly, service panel, thermostatically controlled fan, and all necessary mounting hardware and wiring, and other equipment, as shown on the Plans and specified in these special provisions.

All bolts, nuts, washers, screws, hinges, and hinge pins that are subject to corrosion shall be stainless steel unless otherwise specified. All equipment under this item shall be in accordance with Section 1074.03 of the Standard Specifications except as modified herein.

Cabinet Components. The housing and the mounting cage assembly shall conform to those of the Model 334 cabinet provisions of the "Traffic Signal Control Equipment Specifications" (TSCES) issued by the State of California, Department of Transportation, and to all addenda thereto current at the time of project advertising. The housing shall be rainproof with the top of the enclosure crowned to prevent standing water. All exterior seams for the enclosure and doors shall be continuously welded and shall be smooth. The housing shall have no provisions for a police panel or door.

The cabinet shall have single front and rear doors, each equipped with a lock. The enclosure door frames shall be double flanged out on all 4 sides and shall have strikers to hold tension on and form a firm seal between the door gasketing and the frame. The front and rear doors shall be provided with catches to hold the door open at both 90 and 180 +/- 10 degrees. Gasketing shall be provided on all door openings and shall be dust-tight. For horizontal support and bolt attachment, cage bottom support mounting angles shall be provided on either side, level with the bottom edge of the door.

The latching handles on the doors shall have provisions for padlocking in the closed position. When the door is closed and latched, the door shall be locked. The locks and handles shall be on the right side of the front door and the left side of the rear door. The lock and lock support shall be rigidly mounted to the door. The locks shall be Corbin #2 and two keys shall be supplied to the Department with each lock. The keys shall be removable in the locked position only.

The front and rear doors shall be provided with louvered vents. A removable and reusable air filter shall be housed behind the door vents. The filter filtration area shall cover the vent opening area, and the filter shell shall be provided that fits over the filter providing mechanical support for the filter. The shell shall be louvered to direct the incoming air downward.

The intake (including filter with shell) and exhaust areas shall pass a minimum of 60 cubic feet of air per minute for housing #1 and 26 cubic feet of air per minute for housing #2. The thermostatically controlled fan with ball or roller bearings shall be mounted within the housing and vented. The fan shall provide a capacity of at least 150 cubic feet of free air delivery per minute of ventilation. The fan shall be thermostatically controlled and activated when the temperature inside the cabinet exceeds 75 degrees Fahrenheit and shut off when the temperature is less than 64 degrees Fahrenheit. In addition, the fan shall be manually adjustable for automatic turn on and off. The fan circuit shall be protected at 125% of the fan motor ampacity.

The housing shall also be equipped with a heating element installed in the bottom front of the cabinet and mounted along the side of the rack. The heating element shall draw 500 watts and have an output of at least 1700 BTU/hr. The heater shall have a built-in quick response thermostat with sealed contacts that has a temperature control range of 40°F to 100°F, and have a built-in thermal cut-off to automatically shut-off the heater in the event of overheating.

All subassemblies shall be mounted in removable 19 inch EIA self-standing rack assemblies. The EIA rack portion of the cage shall consist of 2 pairs of continuous, adjustable equipment mounting angles that comply with Standard EIA RS-310-B. The cage shall be centered within the cabinet and bolted to the cabinet at 4 points.

The DMS controller cabinet shall be equipped with 2 shelves. One shelf shall be fixed and the other shall be a slideout shelf suitable for resting a laptop computer on.

The UPS cabinet shall be equipped with 4 shelves. One shelf shall be a slideout shelf suitable for resting a laptop computer on and the other three shall be fixed. The fixed shelves shall be suitable for supporting the batteries.

All other cabinets shall be equipped with 2 shelves. Shelves shall be the full width of the rack and 12 inches deep. The shelves shall be designed to support a minimum of 50 pounds.

The power distribution assemblies for the DMS controller and UPS cabinets shall have as a minimum: one 50 A, 2-pole, 240 V main circuit breaker; five 15 A, 1-pole, 120 V secondary circuit breakers; eight standard 117 VAC controller and equipment receptacles; and one duplex, 3 prong, NEMA GFI type 5-15R grounded outlet.

The power distribution assemblies for all other cabinets shall be as shown on Plans and shall consist of input files that are common to both 332 and 336 type cabinets and provides 9 AC outputs and up to 28 isolated inputs. The power distribution assembly shall consist of the following: one 30 A, 120 V main circuit breaker; three 15 A, 120 V single pole secondary circuit breakers; eight standard 117 VAC controller and equipment receptacles; and one duplex, 3 prong, NEMA GFI Type 5-15R grounded utility type outlet.

Rating of breakers shall be shown on face of breaker or handle. Breaker function shall also be labeled below breakers on front panel. The first equipment receptacle in the circuit shall have ground-fault circuit interruption as defined in the NEC. Circuit interruption shall occur on 6 mA of ground-fault current. All conductors from the power distribution assembly routed to the cabinet wiring shall be connected to the terminal block on the common side, except for the AC power conductor between the service terminal block and main circuit breaker. All internal conductors terminating at the blocks shall be connected to the other side of the blocks.

Two side panels shall be provided and mounted on the cabinet sidewalls. In viewing from the front door, the left side panel shall be designated as the "Input/Communications" and the right side panel shall be designated as the "Service Panel". The panel shall be drilled and tapped, as necessary, to mount the terminal blocks and other attachments described herein, as well as to mount the panel to the cabinet wall.

The terminal blocks shall be barrier type rated at 20 A, 600 V RMS minimum. The terminal screws shall be nickel-plated brass binder head type with screw inserts of same material. The terminals of the power line service terminal block shall be labeled "AC+", "AC-", and "AC GND", and shall be covered with a clear insulating material to prevent inadvertent contact. Terminating lugs large enough to accommodate No. 4/0 conductors shall be furnished for the service terminal block. The service terminal block shall be rated for 100 A at 600 V peak, minimum.

Surge suppression for DMS controller and UPS cabinets shall be provided by a two stage system using metal oxide varistors (MOV) and spark gap arrestors. The clamping voltage of the system shall be 280 V on 240 V lines for the first stage and 320 V on 240 V lines for the second stage.

The power distribution assembly for all other cabinets shall protect the equipment powered by the assembly from power transients. Over voltage protection shall be provided for the power distribution assembly and shall contain, as a minimum, a surge arrester, which shall reduce the effect of power line voltage transients and be mounted to the service panel. The arrester shall have the following minimum features:

Recurrent Peak Voltage:	184 V
Energy Rating (Minimum):	50 J
Power Dissipation, Average:	0.85 W
Peak Current for pulses less than 7 microseconds:	1250 A
Stand-by Current for 60 Hz Sinusoidal:	1 mA or less

Each cabinet shall be equipped with two fluorescent lighting fixtures mounted to the inside top front portion of the cabinet. The fixtures shall have an F-15-T-8 cool white lamp; operated from a normal power factor, UL listed cold weather ballast. A door-activated switch shall be installed to turn the cabinet lights on when the front door or rear door is opened. The door switches shall be on a separate circuit by themselves and used only to turn on the cabinet lights.

Each cabinet shall be supplied with a heavy-duty plastic envelope to store plans, wiring diagrams, schematics, etc. This envelope shall have metal grommets so that it hangs from the door hooks. The envelope shall have minimum dimensions of 10 inches x 15 inches.

Foundations shall conform to those shown on Detail sheet "Cabinet Model 334 Details" of the Plans. The foundation is paid for separately.

Identification. The Cabinet, Model 334 shall be identified and labeled with external markings as specified in Article 1069.02 of the Standard Specifications and as shown on the Plans.

CONSTRUCTION REQUIREMENTS

The Contractor shall deliver the Cabinet Model 334 mounted on a ply board-shipping pallet that is bolted to the cabinet base. The cabinet shall be enclosed in a slipcover cardboard packaging shell. The housing doors shall be blocked to prevent movement during transportation to the site.

The Contractor shall securely fasten the Cabinet Model 334 on the new concrete foundation at the locations shown on the Plans. The Contractor shall confirm the orientation of the Cabinet Model 334 installation and its front door side with the Engineer prior to installation. Stainless steel bolted connections shall be provided with lock-washers, locking nuts, or other approved means to prevent the connection nuts from backing off. Dissimilar materials shall be isolated from one another by stainless steel fittings.

The Contractor shall make all power connections to the cabinet in accordance with the Plans and as required. The neutral bus shall be isolated from the cabinet and equipment ground. It shall terminate at the neutral lug ultimately attached to the meter pedestal. All conductors used

in cabinet wiring shall terminate with properly sized non-insulated (if used, for DC logic only) or clear insulated spring-spade type terminals except when soldered to a through-panel solder lug on the rear side of the terminal block or as specified otherwise. All conductors, except those, which can be readily traced, shall be labeled. Labels attached to each end of the conductor shall identify the destination of the other end of the conductor. Cabling shall be routed to prevent conductors from being in contact with metal edges. Cabling shall be arranged so that any removable assembly may be removed without disturbing conductors not associated with that assembly.

All equipment in the cabinet, when required, shall be clearly and permanently labeled using marker strips. The marker strips shall be made of material that can be easily and legibly written on using a pencil or ballpoint pen. Marker strips shall be located immediately below the item that they are to identify and must be clearly visible with the items installed.

DMS controller and UPS cabinets shall meet the requirements of these specifications and of the DMS manufacturer. The requirements listed in this specification are minimum construction guidelines and shall be adjusted as required to meet the selected sign manufacturer requirements. No additional compensation shall be provided to meet these requirements. These cabinets shall only be ordered after the DMS manufacturer has been selected and has approved the cabinet shop drawings.

Tests. Cabinet Acceptance Test - In addition to the environmental and design approval tests specified in the FHWA Type 170 Traffic Signal Control System Hardware Specification, the following water spray test shall be performed for each type of cabinet:

Spray water from a point directly overhead at an angle of 60 degrees from the vertical axis of the cabinet. Repeat for each of eight equally spaced positions around the cabinet for a period of five minutes in each position. The water shall be sprayed using a domestic type-sprinkling nozzle at a rate of not less than 10 gal/min per minute per square foot of surface area. The cabinet shall then be inspected for leakage. Evidence of water leakage shall be cause for rejection.

Operational Standalone Test - The operational standalone test for each Cabinet, Model 334 installed shall consist of the following:

Visual inspection of the cabinet and its contents for workmanship
Verification of the cabinet grounding in accordance with Article 1074.03(a)(4) of the Standard Specifications
Measurement of the voltage at the input panel

Documentation. Shop drawings and wiring lists showing the proposed layout of each type of cabinet shall be submitted to the Engineer for approval prior to the start of fabrication. Wiring lists for the internal manufacturer cut sheets for all electrical equipment included in each type of cabinet shall be included in the submission.

Four copies of drawings showing the wiring for each cabinet shall be provided. One copy shall be placed in the clear plastic envelope furnished as part of the cabinet. The other three copies shall be delivered to the Engineer.

For each cabinet, four copies of a configuration of the equipment reporting to that cabinet shall be provided. The sheet shall also list field settable options for the equipment contained in the cabinet. This shall include device addresses and output voltage settings for power supplies. One of these copies shall be placed in the clear plastic envelope furnished as part of the cabinet. The other three copies shall be delivered to the Engineer.

Warranty. The Contractor shall warranty all materials and workmanship including labor for a period of two years after the completion and acceptance of the installation, unless other warranty requirements prevail. The warranty period shall begin when the Contractor completes all construction obligations related to this item and when the components for this item have been accepted, which shall be documented as the final completion date in the construction status report. The warranty shall warrant and guarantee repair of the component parts of the Cabinet Model 334 furnished by the Contractor that prove to be defective in workmanship and materials during the first two years of operation as defined and noted above at no additional cost to the Department.

The Engineer will notify the Contractor that a warranted item needs repair. The Contractor shall acknowledge the notification within 24 hours and replace or correct any part or parts of materials and equipment that are found defective within the two-year in-service warranty period. All items needing repair shall be returned to the Department in two weeks from the date of receipt at the Contractor's facility or replaced in-kind by the Contractor, and the Contractor shall be responsible for any return shipping costs. No compensation will be made to the Contractor for such replacements or corrections.

The Contractor shall provide a warranty certificate for this item and its related components to the Department. The Department reserves the right to transfer this service to other parties who may be Contracted with in order to provide overall maintenance of this item.

Basis of Payment. CABINET, MODEL 334; CABINET, MODEL 334, DYNAMIC MESSAGE SIGN; and CABINET, MODEL 334, UNINTERRUPTIBLE POWER SYSTEM measured as provided above, will be paid for at the Contract unit price each, which price shall be payment in full for furnishing and installing the cabinet and all connections; testing, and for all labor, tools, equipment, transportation, and incidentals necessary to complete this item of work.

(EK – 03/19/2004, Revised: CTE – 10/19/2004)

CCTV Distribution System

January 21, 2005

Description.

General. The CCTV (Closed Circuit Television) Distribution System shall be a fully integrated IP multicast system, comprised of hardware and software, providing multi-point internet protocol based video images and control over Ethernet to multiple monitoring center locations while minimizing bandwidth demand upon the system. The system shall be configured to avoid a single point of failure that could totally shut down the system. The system shall include video selection and control features as well as video management and archiving as specified.

The system shall be generally configured as indicated on the plans to collect video images and connect control from field mounted cameras at distribution node locations and to produce video images and controls at designated distribution nodes and at three monitoring locations under this contract work.

The work under this Special Provision shall include system integration and complete, coordinated submittals as specified. The work shall also include a structured shop-floor test of the assembled and interconnected nodal sub-systems witnessed by the Engineer as specified, staged installation and activation, complete record documentation, system maintenance during construction, system maintenance training, and extended maintenance and support, all as specified.

The three monitoring locations to be addressed by this contract under this item are:

The ComCenter at the District 1 Headquarters in Schaumburg
The Traffic Systems Center in Oak Park
The Emergency Traffic Patrol Headquarters in Chicago.

These monitoring locations and the distribution node locations are depicted on the plans and are as defined by the sub-system pay items under this Special Provision. The system shall have capability for additional locations under future work without the need to replace existing system equipment items.

Equipment shall be installed at locations as indicated on the plans, including existing buildings, existing and proposed distribution node equipment huts and at temporary locations as may be indicated.

The system shall utilize existing CCTV elements to the extent indicated but shall otherwise include all materials and equipment necessary to provide a complete operating system. Cameras that are provided under this contract are specified as separate pay items and the connection of these cameras to respective distribution system nodes is covered under separate pay item work. The work under this Special Provision includes the coordination with camera equipment provided under this contract and coordination with existing CCTV equipment as indicated, including adjustments of or supplements to the remote equipment as may be required, but in general, the CCTV Distribution System work shall encompass physical interface to electrical power, fiber optic cable and existing devices as indicated within the various distribution system nodes (equipment huts) and at the monitoring locations.

The system shall operate to allow monitoring location workstations to select and accept video image and control information on fiber from remote field devices and to route display within the monitoring location. When display or control is initiated from a monitoring center, the system shall select and route the image and control information producing the directed image on the selected monitor and connecting control to the selected camera. The system shall provide for display of the same selected image simultaneously at multiple monitoring center locations and on multiple monitors at the same monitoring center location without adding to the system bandwidth demand. Control features shall be as specified in detail elsewhere herein.

The integration of this system with existing CCTV distribution will allow the re-use of designated CCTV elements, but certain existing CCTV distribution elements will no longer be used within this system. Unless otherwise indicated, all existing CCTV equipment and systems that are removed from service shall remain property of the Department and shall be appropriately removed and delivered in working order in safe storage packing to the Engineer at a designated location within District 1.

Communications. The system's communications shall utilize and build upon the existing IDOT District I SONET infrastructure that uses both fiber and microwave radio links. Equipment shall be sized for OC-48 fiber capacity and OC-12 equivalent microwave capacity, even when initially provisioned for less.

The system shall employ MPEG-2 video compression at 6 Megabits per second.

Video Control. The system shall include a Video Control Subsystem as described herein for camera and display selection as well as control of camera pan, tilt and zoom. Where indicated, joystick control for pan, tilt and zoom functions shall also be provided. The system shall provide a programmable hierarchy of video selection and control, with system manager provisions, with protected security, at the District 1 ComCenter.

JPEG Interface. The system shall provide a regular continuous polling sample of all cameras connected to the system, with JPEG images that are extracted to files accessible to the IDOT ITS Office Gateway for display on the Gateway Web page. The JPEG Video Capture encoders shall be programmed to transfer a JPEG file to an IDOT FTP site. The Contractor shall program the file name and the IP address of the FTP site. This equipment set up shall include all necessary elements to provide file capture and transfer at regularly scheduled intervals. The length of these intervals will be identified by the Engineer.

Coordination with other Pay Items. The system shall be provided as a complete, integrated whole, grouped into installed location packages that are unique for each indicated location. Certain locations (such as I80 at the State Line) shall be provided with communications hut facilities under separate pay items, as indicated, in this contract. Other locations, (such as the Hillside Hub), have existing huts or buildings and the CCTV Distribution System items shall be installed within these existing facilities.

All wiring, cabling and other provisions necessary to connect and integrate components within each location package shall be included with the respective system package. The system, in addition to being coordinated with camera items specified elsewhere herein, shall be completely coordinated with associated pay items for System Integration and Shop Staging Tests, System Documentation and Training, Installed Testing and Commissioning, as well as Maintenance of Existing CCTV.

Coordination with Other Contracts. The final system installation will be dependent upon the completion of work done in other contracts, particularly as it applies to the completion of raceways and the installation of interconnecting fiber between system nodal locations. The installation of the system shall be fully coordinated with other contracts.

Certain nodal equipment included in this system is intended for ultimate installation in facilities that are provided or made accessible under a future separate contract. When indicated on the plans, the installation of this equipment may be directed by the Engineer to be at adjacent nodal

locations, for future relocation under another contract. When such temporary interim placement is selected, fiber connection to the adjacent nodal equipment shall be made via a temporary connection and system configuration shall accommodate the interim absence of fiber optic communications continuity. Alternately, if the timing of other construction contracts permits, the Engineer reserves the option to designate installation at the planned locations, with the work appropriately coordinated with the other contract work.

Interconnecting Wiring. All wiring, cabling, and other provisions necessary to connect the installed system package to power panel boards, fiber optic patch panels, grounding systems, etc. at each nodal location shall also be included as part of each respective location package.

Maintenance of Existing CCTV System. Maintenance of the existing CCTV System shall be transferred from the ASMC (Advanced Systems Maintenance Contract). to the contractor from the time that access to the existing system is needed for field installation of the system expansion until final acceptance of the expanded system.

The existing system shall remain in essentially continuous operation throughout the expansion construction, with limited downtime as approved in advance, in writing, by the Engineer. The existing system is used, among other things, for the operation of the gate system on the Kennedy Expressway reversible lanes (REVLAC), and this system shall remain operational on a daily basis. The REVLAC system incorporates certain features that allow operation of devices from the various remote control buildings of the system. Should the contractor require extended (more than 8-hour downtime of the SONET system, with Engineer approval, the contractor shall be responsible for the costs to have the REVLAC system operated from the remote buildings by the ASMC contractor, on a time and material basis.

Submittals. The Contractor shall assemble and submit a complete and detailed description of the system including the proposed equipment, system interconnects, and software. Recognizing the complex detail of this system, the submittal timeframe for this submittal is extended beyond the 30 days from contract execution required for other contract items. The complete package for the CCTV Distribution System shall be submitted no later than 60 days after contract execution, although certain information shall be required at the preconstruction meeting.

At the preconstruction meeting, the contractor shall identify the following:

- CCTV System Integrator and Subcontractors
- CCTV Control and Video Management software vendor
- Video Encoder and Decoder manufacturer
- Communications Subsystem Integrator and Proposed Equipment

The system submittal package shall be complete and shall document compliance with all specified system requirements. It shall include product data of all manufactured components, interconnecting cabling, accessories and appurtenances. It shall include dimensioned shop drawings of any fabricated equipment and sub-assemblies (such as equipment rack layouts). The submittal shall include overall system diagrams and detailed interconnection diagrams for all parts of the system. The submittal package shall identify the details of non-equipment requirements of the system, such as specified maintenance training, and it shall include letters of commitment relative to specified extended maintenance support of key vendor items as specified. As a minimum, the submittal package shall include, but not be limited to:

System installation schedule
SONET/GigE System hardware, complete
Fiber Optic Transceivers & other fiber optic hardware
Video Encoders & Decoders
Video Monitors
Video Workstation equipment and software
Video Administration and Central Control Hardware and software
Communications Sub-System Management equipment and software
Video Archiving equipment and software
Power Supplies and associated appurtenances
Equipment racks associated appurtenances
All interconnecting power, signal and control cable, connectors and appurtenances
All mounting accessories and hardware
Overall System Diagram
Sub-System Location Diagrams
Point-to-Point Interconnection Diagrams
Dimensioned Rack Layout Drawings
All installation and maintenance manuals or a schedule to provide them
Shop Floor Testing Plan, location and interconnection details
Video and Communications Maintenance Training Plans
Documentation of Extended Warranty provisions, as specified
Plan for providing specified documentation
Cable Tray
Schedule for submitting Test Plans

Materials.

SONET System Equipment.

Existing Configuration

The basic communications infrastructure shall build upon the existing SONET network and shall utilize SONET switches matching the existing Cisco 15454 SONET equipment, currently maintained under the district Advanced Systems Maintenance Contract (ASMC) having SONET maintenance performed by SBC. Switches shall be furnished and installed, configured and tested by a manufacturer-certified agent. The Contractor may request and inspection of the existing equipment prior to the Letting date.

Proposed Configuration

The system's communications shall use and build upon the existing IDOT District 1 SONET infrastructure, using both fiber and microwave radio links. Equipment shall be sized for OC-48 fiber capacity and OC-12 microwave capacity, even when initially provisioned for less.

The video transport shall use a combination of SONET and Ethernet. Five additional SONET node locations shall be provided; these are in addition to the existing Hillside Hub and Schaumburg HQ sites.

A new SONET ring shall include nodes at the Hillside hub, at I-55, at I-57/I-294, and the Traffic Systems Center. A SONET spur shall be included to I-80 at the State Line. At this time the I-80 site will not have an alternate path north towards I-55, this capability is being considered in a future phase and shall be taken into account in the equipment selection.

In order to be compatible with the existing system, the SONET nodes shall utilize the Cisco ONS 15454 Multi-Service Platform to transport both the Ethernet traffic for the new video application as well as TDM traffic in the form of DS1 circuit connectivity. The DS 1 circuits shall be further broken down using existing TDM channel bank equipment at several of the nodes sites to provide for RS-232, T1, and analog voice circuit connections.

In addition to the SONET nodes, several other locations shall be established that will use Ethernet fiber links for connectivity. These include video viewing locations at Traffic systems Center (TSC) and Emergency Traffic Patrol (ETP), as well as the Bishop Ford Freeway (BFF)/ I-57 video aggregation location. These locations will use Gigabit Ethernet switches for transport, video aggregation and multicast routing capability. The viewing locations do not aggregate video traffic, rather serve as the egress or drop off point for the multicast video traffic. Viewing equipment at these sites (TSC and ETP) provide the monitoring capability for the video application.

At the SONET locations, two (2) Gigabit Ethernet switches shall provide video aggregation and multicast routing capability. The switches at these sites also serve to connect the TSC, ETP viewing sites, and the BFF connection point via Ethernet over fiber.

Transportation of the Ethernet traffic from SONET-to-SONET site is accomplished by connecting a Gigabit port from the Gigabit Ethernet switch to one port of a 4-port gigabit card on the Cisco 15454. A point-to-point, STS-12c circuit will be mapped from between each SONET node to provide a self-healing circuit path for Ethernet connections between the Gigabit Ethernet switches.

The SONET nodes in this design will not perform an Ethernet switching function. Unlike the switching capability provided by the ML series cards in the existing configuration. The G1K-4 gigabit card shall provide transparent point-to-point connections between the Gigabit Ethernet switches.

High availability, and redundant paths, shall be provided for the video application by a Layer 3 IP routing architecture, shall be implemented at redundant switching/routing nodes, and by the availability of multiple paths to reach the network route/switch nodes. For those circuits that have paths across the SONET infrastructure, the SONET switching shall provide 50ms failover times in the event of a fiber cable cut.

The SONET ONS shall be a NEBS-compliant shelf assembly that contains 17 card (module) slots, a backplane interface, a fan-tray assembly, a front panel with an LCD, and alarm indicators. The SONET ONS shall be capable of carrying traditional time-division multiplexing (TDM) and high-speed data traffic, a variety of card configurations offer incremental bandwidth increases as needed and support DS-1, OC-3, OC-12, OC-48, and 10/100 Ethernet and Gigabit Ethernet speeds.

Workstations shall be able to connect to the SONET ONS using direct, network (LAN and WAN), or DCC connections. The SONET ONS shall support TL1 and the Cisco Transport Controller (CTC), the SONET ONS CTC software interface shall provide card, node, and network-level provisioning and troubleshooting. The SONET ONS shall deploy a variety of network configurations, including point-to-point systems or linear add-drop multiplexers (ADMs), unidirectional path switched rings (UPSRs), two-fiber and four-fiber bidirectional line switched rings (BLSRs), subtending rings, and path-protected mesh networks (PPMNs).

The SONET ONS shall have 17 card slots numbered 1 to 17. All slots shall be card-ready, meaning that when you plug in a card it shall automatically boot up and become ready for service. The cards shall offer bandwidth in modular increments. The SONET ONS shall accept five types of cards: common control, alarm interface, electrical, optical, and Ethernet. The common control cards shall include the TCC+/TCC2 and the cross-connect cards (XC, XCVT, and XC10G). The alarm interface cards are the Alarm Interface Controller (AIC) and the Alarm Interface Controller-International (AIC-I).

The SONET ONS shall be provisioned as required by the CCTV Distribution System and as indicated in the plans.

The Contractor shall synchronize the SONET components using the existing District's Stratum 2 clock. Additional hardware, if required to use this clock, shall be furnished, at no additional cost to the District, as part of this item.

The minimum requirements for the SONET Add/Drop Multiplexers include:

Environment

Temperature Range: -5 to +45 °C

Humidity: 95% humidity (non-condensing)

Power 120 VAC ±10%; 650 watts (nominal); UL listed

(Contractor shall furnish and install additional Eltek Mini Power Systems and batteries to augment and maintain compatibility with the systems currently installed. The batteries shall sustain operation of the SONET and alarm equipment for a minimum of four (4) hours during a total power failure.)

EMC Certified to FCC part 15

Network Management SNMP

Network Interfaces

Physical: RJ-45

Electrical: 1000 Base x
100/10 BaseT

DS-1

STS-3

Optical: OC-48

Network Protocols: RFC 1619

Spanning Tree according to IEEE 802.1D

Priority Management according to IEEE 802.1p

Logical VLANs support according to IEEE 802.1q

Flow Control according to IEEE 802.3X

The Contractor shall provide the necessary ports to provide the capabilities identified on the plans and in the special provisions. These capabilities shall include optical interfaces for OC-48 transmission with protection (counter-rotating, self-healing ring), DS-1 interface with user selectable AMI or B3ZS, and 1000BaseTx or 1000BaseFx Ethernet Interfaces, compatible with the Gigabit Ethernet switches being supplied. The power supplies for the SONET ONS shall be included in this item and not paid for separately. If an existing installation requires an increased power supply capacity, it shall be included in this pay item and not paid for separately.

The Contractor shall provide complete and working equipment, fully equipped to satisfy the overall system requirements. Specific cards identified in this specification are based on interfaces to other system components. The Contractor shall supply any additional cards, though not specifically called out in this specification, to complete the required functionality of the system.

The following cards shall be supplied as indicated in the plans.

Gigabit Ethernet Cards (15454-E1000-2-G or approved equal)

Ports	2 GBIC Interface slots equipped with short range, multimode GBICs
Speed	1000 Mbps
Ethernet Switching Capacity	1.2 Gbps
VLAN Support (802.1Q)	512
MAC Address	8192 first in, first out
Priority (802.1P)	2-level, high/low
Transport Bandwidth	Up to 622 Mbps
Transport Granularity	STS-3c (155 Mbps) STS-12c(622 Mbps)
Power Consumption	60 W maximum
Operating Temperature	-5 to +45 °C

DS1 Cards (DS1-14 or approved equal)

DS1 cards shall supply 14 Telcordia compliant, GR-499 DS-1 ports. Each port operates at 1.544 Mbps over a 100-ohm, twisted-pair cable. The DS1 cards shall satisfy the following:

Input	
Bit rate:	1.544 Mbps \pm 32 ppm
Frame format:	Off, SF (D4), ESF (user selectable)
Line Code:	AMI, B8ZS
Termination:	Wire-wrap, AMP Champ
Input impedance	100 ohms
Maximum cable loss:	655 feet alvyn, 22 AWG (ABAM)
AIS:	TR-TSY-00191 compliant

Output

Bit rate:	1.544 Mbps ± 32 ppm
Frame format:	Off, SF (D4), ESF (user selectable)
Line Code:	AMI, B8ZS
Termination:	Wire-wrap, AMP Champ
Input impedance	100 ohms
Maximum cable loss:	655 feet alvyn, 22 AWG (ABAM)
AIS:	TR-TSY-00191 compliant
Power level:	12.5 to 17.9 dBm centered at 772 kHz -16.4 to -11.1 dBm centered at 1544 kHz
Pulse shape:	Telcordia GR-499-CORE Figure 9-5
Pulse amplitude	2.4 to 3.6 V peak-to-peak
Surge Protection	Telcordia GR-1089
Operating Temperature	-5 to +45 °C
Operating Humidity	5 to 95% non-condensing

Gigabit Ethernet Switches. Gigabit Ethernet Switches shall be provided that satisfy the following:

Environmental

Temperature:	0 to 40 °C (32 to 104 °F)
Humidity	10% to 90% (non-condensing)

Backplane

60 Gbps full duplex
4 Gbps uplinks

Port Density

48 minimum; expandable to 240 (96 at the ETP)

Physical Characteristics

Weight (maximum)	100 pounds
Dimensions (nominal)	17.4" x 17.3" x 12.5"; the equipment shall mount in a standard EIA 19-inch rack and occupy no more than 10 standard rack units.

Power

120VAC±10%; redundant power supplies
(The power supplies shall be removable while the equipment is operating with no degradation.)

Optical Interface

GBIC; single mode long haul and multimode short haul

Link Power Budget

17 dB at 1310 nm; 8.3 μm fiber core

Network Interface

Physical Connector	RJ-45
Network Rates	10/100/1000 MHz Ethernet
Port Density:	240

Regulatory Compliance

Safety	UL Listed; UL 60950
EMC	47 CFR (FCC) Part 15, Type A certification
Environmental	GR-63-Core Network Equipment Building Standards
Telecom	47 CFR (FCC) Part 68 compliance

Supported protocols

Ethernet	IEEE 802.3; 10BaseT
Fast Ethernet	IEEE 802.3u; 100BaseTX
Gigabit Ethernet	IEEE 802.3z; IEEE 802.3x; and IEEE 802.3 ab
1000Base-X (GBIC)	1000Base-SX;1000Base-LX/LH;and 1000Base-ZX
Virtual LAN trunking/tagging	IEEE 802.1Q; IEEE 802.3ad
Spanning Tree Protocol	IEEE 802.1D; IEEE 902.1w; and IEEE 802.1s
Security	IEEE 802.1x

The Gigabit Ethernet Switches shall be Cisco Model 4506 or interchangeable equal approved by the Engineer. Note: At the ETP, a smaller footprint is desired. Accordingly, a smaller version of the same Gigabit Ethernet switch shall be provided. For example: a Cisco Model 4503.

The Gigabit Ethernet Switches shall operate on the District's single-mode optical fibers, as detailed in this specification. The GBIC shall provide a minimal optical link budget of 17 dB. If in-line optical attenuators are required for short links, the cost of the attenuators shall be included in this item and not paid for separately.

The Contractor shall furnish adequate 100BaseT ports to satisfy the system requirements identified in the plans and special provisions. A standard manufacturer port count shall be utilized; a minimum of 24 unused ports or additional ports as indicated on the plans shall be provided, whichever is greater.

The Contractor shall furnish adequate licenses for each switch to use the RMON agent or the Border Gateway Protocol (BGP).

Fiber Optic Video Transceivers. Fiber Optic Transceivers shall be dedicated hardware devices all of the same Manufacturer and shall consist of two distinct types, the Fiber Optic Transceiver – Transmitter (FOVT) and the Fiber Optic Transceiver – Receiver (FOVR). The FOVR provided and installed under this item shall be the mate of the FOVT provided under the CLOSED CIRCUIT TELEVISION CABINET EQUIPMENT specification.

The fiber optic video transceiver - receiver shall receive optical simplex transmission of NTSC video from the CCTV cabinet and shall provide duplex optical communications of camera-control, asynchronous data. Optic video and data transmission shall use one single mode fiber operating in the 1310/1550 nm windows using simple wavelength division multiplexing.

Mechanical and environmental requirements include the following:

Nominal dimensions:	7 inches by 5 inches by 1.5 inches
Operating Temperature Range:	0°C to +70°C (minimum)
Storage Temperature Range:	0°C to +75°C (minimum)
Relative Humidity Range	0% to 95% (non-condensing)
MTBF	75,000 hours (minimum)

Optical requirements include:

Connector:	ST
Optical Power Budget	15 dB (minimum) using 9/125 μ m single mode fiber
Operational Wavelengths	WDM using 1310/1550 nm and a single fiber

Video requirements include:

Connector	BNC
Input signal	0.5–2.0 V pk-pk (1 V nominal)/75 ohms impedance
Bandwidth	5 Hz – 7.0 MHz (minimum)
Differential Gain	$\leq 5\%$
Differential Phase	$\leq 5^\circ$
Tilt	$\leq 1\%$
Signal-to-Noise Ratio	50 dB with 10 dB of link attenuation

The equipment shall operate from either 120 VAC or 12 VDC; maximum power requirements shall not exceed 12 watts.

Video Encoders and Decoders. Video encoders and decoders (codecs) shall be dedicated hardware devices, and except for differences between encoders and decoders they shall all of the same type from the same common manufacturer. The codecs may be either single or dual video type to transfer “full motion” 30 frame-per-second high quality color video via MPEG-2 video compression at 6 Megabits per second. The units shall operate to produce a robust data communications stream that shall allow for both video and audio transmission and shall be immune to timing disruptions in the IP multi-cast configuration specified herein.

The units shall be rack-mountable, complete with redundant power supplies as required for the rack configurations indicated on the plans, operating from a 120-volt single phase AC power input.

Encoder units shall accept NTSC video BNC inputs and Ethernet RJ-45 control/communications input connections.

Approvable codecs shall be compatible with and demonstrably interoperable with the standard codec product of at least one other vendor. Final approval of codec equipment shall be dependent upon a demonstration test of multi-vendor interoperability. Initial submittal information shall include documentation of this interoperability and a demonstration testing plan for approval by the Engineer.

The decoders shall be rack-mountable, complete with redundant power supplies as required for the rack configurations indicated on the plans, operating from a 120-volt single phase AC power input.

The encoders shall interface the serial communications port of the CCTV camera assembly through the fiber optic video link. Using the Ethernet port on the encoder and its IP address, commands shall be exchanged between the camera control computer at the Communications Center and the serial port of the CCTV camera.

Materials shall be supplied to satisfy the following:

Video

Analog Video	NTSC (30 fps)
Analog Video Connections	BNC connector, 75 ohms; S-Video
Encoding Format	ISO/IEC 13818 MPEG-2
Decoding Format	NTSC
Encoding Rate	1 Mbps to 12 Mbps
Decoding Rate	1 Mbps to 12 Mbps
G.O.P. Structure	User Selectable: I; I&P; I,B&P
Intra-picture Distance	1 to 19 frames
Reference Distance	0 to 2 frames
Resolution	D1, 720 x 480
Codec Control	Web server, IP and HTML interface
MPEG-2 Stream Types	Transport

Low Speed Data Transmission

Interface	RS232, RS422, RS485
Connections	DB-9, RJ-45
Data Rate	1.2Kbps to 115.2 Kbps

Data Channel

Format	Serial , asynchronous, RS-422
Interface	IEEE 802.3 Ethernet
Network Connections	RJ-45
Data Rate	100 Mbps
Broadcast	Unicast / Multicast
Management	SNMP, Web server, C. L. I.

The encoder's serial data channel (RS-422) for camera control shall be accessed through the network port using a TCP or EDP connection

Physical Requirements

Operating Temperature	0° to +70° C
Relative Humidity	95% non-Condensing

The encoders and decoders shall be UL listed and be type-accepted to 47 CFR (FCC), Part 15, Type A.

The Codecs shall be the standard product of an established North American manufacturer. The manufacturer shall have been in business for a minimum of 7 years. The manufacturer shall provide a minimum of a twelve (12) month warranty from the date of installation. The manufacturer shall provide technical support via email, fax and telephone. The above forms of support shall be provided Monday through Friday, 8:00am to 5:00pm EST. The Manufacturer shall also have a repair facility within North America.

The units shall be 19-inch rack-mountable, complete with power supplies as required for the rack configurations indicated on the plans, operating from a 120-volt single phase AC power input

The codecs shall be fully capable of transmitting the PTZ commands of the CCTV camera manufacturer being furnished under this contract as well as existing Philips/Bosch, Pelco, Vicon and Cohu camera commands. Serial data will be transmitted over TCP-IP. Each serial port must support IP addressing with the ability to select the appropriate IP socket number. The codecs must provide the ability to establish an IP connection directly from a workstation to any encoder IP address and socket number to pass serial data. Transmission of serial data must be independent of the video stream. Any serial data conversion required by the codec to communicate to the camera shall be included in this pay item and shall not be paid for separately.

The Encoder/Decoder serial data port must support Multicast data to broadcast a single serial data input to multiple remote encoder serial data port recipient. Bi-directional data must be supported on the codecs.

If the codecs cannot consistently transmit the PTZ commands without any data errors, timing conflicts, or malfunctions, a serial device server shall be provided for each codec to interface the serial data to the multicast network and shall be provided at no additional cost to the State.

A demonstration of this low speed serial data transfer shall be required before material submittal approval is given. See submittal requirements in this Special Provision.

Latency shall not exceed 300ms at D1 resolution at a minimum data rate of 5 Mbps.

Codec operation and management.

Each unit must support a local console accessible using one of the serial interfaces to provide access to all configuration menus of the product including the initial IP address configuration as well as for troubleshooting purposes. The interface must be menu driven for novice users.

Each unit must support 'remote' Telnet console access functionality to provide access to all configuration menus of the product. The interface must be menu driven for novice users. The console access must be restricted by a username and password to prevent un-authorized access. For ease of management, both the local and Telnet console must present the same menu commands and structure to the operator.

All units (encoders and decoders) must support SNMPv2 management protocol to provide the ability to control and monitor all configuration parameters and diagnostics from any 3rd party SNMP management application.

The Encoders/Decoders must support firmware updates from a central site. Updates must be downloadable to a single unit or by bulk via a single command from a firmware utility application via the Ethernet network. The firmware utility application must provide confirmation of the successful and unsuccessful updates. Upon completing of the update, the units must resume to original configuration without the need to reload the unit configuration.

Still Picture Capture

The codecs shall support and shall be coordinated with an automated still picture capture application specified elsewhere. A demonstration of this compatibility shall be required before material submittal approval is given.

Special Submittal Requirements and Operational Demonstration

As a part of the product catalog cut submittal, the Contractor shall provide a demonstration of the codecs at the time of the initial product submittal. The manufacturer shall demonstrate the following interoperability with at least one other codec manufacturer. Compatibility shall also include successful transmission of PTZ commands. The demonstration shall be comprised of the following parts:

- **Codec CCTV camera PTZ compatibility.** The demonstration shall include a pair of the proposed codecs, a proposed CCTV camera, and a CCTV camera of another manufacturer other than the proposed CCTV which is of a manufacturer already installed in the State system.
- **Video interoperability.** The demonstration shall demonstrate the following interoperability: The proposed encoder shall be capable of encoding a video stream that is decodable by at least one other Manufacturer complying with this specification, or of a manufacturer which equipment is presently in use by IDOT District 1 at the time of bidding. The interoperability demonstration shall be conducted in multicast mode.
- **Software video decoding.** A software based video decoder with PTZ control shall be provided for viewing and controlling a video stream remotely over the IP network.
- **Video snapshot capability.** A fully functional copy of the proposed video snapshot program shall be provided for the demonstration and throughout the 10 day period described herein.

After a successful demonstration of the above requirements, the codec pair shall remain with the Department for 10 working days for further observation. After 10 working days, the Contractor may pick up the codec pair. All costs for this demonstration shall be included in the cost of this pay item. It is the Contractor's responsibility to provide all hardware (including dome CCTV cameras and Ethernet switches) and software to perform the demonstrations as specified.

Serial Device Server. The serial device server shall be a fully integrated port server and fiber optic Ethernet switch. The port server shall act as a bridge between a 100BaseT Ethernet network and low-speed serial devices. The port server shall comply with the following:

- Minimum of two (2) DB-9 or DB-25 male connectors
- Shall provide serial communication at speeds 10000 bps and above
- Shall support point-to-point and point-to-multi-point modes
- The serial interface shall be RS-232 DTE

The serial device server shall include a fully integrated Ethernet switch that complies with the following:

- Provides a minimum of two (2) RJ-45 10/100TX Ethernet ports; two of the ports shall be configured as 100BaseFX
- Shall provide auto-negotiation on 10/100TX ports
- Shall support 100BaseFX using single-mode fiber optic cable with either a LC or SC connector
- Shall support the following network services: HTTP Telnet, and Com-port control
- Shall provide a HTML web browser user interface for configuration and monitoring of the unit.
- The port server shall provide bi-directional data transfer over two fibers or one UTP Cat 5e cable.
- The port server shall operate on 120VAC
- The port server shall operate as specified over the temperature range of -20 C to +70 C.

Video Control Subsystem. The Video Control Subsystem shall consist of two redundant video control servers, multiple CCTV control workstations and software to allow an operator to select any camera and route the video from it to any monitor. In addition, the video control subsystem shall allow the operator to pan, tilt, and zoom the camera. It will also allow the operator to control the optics of the camera that have remote controllability.

The video control system shall be configured as a client-server with the CCTV server located at the ComCenter. Clients shall be installed on new work stations at the ComCenter, Traffic Systems Center, and the Emergency Traffic Patrol.

Video Control Servers. The servers shall be designed to be rack-mounted in an EIA Standard 19-inch rack using no more than 2RU in height.

General requirements. The CCTV Distribution System Server shall be a standard product of an established brand name company with a demonstrated track record of providing high-quality long-term maintenance and service. The company shall have been producing leading-edge; PC based components for a minimum of five years prior to the bid. The company shall provide nationwide service and support on a 7 day a week, 24 hour a day basis and shall maintain a toll free customer support service. All major components such as the motherboard, power supply, processor, memory, hard disk, CD-ROM, integrated network interface card, audio and video components, shall be assembled and warranted by the computer's manufacturer. The CCTV Distribution System Server, as configured, shall be a standard ,model number of the manufacturer. Computers that are assembled from brand name components by system integrators or re-sellers will be considered "Clones" and are not acceptable.

Each CCTV Distribution System Server shall be equipped with the following:

Operating System: Windows XP, SP2, Full Version on CDROM. System restoration disks are not acceptable.
Hard disk: 160 GB ATA-66/100 IDE (7200 rpm) or better.
Motherboard: 800 MHz bus clock speed. All PCI slots shall support bus-mastering. A single Xeon 2.8 GHZ CPU with a 1 MB cache shall be provided.

Memory: Minimum of 1 GB of memory. At least one memory bank shall remain open for future expansion.

Optical: 24X IDE CD-RW/DVD ROM or better.

Video: AGP 32MB SDRAM RAM Video card with DVI and VGA outputs.

Pointing Device: A button, optical wheel mouse and joystick shall be supplied.

Monitor: One 17" rack mounted flat-screen LCD monitor shall be provided as specified elsewhere.

Network Interface: The workstation shall be supplied with an Integrated Network Interface supporting 10/100 MB/s. The server shall have a UTP (RJ-45) connector. The NI shall be compliant with IEEE 802.3 for Ethernet.

The backup CCTV Distribution System server shall be identical to the primary server except that it shall be configured as a backup server with automatic fail over.

Video Control Workstation. The video control workstation shall be a standard product of an established brand name company with a demonstrated track record of providing high-quality long-term maintenance and service. The company shall have been producing leading-edge PC based components for a minimum of five years prior to the bid. The company shall provide nationwide service and support on a 7 day a week, 24 hour a day basis and shall maintain an 800 customer support service. All major components such as the motherboard, power supply, processor, memory, hard disk, CD-ROM, integrated network interface card, audio and video components, shall be assembled and warranted by the computer's manufacturer. The workstation, as configured, shall be a standard model number of the manufacturer. Computers that are assembled from brand name components by system integrators or re-sellers will be considered "Clones" and are not acceptable.

Each workstation shall be equipped with the following:

Operating System: Windows XP Pro, SP2 (Shall be provided as a full version on CDROM. System restoration disks are not acceptable.)

Hard disk: 160 GB ATA-66/100 IDE (7200 rpm) or better.

Motherboard: 800 MHz bus clock speed with minimum of 4 dedicated PCI slots. All slots shall support bus-mastering. A single Pentium IV 3.0 GHz CPU with 1 MB cache shall be provided.

Memory: Minimum of 1 GB of memory. At least one memory bank shall remain open for future expansion.

Optical: 2 Drives: one 48x CD-RW and one 16x DVD+/-RW or better

Video Card: PCI Express 128 MB with DVI, VGA and TV output

Input Device: A 3-button, optical wheel mouse, keyboard and joystick shall be supplied. The joystick shall be configured for camera PTZ control.

Monitor: One 17" flat-screen, anti-glare monitors shall be supplied for each workstation. The monitor shall support resolution of 1600 x 1280 DPI at vertical refresh rate of minimum 100 Hz and horizontal refresh rate of 85 KHz. The monitor shall be energy star compliant. On-screen advanced control shall be supported.

Network Interface: The workstation shall be supplied with an Integrated Network Interface Card (NIC) supporting 10/100 MB/s and using 32-bit PCI bus-mastering technology. The card shall have a UTP (RJ-45) connector. The card shall be compliant with PCI local bus specification 2.0 and IEEE 802.3 for Ethernet. The card shall also support Netflex-3 technology.

Monitor: The workstation shall be provided with a desk mount 17" active matrix TFT LCD monitor. The monitor shall have a resolution of 1280 x 1024 pixels and a response time of 25 milliseconds. The contrast ratio shall be a minimum of 500:1. The monitor shall have both analog and digital (DVI) inputs.

CCTV Distribution System Video Management & Archiving Workstation.

In addition to the requirements for the CCTV Distribution System Workstation, the management and archiving workstation shall include the following:

The computer shall be rack-mounted and shall occupy no more than two (2) EIA Standard rack units.

Hard drive: The hard drive shall be as specified except that the drive shall have a minimum sustained transfer rate of 10MB/second.

Video Capture Card: A dedicated PCI video capture board shall be included in the workstation. The video inputs shall include Composite video (RCA connector with a BNC adaptor) and an S-video input. The board shall perform hardware based MPEG-2 conversion, software based conversion is unacceptable.

Supported video compression shall be: MPEG-2 (ISO/IEC 13818-2) Main Profile at Main Level (I,B,P frames) with I frame support and MPEG-1 (ISO/IEC 11172-2) The video bit rates shall be as follows: MPEG-2 Standard 4M up to 15Mb/sec., MPEG2 Half D1/SIF 2M up to 8Mb/sec., MPEG-1 SIF 1M up to 1.8Mb/sec. The encoding shall support variable (one pass) and constant bit rates. The board shall support 3D Y/C separation filtering and noise reduction filtering. The board shall also include frame synchronization, time base correction and auto gain control. The board shall be manufactured by Canopus or approved equal. The equivalent manufacturer must equal all the performance and functionality of the Canopus MPEG-2 decoder. One stereo input as a minimum shall be provided with locked audio support

Video Archiving
Software:

The workstation shall also include video production software with the following features: The archiving software shall be nonlinear, real time video editing. The product shall include 4:3 and 16:9 aspect ratio support, DVD creation with customizable menus and scene indexes. The package shall include a number of presets and transitions and a broadcast quality title engine. The package shall be Adobe Premiere Elements or approved equal. An approved equal must have all the features and performance of the specified package.

CCTV Distribution System Management and Monitoring Workstation. The Contractor shall furnish rack-mounted computer with the same attributes as the video workstation. The computer shall not occupy more than two standard rack units.

The computer shall include a system management system that can maintain the real-time status and provisioning of the SONET and Gigabit Ethernet switches. The Contractor shall furnish

software and software licenses for these machines to control the equipment at the field locations. The system management software shall allow circuits to be provisioned remotely through the Cisco Transport Controller (CTC) with simple A-to-Z provisioning or through widely used TLI commands. For the Ethernet L2/L3 switches, Ciscoworks LAN Management solution Software (LMS) 2.2, or the latest version, shall be provided. The LMS shall be comprised of applications providing a wide variety of device management tools for centrally managing the devices. The LMS shall include: CiscoView, Resource Manager Essentials, Campus Manager, Device Fault Manager, nGenius Real Time Monitor, and the CiscoWorks Server. The LMS shall be installed and configured for operation of the CCTV Distribution System Management and Monitoring workstation.

Portable Computers for Setup and Maintenance. The Contractor shall furnish two (2) portable, laptop, camera control computers. These computers shall be turned over to the Bureau of Electrical Operations and used to setup, operate, and maintain equipment at field locations.

The laptop computers shall include client software and maintenance software provided by the CCTV camera manufacturer. These computers will have the capability of accessing any camera in the system by connecting to the Gigabit network through a 100BaseT port on any of the Ethernet switches. In addition, the computer shall access individual CCTV cameras by connecting to the RS-422 cable in the CCTV cabinet at the base of the tower. The Contractor shall provide a minimum of ten (10) cables with appropriate connectors to interface the laptop computer to the Ethernet and ten (10) cables to interface the laptop computers to the RS-422 connection in the CCTV cabinet.

The laptop, camera control computer shall be a standard product of an established brand name company with a demonstrated track record of providing high-quality long-term maintenance and service. The company shall have been producing leading-edge PC based components for a minimum of five years prior to the bid. The company shall provide nationwide service and support on a 7 day a week, 24 hour a day basis and shall maintain an 800 customer support service. All major components such as the motherboard, power supply, processor, memory, hard disk, CD-ROM, integrated network interface card, audio and video components, shall be assembled and warranted by the computer's manufacturer. The computer, as configured, shall be a standard model number of the manufacturer. Computers that are assembled from brand name components by system integrators or re-sellers will be considered "Clones" and are not acceptable.

Each laptop computer shall be equipped with the following:

Operating System:	Windows XP Professional
Hard disk:	40 GB ATA-66/100 IDE (7200 rpm) or better.
Motherboard:	A single Intel M-processor or equal 1.4 GHZ CPU with 512 KB cache shall be provided.
Memory:	Minimum of 512 MB of memory. At least one memory bank shall remain open for future expansion.
CD-ROM:	40X CD-ROM or better.
Video Card:	Equivalent AGP with 32MB SDRAM RAM Video card.

Software. The Contractor shall furnish, install, provision, and test software to select and control the cameras. The software shall allow an operator to select a camera using a pointing device. The pointing device shall allow the operator to associate the camera with a specific monitor. When the operator clicks or releases a button, the video from that camera shall be displayed on the monitor.

The software shall also provide mouse and joystick control of the cameras. The operator shall have the option of using either the mouse or the joystick to pan, tilt, zoom, and otherwise control the cameras.

The basic video control program will be comprised of a server application, client application and device driver applications.

The various software components shall be able to be started in any order. The software shall allow clients, servers and device drivers to be added at any time, during or after initial configuration. The software shall allow additional devices to be added at any time during or after initial configuration. The software shall allow equipment from different manufacturers to be controlled by this program.

The unexpected or unplanned termination of a component shall not cause any other component to fail.

The software shall support client-to-server and client-to-multiple-server communications and operation. The software shall support server-to-server communications and operation to allow video sharing. The software shall be capable of linking to external access control and alarm systems to create an integrated security system.

Server Application. The server application shall have 'Hot Standby' capability with automatic switchover to the backup server. The configuration interface shall provide a connection manager for defining switchable connections within the system. The switching algorithm shall route video based on configurable parameters for path selection.

Time servers. The configuration interface shall provide a means to identify time servers and have other servers synchronize to them on a periodic basis, as established during the setup process. Any server shall be able to act as a network time server.

Operation Modes. The server application shall have two modes of operation: a run mode and a configuration mode.

In the run mode, the server application shall accept connections and requests client workstations

In the configuration mode, the server application shall present a graphical user interface that allows all aspects of the software to be configured.

The configuration and run modes shall be capable of running simultaneously to allow configuration to take place without interfering with the client connections and operation.

A single user interface shall be used to configure all devices, including equipment from different manufacturers. Functions not available for a specific piece of equipment shall be indicated through a difference in color or intensity.

Devices. The configuration interface shall provide the ability to add or remove devices and to modify the configuration of any configured device driver.

The software shall provide a configurable arbitration system that eliminates CCTV resource conflicts and allows users to take exclusive control of specific devices. The configuration interface shall provide the means to define interlocks between devices that conditionally prevent a device from being controlled.

User Configuration. The software shall provide configurable user groups and assign access privileges to them. Access privileges shall allow a user's access to administrative functions to be restricted. Access privileges shall allow a user's access to be restricted to each map and device independently. A user's access privileges may be configured to a subset of a device's features. Access privileges shall allow a user's access to workspaces to be restricted.

An initial configuration shall be as follows:

User Level	Select View	Assign Video	Control PTZ	Video Cutoff	Add Devices	Config Devices	Configure Workspace	Config Maps	Config Users
Level 5	X								
Level 4	X	X	X						
Level 3	X	X	X	X					
Level 2	X	X	X	X	X				
Level 1	X	X	X	X	X	X	X		
Administrator	X	X	X	X	X	X	X	X	X

Scripts and expressions. The software shall provide an expression service that allows events to be triggered based on system states or conditions of devices. The software shall provide a scripting language to allow automation of common tasks. The software shall support local and global scripts and variables. The scripting language shall support conditionals to ensure the correct conditions exist before a particular action takes place. Scripts shall be capable of executing in response to user input, conditions within the system, access or alarm input, or according to a schedule.

Labels and prompts. The software shall provide user-definable labels with scripting capability. The software shall provide user-definable prompts with scripting capability.

Timers and schedules. The software shall provide configurable timer and schedule services for executing specific tasks on a one-time or repetitive basis. The configuration interface shall provide a mechanism for configuring a group of users to notify when a scheduled event occurs.

Alarms and events. The software shall provide user-definable alarms and events that are triggered when specific conditions occur within the system. Alarms and events shall have scripting capability. The configuration interface shall provide a mechanism for configuring a group of users to notify when an alarm or event occurs. The configuration interface shall provide the means to configure a plan for dynamically escalating user notification of alarms and events. The software shall provide an archive engine capable of categorizing and storing up to 1 million alarms and events per day. Alarms and events shall have the capability to run one automated event when the alarm is triggered, a second automated event when a user selects the alarm or event in the viewer, and a third automated event when the user has acknowledged the alarm or event.

Maps. The software shall import maps in standard graphics file formats: wmf, .emf, .bmp, and jpg.

Users shall customize the maps by placing device icons, user-defined labels, user-defined hyperlinks, and alarm icons on them. The configuration interface shall provide a drag-and-drop capability for placing these labels, hyperlinks, device icons and alarm icons on maps. Device icons on maps shall be capable of showing the active status of the physical devices they represent. Labels on maps shall have single-click and double-click scripting capability. Hyperlinks on the maps shall have 'controllable transparency and scripting capability. Alarm icons on maps shall have scripting capability. Alarm icons on maps shall be capable of being animated when triggered.

Client Application. The client application shall be configurable to log into different servers. The client application shall provide server auto-discover functionality. The client application shall automatically synchronize with the server application after a valid username and password has been entered. This synchronization shall include all support and graphical files (i.e. maps) necessary for the client to run. The client interface shall be comprised of a main map display area, an event viewer, a device list, and any number of custom windows. The client application shall provide multi-monitor support.

Interface. The client program shall have a common interface to control equipment from different manufacturers. The same interface shall be used to retrieve archived video from different devices.

Workspaces. The client application shall have configurable workspaces that can be saved and loaded. There shall be no limit on the number of workspaces. Workspaces shall allow configuration of which predefined and custom windows are visible. Workspaces shall allow configuration of the size of predefined and custom windows, including the ability to make them fixed size or dynamically sizeable.

Workspaces shall allow configuration of the position of predefined and custom windows, including the ability to make them fixed position or moveable.

Workspaces shall allow configuration of the content of custom windows, including the permitted types of content and the default content. Workspaces shall allow configuration of the appearance of custom windows, including their borders and how they are layered. Workspaces shall support multi-monitor systems.

Custom windows. The client interface shall support any number of custom windows.

Custom windows shall allow users to view live and archived video, load maps, connect to and control remote PCs, or connect to the Internet via an integral browser window. Multipurpose windows shall have context sensitive toolbars to control the different types of window content. Custom windows shall have the ability to be opened and closed, moved, locked in place, scaled, and scaled to content. Custom windows shall be independent of each other, allowing different types of content to be displayed at the same time and different types of devices to be controlled. Custom windows shall allow video to be loaded by dragging the camera from a map or from the device list to the window's display area. Custom windows shall act as live control pads, allowing the user to control the currently loaded camera using the mouse or mouse wheel. Custom windows shall provide a search and filter utility to aid in locating archived alarms and events and archived video.

Camera Groups. The program shall have the ability for the user to place any camera together with any other camera into logical groups for use in other portions of the program. The group names shall be user assignable. The minimum number of camera groups shall be 64.

Video Monitor Quick Display. The program shall have a quick display option to enable the operator to quickly assign various video sources (cameras or groups of cameras) to specific monitors from one pull down menu without having to use a map interface. The menu shall consist of a two column display consisting of a column of monitors on the left and a column of sources on the right.

Video monitor rotation. The system shall include a application which will allow the operator to select a group of cameras to be displayed on a given monitor with the individual cameras within the group to be sequenced through at a user specified rate.

Event viewer. The client application shall provide an event viewer that shows activities as they occur, including alarms and events, scheduled events, and scripts. The event viewer shall have the ability to filter and sort activities on date, priority, event category, and key words in description fields. The event viewer shall provide the means to view archived alarms and events. The event viewer shall provide a search and filter utility to aid in locating archived alarms and events.

Device List. The device list shall list all the devices for which the user has access privileges. The device list shall provide access to each device's controls. The device list shall provide a means to switch devices.

Maps. The user shall be able to select a map from the list of available maps. The user shall be able to adjust the view of the currently loaded map by zooming in, zooming out, zooming to fit, and loading a stored view. Maps shall show icons representing physical devices and alarms. Clicking a device icon on a map shall provide access to controls for the device represented by that icon. The device list and event viewer shall provide all the functionality of maps, effectively making maps optional.

Device Drivers. Device drivers shall be provided to communicate with any device via direct serial cable connection, IP, or modem pool. Multiple device drivers shall be able to share a portion of a modem pool. Each device driver shall be unique to the type of equipment it controls.

The addition of a new device driver shall require no modification to the client or server application. Device drivers shall run anywhere on the network, not necessarily located where the server is installed. Device drivers shall have the capability of running as a Windows Service or as an executable.

The software shall operate with the existing CCTV cameras and the CCTV cameras installed under this contract. The software system shall be equivalent to that of the Chameleon System provided by 360° Surveillance and approved by the Engineer.

Video Monitors.

In-rack video display clusters.

The modular maintenance video display clusters shall have four 4-inch (diagonal measure), LCD displays with signal pass-through in a 2U rack-mount frame. Each display shall be 480 x 234 pixels and shall be NTSC compatible with individual color, tint, and brightness controls. The modular maintenance video display clusters shall be Marshall Electronics model V-R44P or approved equal.

In-rack 14-inch monitor.

The maintenance video monitors shall be a 19" rack mount CRT monitor, 350 mm (14") minimum diagonal measure, Pelco model PMC14H or approved equal.

LCD, 42-inch flat panel (suspended).

The 1070 mm (42") diagonal-measure flat-panel LCD monitors shall accept and display a standard NTSC signal in full resolution. Input connections shall include Normal Hi-Resolution Component Video, RGB In (15-Pin Connector), and A/V In (RCA jacks). The monitor shall be warranted against image burn-in for a period of not less than 1 year of continuous (24 hours per day, 7 days per week) use. The monitor shall NOT have a broadcast tuner. The 1070 mm (42") diagonal-measure flat-panel LCD monitors shall be manufactured by Zenith, Toshiba, or Marshall Electronics.

LCD, 17-inch flat panel (desk top).

One 17" flat-screen, anti-glare monitors shall be supplied for each work station. The monitor shall support resolution of 1600 x 1280 DPI at vertical refresh rate of minimum 100 Hz and horizontal refresh rate of 85 KHz. The monitor shall be energy star compliant. On-screen advanced control shall be supported.

LCD, 15-inch, CCTV Monitor, Rack-mounted.

One 15" flat-screen, LCD, anti-glare rack mount monitor shall be supplied for the CCTV Distribution System Server rack. The monitor shall have a native resolution of 1024 x 768 DPI. The LCD shall be a TFT active matrix type with a 75° Horizontal and 55° vertical viewing angle. The monitor shall have a minimum contrast ratio of 300:1 with an average white luminance of 250 cd/m². The monitor shall accept a VGA analog signal. The monitor shall be energy star compliant. On-screen advanced control shall be supported. A freestanding LCD monitor attached to a shelf will not be acceptable.

The Contractor shall furnish hardware to mount the monitor in the EIA Standard 19-inch equipment cabinet.

4-port Keyboard-Video-Mouse (KVM) Switch. One 4 Port Keyboard-Video-Monitor (KVM) Switch shall be provided for the CCTV Distribution System Server rack. The KVM switch shall include the following features: automatic scanning, cascading capabilities, hot pluggable operation, keep alive function, intellimouse support, mouse reset function, on-screen display (OSD) capability, password security, pc mouse/keyboard/video support, push button or keyboard switching, scanning capabilities, status indicator LED's and support video modes up to 1600 x 1200 at 72Hz.

Video Projection Equipment.

LCD Projector.

The contractor shall furnish a video projector in accordance with the following specification:

Synchronization Compatibility	Separate Sync / Composite Sync / Sync of G
Video Bandwidth	RGB 100MHz (-3dB), Video 6.5MHz (-3dB), monitor output bandwidth 80MHz (-3dB)
Video Compatibility	NTSC
Native Resolution	1024 x 768 XGA or better
Supported Resolutions	SXGA, XGA, SVGA, VGA, Mac
Lamp Life	2000 hours (nominal)
Color Reproduction	16.7 million colors displayed simultaneously
Outputs(1)	monitor output (mini D-Sub 15-pin), (1) mini audio with variable audio output
Environment	Operational Temperatures 32 - 95 degrees Fahrenheit
Regulations	USA UL1950, FCC Class B; Canada CSA950 (C-UL)
Accessories Included	User's manual (CD-ROM), PJ/PC remote, batteries, power cable, 15-pin mini D-sub cable, USB cable A & B, quick connect guide, registration card, lens cap with attachment string & ceiling mounting bracket & mount for LCD/DLP projectors
Reliability	Mean time between failure (MTBF) >20000 hrs
Brightness	3000 lumens or greater
Aspect ratio	4:3

The Contractor shall include a ceiling mount with attachment hardware for the projector. The ceiling mount shall provide 30° of pitch/roll and 340° of yaw.

The Contractor shall supply two replacement bulbs for a single-bulb machine and eight replacement bulbs for machine with four bulbs.

Motorized Screen. The concealed in-ceiling projection screen shall be 69" (H) x 92" (W), electrically operated 120 volt (60 Hz), 1.4 amp. Shall have a specially designed motor mounted inside the roller with patented noise silencer to be three wire quick reversal type, with automatic

thermal overload cut-out, integral gears, capacitor and an electric brake to prevent coasting. To have preset but adjustable but adjustable limit switches to automatically stop picture surface in the "up" and "down" positions. The roller to be of rigid metal with, 3 inch diameter. Screen fabric to be flame retardant and mildew resistant fiber glass with Video Spectra 1.5 picture surface with black masking borders standard. Bottom of fabric shall be formed into a pocket holding a 3/8" metal rod. The ends of the rod shall be protected by heavy-duty plastic caps. The case shall be made of wood with a metal-lined wiring compartment. A section of the bottom of the case shall be a door equipped with hinges so that the door opens and closes automatically with lowering and raising the picture surface. When the picture surface is being lowered, the door shall drop open by gravity. When the picture surface is being raised, two ends of the slat in the bottom of the fabric shall engaged two hooks on the door to lift to a closed position where the limit switch shall cut off the electrical current to the screen. The balance of the bottom of the case shall be a second hinged door with manual opening to provide access. Hinges shall be mounted to allow matching of the doors to the ceiling. Case doors to be painted to match ceiling. Screen to be furnished complete with a dual station three position rocker switch control box with cover plate. The second station shall be wired to turn the projector on and off. The screen shall be a DA-LITE SENIOR ELECTROL type or approved equal.

JPEG Video Capture. The JPEG Video Capture at the communications shelters as identified on the plans shall provide a regular continuous polling sample of all cameras connected to the system, with JPEG images extracted to files accessible to the IDOT ITS Office Gateway for display on the Gateway Web page. The JPEG interface shall consist of a 19" rack-mounted video server chassis with 12 slots for individual 4-channel video servers. The rack shall be furnished with a power supply for operation of 120 VAC. Video servers shall be hot-swappable, use Motion JPEG video compression, and provide PTZ control support, which shall be able to be disabled. The rack and video servers shall be compliant with FCC Part 15 subpart B. The Video server rack shall be the Video Servers Rack manufactured by AXIS Communications. Twelve 4-channel video servers shall be furnished for each video server rack. The video servers shall be AXIS Communications 2400+ Blade servers.

As an alternative to the use of hardware capture devices, the Contractor may propose a software solution. This software program shall have the capability to automatically capture still images in the JPEG format directly from the MPEG2 video stream without the use of capture cards or devices. The captured images shall be published to an FTP site for public access, as identified by the ITS Program Office. The program may be the product of the control program publisher or it may be an extension created by a third party compatible with both the codec's and control program. The still picture capture program shall run on a CCTV Distribution System Still Image Capture Workstation.

The capture program shall have the capability to automatically capture still images in the JPEG format directly from the MPEG2 video stream without the use of capture cards or devices. The program may be the product of the control program publisher, codec manufacturer, or it may be an extension created by a third party compatible with both the codecs and control program. The program shall be user configurable to allow the end user to add, delete and configure cameras to the capture routine as needed with out programming. The program shall allow the user to specify the interval between image captures and shall be capable of being configured for a minimum of 300 cameras. The images shall be saved at a user specifiable resolution of up to 720x480 pixels with a user specifiable filename and storage path. The program shall have an option to either add an number to the specified file name or overwrite the previous file. The still

picture capture program shall run on the Distribution System Still Image Capture Workstation described elsewhere herein. If the JPEG picture capture cannot be performed directly from the MPEG2 video stream, hardware devices for JPEG capture shall be provided at no additional cost to the State.

CCTV Distribution System Still Image Capture Workstation (DSIC). If a software JPEG video capture is approved for use, the Contractor shall provide a CCTV Distribution System Still-Image Capture Workstation. In addition to the requirements for the CCTV Distribution System Workstation, the Still-Image Capture Workstation shall include the following: The Still Image Capture unit shall be rack mounted in a standard 19-inch rack using no more than 2RU in height. The DSIC shall be connected to the KVM in the rack and shall utilize the rack mounted keyboard and 15" monitor.

Video Distribution Amplifiers. Video distribution amplifiers shall be high performance, high impedance design with an input loop-through connection. The amplifier shall include signal gain and cable equalization. The distribution amplifiers shall meet the following requirements:

Bandwidth	29MHz (-3dB) minimum
Gain	-3dB to +3dB adjustable (0.7Vp-p to 1.5Vp-p output when input level is 1.0Vp-p)
Input levels	0.4v to 2.0v with no offset at unity gain
Connectors	BNC
Impedance	75 Ohms
Return Loss	greater than 35dB at 5 MHz
Differential Phase Error	$\pm 0.1^\circ$ to 5 MHz
Differential Gain Error	$\pm 0.1\%$ to 5 MHz
Frequency Response	± 0.1 dB to 5 MHz
Input connections	1 composite video
Output connections	four (4) as indicated on plans, one (1) composite loop-through

The distribution amplifiers shall be rack mounted in 3 RU rack mounted frame with an integral power supply. Multiple single channel video distribution amplifiers placed on or fastened to a rack mount shelf will not be acceptable. Corded modular power supplies will also be unacceptable.

I-55 Cut-Over Fiber Optic Modems

The Contractor shall furnish three Meridian Model PR-200iR-V/0-1D/ST fiber optic video modems and one Meridian SR-2001 Universal Subrack Frame to be used to demonstrate system functionality in the Shop Floor Testing and for a phased cutover of the I-55 CCTV circuits at the I-94/I-55 Shelter. The Meridian Model 200i shall satisfy the following:

- Video and simplex data model Meridian Technologies PR-200iR
- Unit shall operate using single mode fiber
- Unit shall receive Frequency Modulated light and convert to NTSC video; shall convert data PTZ controller from source to Frequency Modulated light and transmit over the same fiber.
- Card shall occupy one card slot

Data format shall be Biphase; RS-232 to biphase converter shall be included.

Optical Source for Single mode shall be >0 km but <40 km

Card shall operate at 1310/1550 nm

System Video Performance

Video Input/Output impedance:	75 ohms
Video Input/Output levels:	1.0 V p-p; 1.5 V max
Bandwidth	5 Hz to 8 MHz
Differential Gain (10%-90% APL)	<±1.5%
Differential Phase (10%-90% APL)	<0.5%
S/N Ratio at 1 km	67 dB
FM Carrier Frequency	70 MHz

System Data Performance

Data Rate	DC to 300 kbps
BER	10 ⁻⁹

Operating Temperature

-25C to +70C

The SR-2001/AS2 Universal Frame shall be one supply, rack-mountable frame for installation of Model 200iR cards.

Chassis shall be made of extruded aluminum and steel sheet metal components.

Dimensions shall be 19"x11"x5.25"

Chassis shall include 200W switching power supply for powering up to 18 Meridian Technologies transceivers.

Power supply shall include auto ranging 87-240 VAC input (50/60 Hz); over voltage protection; short circuit protection; and over current protection.

Equipment Racks. Equipment racks and cabinets shall be installed as shown in the plans. Unless otherwise stated, equipment racks shall be installed at the communications shelters, equipment cabinets shall be installed at the ComCenter and TSC, and a wall-mounted cabinet shall be installed at the ETP.

Equipment cabinets at the shelters shall not include castors or rollers. The cabinet shall have maximum dimensions of 82 inches high by 24 inches wide by 36 inches deep. The cabinet shall be capable of mounting 2,000 pounds of equipment and hardware. The cabinet shall provide a minimum of 42 standard rack units of mounting space. The cabinet shall have beige, powder-coat paint finish. The front and back of the rack shall have heavy-gauge doors of perforated metal, protecting the components in the rack but permitting the enclosed equipment to be viewed and allowing ventilation air to enter. The front and back doors shall be lockable. The front door shall be split. The equipment rack shall be APC Model 2800 or approved equal.

Equipment cabinets at the Communications Center shall include castors or rollers. The cabinets shall be installed with slack or flexible cables to allow them to be moved forward to allow access to the rear of the cabinet. The cabinet shall have maximum dimensions of 82 inches high by 24 inches wide by 36 inches deep. The cabinet shall be capable of mounting 2,000 pounds of equipment and hardware. The cabinet shall provide a minimum of 42 standard rack units of mounting space. The cabinet shall have beige, powder-coat paint finish. The front and back of the rack shall have heavy-gauge doors of perforated metal, protecting the components in the rack but permitting the enclosed equipment to be viewed and allowing ventilation air to enter. The front and back doors shall be lockable. The front door shall be split. The equipment rack shall be APC Model 2800 or approved equal.

Equipment racks shall be equipped with all hardware required to mount equipment that has been designed to mount in accordance with EIA-310-D. Where a camera PTZ selector-controller is required, a pull-out shelf designed for use with such a controller shall be furnished as part of the equipment rack. Where equipment in the rack requires the use of a keyboard, mouse, or both, the rack shall be furnished with a pull out shelf for the keyboard, mouse, or both. Pull-out shelves for equipment control shall be mounted at a working height of 34 to 42 inches.

Wall-mounted equipment racks shall be installed at the ETP. These racks shall have nominal dimensions of 19 inches wide by 36 inches tall by 18 inches deep. The racks shall provide 20U of mounting space. All rack components, excluding handles, hinges or other components which shall be made from corrosion-resistant materials or furnished with a plated or anodized coating, shall be fabricated from steel, 20 gauge minimum, and primed and painted using an electrostatically applied polyester or enamel coating after welding is completed.

Interconnecting Cabling.

600 volt cable

All 120 VAC distribution wiring that is entirely within the communication hut shall be made with NEC Type THHN/THWN cable rated for 600V, with a minimum wire gauge of 12 AWG. All conduits shall be a minimum of electrical metallic tubing (EMT), and all EMT conduit fittings shall be compression, not set-screw type. Outlet and junction boxes shall all be galvanized steel with galvanized steel faceplates or covers. All switches, receptacles, and other wiring devices shall be industrial specification grade.

All power wiring (600 volt cable) shall be in electrical metallic tubing (EMT).

Two 20-Ampere circuits from the UPS panel shall be dedicated to each equipment rack, and provide a minimum of 3 duplex receptacles per circuit at evenly spaced intervals for the entire height of the each rack.

Plug Strips may be used within the equipment racks, but shall not reduce the number of duplex receptacles required per circuit . The plug strip housing shall be all metal and shall mount in the rack using the standard 19" rack and occupy no more than 1 U in height. Plug Strips shall be Tripp-Lite PDU-1220 or approved equal.

Wall-mounted plug strips shall be furnished and installed to be mounted on plywood backboards. These strips shall include a 15-ampere circuit breaker and shall include solid-state surge protection. The surge protection shall be rated for 800 joules or greater.

Power Supplies for equipment requiring other than 120 VAC shall be manufactured by or approved in writing for that use by the maker of the equipment they are to serve. Power supplies shall be rack-mounted, or shall be bolted or otherwise mechanically attached to shelving designed for mounting in the equipment rack. Connections between the power supplies and the equipment they serve shall be made with PVC-jacketed cables.

Unjacketed individual conductors shall not be permitted.

Coaxial Cable (including connectors)

The coax cable shall be a Belden 1694A precision video cable, or approved equal complying with the following specifications. The center conductor shall be a 18 AWG, Solid Bare Copper conductor, the insulation shall be Gas Injected Foam High Density Polyethylene, and the shield shall consist of an Aluminum Foil-Polyester outer shield with 100% shield coverage plus tinned copper Braid Shield with 95% shield coverage. For installations in shelters, the jacket material shall be Polyvinyl Chloride, suitable for indoor and outdoor-aerial applications.

For installations at the ComCenter and TSC, the coaxial cable shall be plenum rated in accordance with NEC 800-51(a). The coax shall be equivalent to Belden 1695A 0071000.

Applicable Specifications: UL/NEC CMR, C(UL) CEC CMG. Flame Resistance: UL 1666 Vertical Shaft, CSA T4.

Electrical Characteristics:

Impedance:	75 +/- 1.5 ohms
Inductance:	0.106 microH/ft.
Capacitance Conductor Shield:	16.2 pF/ft. (nominal)
Velocity Of Propagation:	82 % (nominal)
Delay:	1.24 nS/ft. (nominal)
Nom. Conductor Dc Resistance @ Deg. C:	206.4 ohms/1000 ft.
Nom. Shield Dc Resistance @ 20 Deg. C:	2.8 ohms/1000 ft.
Return Loss:	23dB minimum, 5 - 850 MHz 21dB minimum, 851 – 3000 MHz
Max. Operating Voltage:	not less than 300 Vrms (UL)

Nominal Attenuation

MHz	dB/100 ft	MHz	dB/100 ft
1.0	.24	180	2.42
3.6	.45	270	2.97
5.0	.54	360	3.43
7.0	.63	540	4.25
10.0	.72	720	4.95
67.5	1.57	750	5.00
71.5	1.60	1000	5.89
88.5	1.75	1500	7.33
100.0	1.84	2000	8.57
135.0	2.10	2250	9.14
143.0	2.16	3000	10.67

Physical Characteristics:

Temperature Rating:	- 30 TO + 75 DEG. C
Min. Bend Radius:	10x cable O.D. or 2.75"
Max. Pulling Tension:	69 LBS
Nom. Weight/1000 ft:	40 LBS
Jacket Color:	BLACK for CMG cable; violet for CMP cable
Applicable Specifications:	UL/NEC: CMR/CMP C(UL)/CEC: CMG
Flame Resistance:	UL: 1666 VERTICAL SHAFT CSA: FT4

Coaxial connectors shall be BNC or as required by the equipment to which the cables connect. The connectors shall be attached to the cable by crimping or by a cord-grip clamping action. Connectors shall be plated for corrosion resistance and good electrical connections. All BNC connectors shall be physically designed to fit the specified cable without adaptation and shall have a characteristic impedance of 75 ohms. Connectors with a characteristic impedance of 50 ohms are not acceptable and shall be replaced by the Contractor at no additional cost to the State.

Connectors shall be Amphenol part number 31-70000 or approved equal.

Ethernet Cable (including connectors)

Ethernet Cable shall be ANSI/TIA/EIA-568-B.2 Category 5e, UL verified to Category 5e, 4 twisted pair, 24 AWG bare copper with polyolefin insulation. The cable shall be unshielded with polyvinyl chloride (PVC) insulation. The cable shall be Belden part number 1500A or approved equal. The terminations shall be crimp-on RJ-45, Ideal Industries 85-396 or approved equal.

Fiber Optic Cable (including jumpers, splices, connectors)

Single-mode fiber optic cable shall be furnished, installed, and terminated under the pay items for the single-mode fiber optic cable. Single mode fiber optic terminations inside the communication huts shall be made with Amphenol 942 series terminations or approved equal, or as required in the fiber optic cable special provision, whichever is more stringent. Single mode fiber optic patch cables shall be absolutely minimized. If required, Single mode fiber optic patch cables shall be Amphenol 942 series, ultra-polished, or approved equal.

Multi-mode fiber optic cable shall be used only for inter-equipment signal transmission within a particular subsystem. All multi-mode fiber optic cable shall be furnished as pre-manufactured patch cables, Amphenol 943 with 62.5/125 cable and 3mm jacket, or approved equal. Multimode fiber optic cable is included in the cost of this pay item and will not be paid for separately.

Video Patch Panels

Video patch panels shall consist of video patch jacks, a black phenolic panel, and video patch cords. The video panel shall mount 24 looped-thru video jacks and shall be one (1) rack unit high. The video jacks consist of two coaxial jacks that are looped normal-

thru. The interface to the jacks shall be BNC female connectors. The jacks shall be self-terminating such that an un-patched jack of a module will be automatically terminated in 75 ohms if the other jack is patched.

The patch jacks shall satisfy the following:

Characteristic Impedance	75 ohms nominal
Voltage Rating	400 Vrms
Insulation Resistance	5000 Megohms
Return Loss	Better than 23 dB through 2.25 GHz
Center Contact Resistance	not greater than 15 milliohms
Outer Conductor Resistance	not greater than 0.2 milliohms

The Contractor shall furnish ten 24-inch patch cords with each video patch panel. Each patch cord shall be a coaxial with the characteristics identified for the coaxial cable in this specification and shall be terminated on both ends with a plug that mates with the patch jack.

Cable Identification Materials

All cables, fiber optic cables, and individual conductors and fiber strands when broken out from a cable assembly shall be uniquely labeled in accordance with the Contractor's interconnection diagram. Labels shall be computer-printed and shall be waterproof and non-smearing. Labels shall be polyester adhesive wrap labels produced by the W. H. Brady Company or approved equal. The labeling shall comply with ANSI/EIA/TIA -606-A

Cable Tray

Unless otherwise indicated on the plans, the Contractor shall furnish cable tray with 3/8" x 1-1/2" high tensile tubular steel stringers and 1" x 1-1/2"x1/8" channeled cross slats. The nominal width of the tray shall be 12" and the distance between cross slats shall be 8". The Contractor shall furnish all hangers, rods, straight splices, unistrut, threaded rods, nuts, open clips, closed clips, wall anchors, J-bolt assemblies, straight clamps, corner clamps, and other hardware required to complete the assembly required by the plans. The Contractor shall include all necessary bonding and grounding hardware to bond and ground the new cable tray; the new cable tray shall be bonded to any existing cable tray and connected to any existing building ground.

Fiber Optic Termination Panel – Wall Mounted

The wall-mounted fiber optic termination panel shall be a two door, wall mounted box with nominal dimensions of 13"H x 13"W x 3"D. The exact dimensions may deviate by ± 2 " for any dimension. The termination panel shall terminate 24 single mode fibers in ST connectors or connectors matching the terminations on the equipment. All connectors shall be identical. The left chamber of the box will contain splices between the incoming cable and the pigtailed connectors that attach to the bulkhead connectors. The right chamber will house the incoming distribution cables, connecting the incoming fibers to the terminal equipment. Suitable terminations panels would include Corning WIC-02P, 3M 8434, or ADC FL-1000 with proper connectors, splice trays, connector plates, and pigtails.

Construction.

General. Each defined subsystem shall be one or more, self-contained assemblies of rack-mounted components. These components are assembled, integrated, and coordinated as required for the defined functionality, complete with all interfaces and interconnecting cabling, suitable for advanced shop staging and testing, as defined elsewhere herein, with other subsystem assemblies. Each shall be installed at its indicated location and connected to power and communications circuits as indicated and as required.

The interconnections are generally as depicted on the Plans. The Contractor shall be responsible for submitting a complete, integrated interconnection diagram, all as part of shop drawings required for the work, and shall mark the Plans during construction as part of Record Drawing requirements. It shall be noted that the Plans may not show every detail of interconnecting wiring and that the contractor is required to provide all the interconnections within each location to satisfy the requirements of the system being furnished.

Product information and shop drawings shall be submitted for approval in detail. The submittal shall include, but not be limited to:

- Product information on all components, highlighted to indicate specification compliance
- Product information that applies to more than a single specific model or variation, and may list optional equipment or features, shall clearly indicate the model, variation and options selected
- All warranty information
- Shop drawings of assemblies of equipment, with layout and dimensions
- Interconnection wiring diagrams, indicating all component and cabling identification
- Interconnection wiring diagrams shall be of such detail that a competent electrician, though unfamiliar with the equipment, is able to properly select and terminate all wiring required for proper system operation
- Installation drawings, detailing dimensioned placement at facilities and all connections
- Description of location and arrangements for Shop Staging Tests

All submitted information shall be provided in both hardcopy and electronic format on CD-ROM.

Although not explicitly detailed on each plan sheet, the Contractor shall bond and ground all equipment, cables trays, and hardware. This bonding and grounding shall comply with the National Electric Code and manufacturers' recommendations for the equipment being installed.

Communications System Installation. Equipment shall be furnished and installed, configured and tested by a manufacturer-certified agent. The submittals for the equipment shall address the following installation requirements. The installer shall meet the following requirements:

- The installer shall have at least four (4) Cisco CCIE level certified fulltime Engineers on the payroll at time of Letting and through out the contract duration.
- The installer shall be familiar with the design, configuration and deployment of optical solutions, Layer 3 switches, and IP multi-cast.

- The installer shall demonstrate previous design and implementation experience with Cisco or other vendor's optical solutions.
- The installer shall have local field engineering resources.
- The installer shall have project managers certified by the Project Management Institute.
- The installer shall have the capability to provide 24 hour network monitoring from a NOC facility

If any of the above requirements cannot be meet by the installer, the installer will be unacceptable and the Contractor must submit another installer for review and approval.

Prior to installation the following shall be submitted for review and approval:

- A detailed equipment list
- A drawing depicting physical layout and icons that represent the equipment required at each node
- A scope of work for testing methods that they will utilize for validating implementation and configuration.

Documentation. The installer shall provide record documents, in addition to other documents specified elsewhere herein, that will provide physical chassis card/slot assignments, logical addressing information, SONET layer drawings, and IP layer drawings.

Integration. The Contractor shall develop a system architecture identifying the interconnection, provisioning, and setup of all equipment. This architecture shall be approved by the Engineer and shall address the following:

Future expansion and requirements as depicted in the plans

The interconnection of existing T-1 requirements at the I80/Stateline, I294/I57, and I94/I55 shelters

The interconnection of the northern SONET ring under phase 2 of this effort

The use of Gigabit Ethernet switches to interface video encoders and transport video using the Internet Protocol (IP).

High availability and redundant paths will be implemented using a Layer 3 IP routing architecture, utilizing redundant switches and fiber optic links

OC-48 SONET rings will provide point-to-point STS-12c links for transporting the IP packets between critical nodes.

The Contractor shall develop an addressing scheme for assigning the IP addresses. This scheme shall be approved by the Engineer.

The system is intended to be a complete integrated whole. Manufacturer equipment variances shall be taken into consideration in assembling the complete package, and no necessary component, appurtenance, software or other interface shall be omitted if required to achieve the defined system functionality, even though not explicitly defined in these Special Provisions or not explicitly shown on the plans. The Contractor shall remain responsible for the successful integration of the various sub-parts of the system; the Contractor may identify one key vendor, such as the communications system vendor, as the designated integration coordinator for a specific subsystem.

Shop Floor Testing. The contractor shall establish a location for shop-floor, simulated operational testing of assembled and interconnected sub-systems. The facility shall be within District' 1, indoors, with heating and air conditioning as required for the operational environment of the equipment, and with adequate power, lighting and restroom facilities to allow extended operational witness testing of the system.

This facility shall connect all equipment to be installed under this specification in an operational configuration. The equipment shall be grouped by ultimate location and configured as such. Optical links with simulated losses equal to those anticipated on the actual links plus three decibels (3 dB) shall interface the equipment. The equipment shall be equipped and provisioned as it will be in the final configuration.

This facility shall be used to validate and demonstrate the entire CCTV system design, from CCTV camera to video monitors. The Contractor shall demonstrate all functionality of the system. This shall include selecting and controlling cameras, selecting monitors and displaying video from any camera, and the operation of all alarms. The Contractor shall demonstrate the ability of controlling the system setup and provisioning through the network management system.

This facility shall be used to validate the software and system design. The Contractor shall develop a comprehensive Test Plan to verify the operation of the system and its ability to support the anticipated traffic loads. This Test Plan shall include all configurations and settings (hardware and software), test procedures, and anticipated results. A draft of the Test Plan shall be submitted to the Engineer for approval not less than 30 days prior to the initiation of any testing.

System tests shall be witnessed by the Engineer and the Contractor shall schedule the tests with the Engineer, allowing at least two (2) weeks advance notice. The contractor shall provide all test equipment, materials and interconnecting cable necessary to simulate a complete interconnected system. System-wide fiber losses shall be estimated and dummy loss attenuation shall be include to simulate, as close as possible, real installed system conditions at the end-of-life of the components. This shall equate to the anticipated link loss plus three (3) dB.

Testing shall include all of the camera equipment in the Video Distribution Control System, including components furnished under other items of this contract. Further, the Department will provide one of each type of existing CCTV camera for testing the integration of legacy cameras. The contractor shall provide the necessary temporary mounting provisions and connections for all of the cameras. The contractor shall provide lighting controls to simulate daytime and nighttime lighting conditions.

The contractor shall prepare and submit a detailed plan to test the proposed configuration and provisioning of the equipment and to demonstrate system performance of all specified and all

submitted operational functionality for approval by the Engineer. The test plan shall simulate a matrix of mode and component failures and the system shall successfully perform all tests, as witnessed and approved by the Engineer. Should malfunctions or failures occur, the contractor shall make system corrections and repeat the associated tests. A complete record of all tests shall be kept by the contractor and delivered to the Engineer.

Once shop-floor testing is successfully completed, individual location sub-systems may be installed and connected at their respective field locations. The contractor shall use appropriate care in the transfer of the sub-systems and shall assure the physical protection of all equipment from mechanical damage and from the elements and shall also assure security of equipment.

Coordination With Other Contracts. The final system installation will be dependent upon the completion of work done in other contracts, particularly as it applies to the completion of raceways and the installation of interconnecting fiber between system nodal locations. The installation of the system shall be fully coordinated with other contracts.

Certain nodal equipment (such as the equipment for the I80 locations) included in this system is intended for ultimate installation in facilities that are provided under another contract. The Contractor shall coordinate installation work with the other contractor and, to the extent possible shall coordinate interface work to minimize re-work and to optimize the use of space.

Interconnecting Wiring. All wiring, cabling, and other provisions necessary to connect the installed system package to power panel boards, fiber optic patch panels, grounding systems, etc. at each nodal location shall also be included as part of each respective location package. Where the plans indicate wire and cable that exceeds immediate installed system use, the spare cables shall be labeled and terminated, and where terminated at equipment rack locations, the lengths of any spares shall be first approved by the Engineer as suitable for extension to future equipment in the line-up.

Maintenance of Existing CCTV System. Maintenance of the existing CCIV System shall be transferred from the ASMC (Advanced Systems Maintenance Contract) to the contractor from the time that access to the existing system is needed for field installation of the system expansion until final acceptance of the expanded system.

The existing system shall remain in essentially continuous operation throughout the expansion construction, with limited downtime as approved in advance, in writing, by the Engineer. The existing system is used, among other things, for the operation of the gate system on the Kennedy Expressway reversible lanes (REVLAC), and this system shall remain operational on a daily basis. The REVLAC system incorporates certain features that allow operation of devices from the various remote control buildings of the system. Should the contractor require extended (more than 8-hour downtime of the SONET system, with Engineer approval, the contractor shall be responsible for the costs to have the REVLAC system operated from the remote buildings by the ASMC contractor, on a time and material basis.

Phased Cut-over of Existing CCTV Circuits on I-55

The Contractor shall cutover the existing CCTV circuits on I-55, three circuits at a time. The new fiber optic modems and Universal Sub rack Frame shall be installed in the I-94/I-55 Shelter. The fibers from the transceivers at the CCTV field locations on I-55 shall be terminated on the

new receivers. After testing the new configuration and verifying that the video and camera control is operational at the shelter, the video shall be connected to the encoders and the system retested in its final configuration. When the three CCTV circuits have been successfully reconfigured and successfully tested, the Contractor shall relocate three transceivers from the TSC to the I-94/I-55 shelter and the process shall be repeated for the next three circuits. This process shall continue until all CCTV circuits are terminated in the new shelter.

Installed Operational Testing. Once all CCTV camera equipment and all CCTV Distribution System location sub-systems are installed, connected and locally operational, the entire system shall be tested. The contractor shall submit a test plan for approval by the Engineer, and the test plan shall assure demonstration of all required system functionality.

Fiber optical loss values on existing fiber runs to be employed in the CCTV Distribution System are as indicated in the plans. The contractor may confirm these values prior to interconnecting to the existing fiber. Prior to system testing, all fiber optic runs to be employed for the system shall be tested optical loss values between nodes and overall and the test values shall be documented and compared with system requirements. Except for proven excess losses in existing fiber runs, the contractor shall remain responsible for any amplification necessary to establish system performance as specified. Testing shall incorporate testing of all of the camera equipment furnished under other items of this contract.

System tests shall be witnessed by the Engineer and the Contractor shall schedule the tests with the Engineer, allowing at least 2 weeks advance notice. The contractor shall provide all test equipment, materials and interconnecting cable necessary to perform the tests.

ComCenter at District Headquarters. In accordance with the plans, the Contractor shall accomplish the following: (Note: no specific order is intended; order and scheduling shall be identified by the Contractor. In addition, these are partial lists only generally summarize the work to be done; they are neither exhaustive nor specific.)

- Install equipment cabinets.
- Install SONET multiplex equipment.
- Install two Gigabit Ethernet switches.
- Install decoders and video amplifiers. Connect decoders to the video amplifiers.
- Connect the decoders to the Gigabit Ethernet Switches and the video amplifiers to the existing video switching matrix.
- Replace five existing 42" LCD monitors.
- Install two new 42" LCD monitors. Connect to power panel and existing video switching matrix.
- Install port server. Connect to Gigabit Ethernet switch; connect RS-232 ports to alarm monitoring CPU.
- Install video control workstation with client video control software; connect to Gigabit Ethernet switch
- Install four rack-mounted computers; two video control servers, one Distribution System Video Management and Archiving Workstation, and one CCTV System Management and Monitoring Workstation. Connect these computers to the keyboard, mouse, and 15" rack-mounted monitor through the KVM switch.
- Setup and provision equipment and software

As part of the ComCenter, establish a remote fiber optic link to the ITS Project Office. Furnish and install one Gigabit Ethernet Switch, one Camera Control System Workstation, and four Video Decoders for installation at this site. This link shall use existing single mode optical fibers. Four additional 17" LCD Monitors shall be furnished and installed next to the existing plasma monitor. The Contractor shall furnish and install ceiling brackets to secure these monitors. The Contractor shall install the coax and power for these monitors in the wall and restore the wall to its original condition. Fiber optic cables shall be furnished and installed to interconnect this equipment to the existing termination panels. All work shall be coordinated with the Engineer and the building representative.

Emergency Traffic Patrol. In accordance with the plans, the Contractor shall accomplish the following: (Note: no specific order is intended; order and scheduling shall be identified by the Contractor. In addition, these are partial lists only generally summarize the work to be done; they are neither exhaustive nor specific.)

- Install 42" LCD monitor in second floor conference room as identified in the plans
- Install new conduit and power cable from the electrical distribution panel to the telephone room. Terminate in a quad-connector box mounted on the existing plywood backboard.
- Install new conduit and power cable from the electrical distribution panel to the conference room. Terminate this wire in a ceiling mounted, quad-connector box.
- Install new conduit and power cable from the electrical distribution panel to the dispatch room. Terminate in a duplex socket.
- Install coaxial cable from the telephone room to conference room; install coaxial cable from telephone room to dispatch room; and install coaxial cable to second floor conference room.
- Install one 19-inch, wall-mounted equipment rack
- Install one Gigabit Ethernet switch.
- Install three video decoders
- Connect decoders to Gigabit Ethernet switch; connect coaxial cables to decoders.
- Install video control workstation with client video control software; connect to Gigabit Ethernet switch
- Install video projector on ceiling-mounted shelf in the conference room
- Setup and provision equipment and software

Traffic Systems Center. In accordance with the plans, the Contractor shall accomplish the following: (Note: no specific order is intended; order and scheduling shall be identified by the Contractor. In addition, these are partial lists only generally summarize the work to be done; they are neither exhaustive nor specific.)

- Install SONET multiplex equipment.
- Install two Gigabit Ethernet switches.
- Connect the SONET multiplex equipment to the channel banks.
- Install video decoders and video amplifiers.
- Install Video Control Subsystem
- Install power to all equipment.

- Remove the existing Meridian Fiber Optic Video Transceivers and transport them to the I94 at I57 shelter.
- Connect the outputs of the decoders to the video amplifier. Connect one output of the video amplifier to the existing video switching matrix, connect one output to the
- Install a video control workstation with client software. Provide power to the computer.
- Connect the video control workstation to the video decoders using the existing TSC LAN.
- Setup and provision equipment and software

I80 at State Line. In accordance with the plans, the Contractor shall accomplish the following: (Note: no specific order is intended; order and scheduling shall be identified by the Contractor. In addition, these are partial lists only generally summarize the work to be done; they are neither exhaustive nor specific.)

- Install SONET multiplex equipment.
- Install two Gigabit Ethernet switches.
- Connect Gigabit Ethernet switched to SONET multiplex.
- Connect power to SONET multiplex equipment, Gigabit Ethernet equipment, video amplifiers, and JPG capture encoders. The size and number of conductors shall be as indicated in the drawings. All electrical conductors shall be installed in EMT conduit.
- Disconnect coaxial cables from existing transmission equipment and reconnect to new video amplifiers.
- Install coaxial cables between the video amplifiers and the JPG capture encoders and the MPEG-2 encoders.
- Disconnect the existing channel multiplex equipment from the existing transmission equipment. Reconnect the channel multiplex to the DS-1 port on the SONET multiplex.
- Install serial port server. Connect port server to Gigabit Ethernet switch and one RS-232 port on the port server to the shelter's alarm panel.
- Setup and provision equipment and software

I80 at I394. In accordance with the plans, the Contractor shall accomplish the following: (Note: no specific order is intended; order and scheduling shall be identified by the Contractor. In addition, these are partial lists only generally summarize the work to be done; they are neither exhaustive nor specific.)

- Reconfigure existing video circuits and fiber optic patches. Work could include removing fiber optic video receivers for installation at either the I80/State Line or I57/I294 shelters. This work shall be included in the I80 at State Line and I57 at I294 pay items.

CCTV Distribution System, I57 at I294. In accordance with the plans, the Contractor shall accomplish the following: ((Note: no specific order is intended; order and scheduling shall be identified by the Contractor. In addition, these are partial lists only generally summarize the work to be done; they are neither exhaustive nor specific.)

- Install SONET multiplex equipment.
- Install two Gigabit Ethernet switches.
- Install video patch panel.
- Connect Gigabit Ethernet switched to SONET multiplex.

- Connect power to SONET multiplex equipment, Gigabit Ethernet equipment, video amplifiers, and JPG capture encoders. The size and number of conductors shall be as indicated in the drawings. All electrical conductors shall be installed in EMT conduit.
- Disconnect coaxial cables from existing transmission equipment and reconnect to new video amplifiers.
- Install coaxial cables between the video amplifiers and the JPG capture encoders and the MPEG-2 encoders.
- Disconnect the existing channel multiplex equipment from the existing transmission equipment. Reconnect the channel multiplex to the DS-1 port on the SONET multiplex.
- Install serial port server. Connect port server to Gigabit Ethernet switch and one RS-232 port on the port server to the shelter's alarm panel.
- Setup and provision equipment and software

CCTV Distribution System, Hillside Hub. In accordance with the plans, the Contractor shall accomplish the following: (Note: no specific order is intended; order and scheduling shall be identified by the Contractor. In addition, these are partial lists only generally summarize the work to be done; they are neither exhaustive nor specific.)

- Install new equipment racks and cable tray
- Install power to new cable racks
- Install SONET multiplex equipment.
- Install three Gigabit Ethernet switches.
- Connect Gigabit Ethernet switched to SONET multiplex.
- Install video patch panel.
- Connect power to SONET multiplex equipment, Gigabit Ethernet equipment, video amplifiers, and JPG capture encoders. The size and number of conductors shall be as indicated in the drawings. All electrical conductors shall be installed in EMT conduit.
- Disconnect coaxial cables from existing transmission equipment and reconnect to new video amplifiers.
- Install coaxial cables between the video amplifiers and the JPG capture encoders and the MPEG-2 encoders.
- Disconnect the existing channel multiplex equipment from the existing transmission equipment. Reconnect the channel multiplex to the DS-1 port on the SONET multiplex.
- Install serial port server. Connect port server to Gigabit Ethernet switch and one RS-232 port on the port server to the shelter's alarm panel.
- Set up and provision equipment and software

CCTV Distribution System, I94 at I57. In accordance with the plans, the Contractor shall accomplish the following: (Note: no specific order is intended; order and scheduling shall be identified by the Contractor. In addition, these are partial lists only generally summarize the work to be done; they are neither exhaustive nor specific.)

- Install SONET multiplex equipment.
- Install two Gigabit Ethernet switches.
- Install video patch panel.
- Connect Gigabit Ethernet switched to SONET multiplex.
- Connect power to SONET multiplex equipment, Gigabit Ethernet equipment, video amplifiers, and JPG capture encoders. The size and number of conductors shall be as indicated in the drawings. All electrical conductors shall be installed in EMT conduit.
- Disconnect coaxial cables from existing transmission equipment and reconnect to new video amplifiers.

- Install coaxial cables between the video amplifiers and the JPG capture encoders and the MPEG-2 encoders.
- Disconnect the existing channel multiplex equipment from the existing transmission equipment. Reconnect the channel multiplex to the DS-1 port on the SONET multiplex.
- Install serial port server. Connect port server to Gigabit Ethernet switch and one RS-232 port on the port server to the shelter's alarm panel.
- Patch fibers at the Skyway and Maintenance shelters as indicated in the plans to connect the CCTV cameras to the shelter at I94 and I57.
- Set up and provision equipment and software

CCTV Distribution System, I94 at I55. In accordance with the plans, the Contractor shall accomplish the following: (Note: no specific order is intended; order and scheduling shall be identified by the Contractor. In addition, these are partial lists only generally summarize the work to be done; they are neither exhaustive nor specific.)

- Install SONET multiplex equipment.
- Install two Gigabit Ethernet switches.
- Install video patch panel.
- Connect Gigabit Ethernet switched to SONET multiplex using Ethernet cables.
- Install video amplifiers.
- Install power to SONET multiplex equipment, Gigabit Ethernet equipment, video amplifiers, and JPG capture encoders.
- Disconnect coaxial cables from existing transmission equipment and reconnect to new video amplifiers.
- Install coaxial cables between the video distribution amplifiers and the JPG capture encoders, between the video distribution amplifiers and between the MPEG-2 encoders, and between the video distribution amplifiers and the in-rack video display clusters.
- Using coaxial cables, connect the input of the video amplifiers to a jack on the video patch panel. Connect the jack in the video patch panel to the corresponding fiber optic video receiver.
- Re-install Meridian FO Video Transceivers removed from the TSC. Reconnect the optical port to the fiber termination panel, careful to maintain the current configuration. Connect the RS-485 port of the to the control port on the corresponding MPEG-2 encoder. Connect the video output of the FO Video Transceiver to the field side (line) of the video patch panel; connect the output side (equipment) of the video patch panel to the distribution amplifier.
- Install serial port server. Connect port server to Gigabit Ethernet switch and one RS-232 port on the port server to the shelter's alarm panel.
- Patch fibers at the Skyway and Maintenance shelters as indicated in the plans to connect the CCTV cameras to the shelter at I94 and I55.
- Set up and provision equipment and software

Integration. The Contractor shall provide a third party to integrate software into the CCTV system. This software will control existing cameras and cameras installed under this project. The software shall allow any operator to select a camera and to place it on a monitor located at their facility of operations center. This capability shall be provided to operators at the Communications Center, the Traffic Systems Center, and the Emergency Traffic Patrol. Five

levels of access will be provided and assigned by user log-in identification. These privileges shall be controlled by the system administrator located at the Communications Center. The system shall support a minimum of 100 users or user identifications.

The Integrator shall assign system IDs to field equipment, locations, and populate the network's information database. This shall include legacy CCTV hardware.

The Contractor shall furnish and install two-colored, embossed identification tags for all equipment based on the system IDs. This requirement will be further defined by the Engineer regarding standard nomenclature and methods.

The Contractor shall provide a third party to integrate the SONET and Gigabit Ethernet System. This CCTV System Integrator shall have a minimum of ten years of experience with designing and integrating systems using Cisco equipment. The Integrator shall prove a 24/7/365 point of contact and system support. The Technical Staff shall include a minimum of three individuals certified at the level of Cisco CCIE.

The Contractor shall also integrate the new system equipment into the existing System Management System at the Communications Center. This work shall include alarm panels in the new communications shelters.

Final Documentation. The system shall not be complete until the delivery and approval of final documentation of the installed system. Documentation shall be provided in both hard-copy and electronic format. Hard copy documentation shall be in triplicate in heavy-duty piano-hinge binders or other rugged bindings as approved by the Engineer, and each lot of documentation shall be in rugged plastic or metal storage containers suitable for future access of materials. Electronic format documentation shall be PDF on CD media, in duplicate, and in a rugged positive-closure hard-shell container.

Documentation shall include but not be limited to approved copies of all submittal material complete with any modifications and corrections made in the course of construction, all test plans and test results, bid drawings marked to indicate all changes and field adjustments made in the course of construction, and all installation and maintenance manuals.

The Contractor shall provide a maintenance history for each piece of electronic equipment provided on this project. This history shall include the equipment type, model and serial numbers, date of manufacture, date and location of installation, date of all associated tests required by these Special Provisions and the performance of the equipment during these tests. Any maintenance activity performed on the unit because of a failure shall be documented, and shall include: an explanation of all failures, date that the equipment was removed from a cabinet, the repairs that were made, the date and nature of any tests made to check the correct operation of the unit, and the date and the location where the unit was reinstalled in the field.

Software Manuals.

Software manuals shall include the following:

Client Manual

The Client Manual shall clearly outline all steps necessary to operate the software. The manual shall include the following:

- Step by step instructions on how to perform all the tasks the system is capable of.
- Screen captures taken directly from the software to illustrate the instructions.
- A table of contents and index.

Server Manual

The Server Manual shall clearly outline all steps necessary to configure the software. The manual shall include the following:

- The Server Manual shall include screen captures taken directly from the software to illustrate the instructions.
- The Server Manual shall contain a table of contents.
- The Server Manual shall contain an index.

Driver Application Notes

Each device driver shall have Driver Application Notes that document configuration and operation of the driver and its devices.

The Driver Application Notes shall clearly outline all steps necessary to configure the software.

The Driver Application Notes shall include screen captures taken directly from the software to illustrate the instructions.

The Driver Application Notes shall contain a table of contents.

Training. Training shall be conducted at two levels, a systems operation level and a specific equipment level. A letter of commitment describing the proposed training shall be submitted along with the equipment submittals for review and approval.

System Operation training. The system operation training shall be conducted on the system when it becomes operational and prior to any final inspections. System training shall consist of actual hands-on training of the functioning system. The training shall encompass and demonstrate all aspects of the video system. System operation training shall be broken up into two levels, end user and administrator. The end user training will encompass monitor and camera selection as well as PTZ functions. The administrative level training will begin where the user training leaves off and include all operational and configuration topics including, but not limited to: maps, device designation/configuration, user configuration, system maintenance operations, and trouble shooting. A course outline shall be submitted for approval by the Engineer. Training shall be for up to 12 State employees. The Contractor may add other personnel to the training at no additional cost to the State.

Equipment training. Training on specific equipment shall be provided under this contract. The specific equipment training shall consist of hands on training of the SONET optical router and the gigabit Ethernet switches. The training shall be conducted by a manufacturer certified training partner. The training company shall have a minimum of 5 years experience in training

individuals of this type of equipment. The manufacturer's representative or distributor shall not perform the equipment training. Training classes shall be provided for each of the two types of equipment. The classes shall be multi-day, held at the District One Headquarters or at a location within District One, excluding downtown Chicago. Any prerequisite classes required for the specific equipment training shall be provided by the same training company as the specific equipment training. Training shall be for up to 10 State employees. The Contractor may add other personnel to the training at no additional cost to the State. Topics covered in detail shall be VLANs, IP Networking & Addressing, IP Sub netting, Configuration of switches, Spanning Tree protocol, IP Multicast, Multilayer switching and QoS.

There shall also be a complete one day session, in addition to the specific equipment training, for system specific training. The training shall include system setup, configuration, operation, maintenance, and trouble shooting. Specific equipment configuration settings shall be explained and discussed in detail during this training as well as operation and maintenance.

Warranty.

System Warranties. In addition to the specified contractor's warranty for the contract work as a whole, the CCTV Distribution System shall be furnished to the Department complete with manufacturer's warranties for incorporated equipment and systems. The time period for these shall be the same as that for the contract work, 6 months from the date of final acceptance of the work or the manufacturer's published standard warranty term from the date of final acceptance, whichever is longer. The contractor shall provide extended warranty coverage as may be necessary to meet these requirements at no additional cost to the state. Submittal information shall include complete warranty information and a contractor's certification of commitment to provide extended warranty coverage as specified.

Method of Measurement. Each individual subsystem shall be counted for payment when furnished and installed, connected, field tested and accepted. A 25% payment will be allowed when all sub-systems are assembled, delivered to the shop staging location and approved for testing by the Engineer. An additional 25% payment will be allowed when all sub-systems have been connected in simulation and successfully passed shop staging testing as approved by the Engineer. An additional 25% payment will be allowed for individual sub-systems as they are installed and made operational. The final 25% payment will be allowed when all sub-systems have been installed, connected and passed installed operational testing; when all training has been provided; and when all documentation has been completed, delivered and approved by the Engineer.

Basis of Payment. The CCTV Distribution System, although operating as an integrated whole, will be paid on the basis of the system elements installed at each individual location as follows:

CCTV DISTRIBUTION SYSTEM, COMCENTER
CCTV DISTRIBUTION SYSTEM, EMERGENCY TRAFFIC PATROL
CCTV DISTRIBUTION SYSTEM, TRAFFIC SYSTEMS CENTER
CCTV DISTRIBUTION SYSTEM, I80 AT STATE LINE
CCTV DISTRIBUTION SYSTEM, I57 AT I294
CCTV DISTRIBUTION SYSTEM, HILLSIDE
CCTV DISTRIBUTION SYSTEM, I57 AT I94
CCTV DISTRIBUTION SYSTEM, I55 AT I94

CLOSED CIRCUIT TELEVISION DOME CAMERA

January 5, 2004

Description. This work shall consist of furnishing and testing an integrated Closed-Circuit Television (CCTV) Dome Camera Assembly as indicated in the Plans. This assembly shall contain all components identified in the Materials Section and shall be configured as indicated on the plan sheets.

Materials.

General. The camera assembly shall consist of a non-pressurized dome with a camera, lens, camera controller, and pan/tilt motor, internal to the dome. External interfaces to the dome shall include a standard NTSC video BNC connector, RS-422 data interface for control, and 24 VAC power for the CCTV Dome Camera.

The camera assembly shall have a variable-speed manual pan and tilt, and shall include a "pre-set" timed rotation capability to allow the camera to be automatically oriented to predefined positions via the central software.

All equipment and materials shall be standard catalog items with manufacturer's part numbers and shall be readily available from the manufacturer. The manufacturer shall be ISO 14001 certified. The manufacturer's quality system shall comply with I.S./ISO 9001/EN 29001, QUALITY SYSTEM.

The manufacturer shall provide a three (3) year warranty. During the warranty period, the manufacturer shall pay inbound and outbound shipping charges for products returned as warranty claims. The manufacturer shall also provide an advance exchange program for the warranty claims.

The manufacturer shall provide technical support via email, fax and toll-free telephone. The above forms of support shall be provided Monday through Friday, 8:00am to 8:00pm EST.

The Contractor shall provide a totally operational assembly with all cabling and terminations matched to support the selected components.

CCTV Camera and Lens. The CCTV camera and lens shall comply with the following specifications:

Image Sensor: 1/4 inch or smaller

Signal format: Compatible with all applicable National Television Standards Committee (NTSC) specifications, have 470 horizontal lines and 350 vertical lines at 60 Hz and 30 full frames per second.

Color balance: Through-the-lens type, with less than 10 IRE units unbalance from 285° to 580° K.

Video Signal: NTSC

Iris: Automatic with Manual Override

Focus: Remotely Controlled and Automatic or Manual

Pixels: 724(H) X 494(V)

Day/Night Switchover Day (color) / Night (mono) automatic with manual override

Sensitivity:

Color : 2.0 Lux with fast shutter; 0.15 Lux with slow shutter

B & W: 0.3 Lux with fast shutter; 0.017 with slow shutter

Signal/noise Ratio: Greater than 50 dB with AGC off, CCIR weighting

Aperture f1.6 to f2.7

Focus Auto or manual (user selectable)

Iris Auto or manual (user selectable)

Automatic Gain	On or off (user selectable)
White Balance	Auto or manual (user selectable)
Zoom Range:	1 to 25X analog (Minimum)
Software Zoom:	1 to 10X digital (Minimum)
Temperature:	-40° F to 122° F (-40°C to 50°C)
Relative Humidity	0 to 100 %
Pan (Horizontal)	360 Degrees Continuous Manual: Variable speed, < 1 degree/sec to >50 Degrees/sec (minimum for large movements)
Preset Operation:	120 Degrees/sec (minimum) at 0.5 degree accuracy or 220 degrees/sec (minimum) at 0.1 degree accuracy
Tilt (Vertical)	+2 to -92 Degrees Manual: Variable speed, < 1 degree/sec to > 40 Degrees/sec Preset: 120 Degrees/sec (minimum)
Pre-Sets:	60 minimum with automatic rotation of preselected presets
Privacy Zones	6 (minimum) programmable zones that can be set for video blanking
Sector Identification	16 (minimum) independent sectors in the horizontal plane
Alarm Processing	2 (minimum) on-board alarm inputs

External synchronization: Color lock and burst phase adjustment shall be available along with horizontal phase adjustment.

The camera shall have a built-in programmable character generator capable of superimposing camera identification on the video display. The identification shall be programmable for up to two lines of 20 characters per line. Text characters shall be white with a black border 28 horizontal TV lines in height. The camera identification shall be programmable from a laptop computer, using the data connector in the control cabinet.

The control/receiver driver shall accept control commands through a standard RS-422 and RS-485 interface (user selectable). This port shall operate at user adjustable speeds between 2400 and 9600 bps. The receiver/driver shall be assigned a user selectable address and be capable of responding to a minimum of 64 unique addresses via software or dip switch.

Each unit shall only respond to commands directed to its unique address. The receiver/driver shall provide confirmation via the full duplex RS-422/RS-485 communications port in response to all commands.

The camera's 360° pan rotation shall be capable of being divided into 16 independent sectors with 16-character titles per sector. Any or all of the 16 sectors may be blanked from the operator. In addition to the blanking function, a privacy masking feature shall be provided that allows creation of up to six (6) rectangular masks that prohibit areas of the field of view from being seen even if the camera is panned, tilted, or zoomed.

The Contractor shall fully document and provide to the Department the communication protocol implemented on the receiver/driver. This protocol shall be open and allow third-party development of control software. If the current protocol is not NTCIP compliant, the Contractor shall supply upgrades to make the software compliant in the future at no cost to the Department.

The video shall be synchronized to the 60 Hz power source. A phase adjustment shall be provided for roll-free vertical interval switching at the video switch. In addition, a video isolation amplifier shall be provided to address potential interference.

A variable speed electronic shutter shall be provided which shall be adjustable from 1/100 to 1/10,000 of a second, in a minimum of seven steps. An Automatic White Balance Control shall be provided to adjust the white balance dynamically in response to the varying light conditions encountered in outside environments.

The camera shall provide a selectable slow shutter (frame integration) function that increases the camera's sensitivity up to 50 times by reducing the shutter speed. Selectable slow shutter speeds shall be 1/60 sec., 1/30 sec., 1/15 sec., 1/8 sec., ¼ sec., ½ sec., 1 sec., and fully automatic.

Digital image stabilization shall be provided using electronic compensation that filters out vibrations caused by wind and other environmental conditions.

The camera shall provide four (4) normally open or normally closed alarm input contacts and one (1) relay output. Any or all of the input contacts may be programmed upon activation to automatically move the camera to any preposition location, close the output relay for a programmed period of time, and display an alarm indication on the on-screen display of the display monitor.

Environmental Enclosure/Housing. The environmental enclosure shall be designed to physically protect the integrated camera from the outdoor environment and moisture via a sealed enclosure. If the option exists in the standard product line of the manufacturer, the assembly shall be supplied with an integral sun and bulletproof shield. The enclosure shall be fully water and weather resistant with a NEMA 4X rating or better and be IP66 certified. The weight shall not exceed 14 pounds and the size shall not exceed 10" diameter by 14" height.

The camera dome shall be constructed of distortion free polycarbonate, nominally 0.12" thick. The dome, by itself, shall withstand a 100 foot-pound impact without damage. When installed with the camera and its associated equipment, assembly shall exceed the UL1598 horizontal impact standard for lighting fixtures by a factor of 10. The Contractor shall certify compliance with this requirement.

The environmental housing shall include a camera-mounting bracket. In addition, the environmental housing shall include a heater, blower, and power surge protector. An integral fitting compatible with a standard 1-1/2 in NPT pipe, suitable for outdoor pendant mounting shall also be provided.

The enclosure shall be equipped with a heater controlled by a thermostat. The heater shall turn on when the temperature within the enclosure falls below 40°F (4.4°C). The heater shall turn off when the temperature exceeds 60°F (15.6°C). The heater will minimize internal fogging of the dome faceplate when the assembly is operated in cold weather.

In addition, a fan shall be provided as part of the enclosure. The fan will provide airflow to ensure effective heating and to minimize condensation.

The enclosure shall be equipped with a hermetically sealed, weatherproof connector, located near the top for external interface with power, video, and control feeds.

Diagnostic Software. PC based diagnostic software shall be supplied which shall allow all camera functions accessible via the control/receiver driver to be viewed or exercised. A cable shall be provided

with a standard PC RS422 and PC RS485 port, to connect the receiver driver to the command port of the integrated CCTV dome camera assembly. A copy of this PC diagnostic shall be supplied for every assembly. The program shall operate under Windows NT, 2000, Windows XP, and Windows 95/98 and be capable of configuring and controlling a CCTV dome camera assembly and its functions (position, zoom, focus, iris, power, color balance, etc.) from within it. This includes storing and recalling preset positions for fast system configuration.

Camera Control. The camera and assembly shall accept and respond correctly to commands issued by the software program and provide all responses anticipated by the software.

The following camera control functions shall be provided:

- The camera shall store up to 99 preset scenes with each preset programmable for 16 character titles. A tour function shall be available to consecutively display each of the preset scenes with a programmed dwell time. Any or all of the presets may be included or excluded from the tour.
- The camera shall be capable of recording two (2) separate tours of an operator's keyboard movements consisting of, tilt, and zoom activities for a total combined duration time of 15 minutes. Recorded tours can be continuously played back.
- When an operator stops manual control of the camera, and a programmed period of time is allowed to expire, the camera will execute one of the following operator programmable options: 1) return to preset #1 2) return to the automated tour previously executed 3) do nothing.
- The camera shall ensure that any advanced commands required to program the camera are accessed via three levels of password protection ranging from low to high security.
- The camera system shall provide a feature that automatically rotates, or pivots, the camera to simplify tracking of a person walking directly under the camera.
- The camera's 360° pan rotation shall be divided into 16 independent sectors with 16-character titles per sector. Any or all of the 16 sectors may be blanked from the operator.
- In addition to the blanking function, a privacy masking feature shall be provided that allows creation of up to six (6) rectangular masks that prohibit areas of the field of view from being seen even if the camera is panned, tilted, or zoomed

CONSTRUCTION REQUIREMENT

General. The Contractor shall prepare a shop drawing detailing the complete CCTV Dome Camera Assembly and installation of all components to be supplied for approval of the Engineer. Particular emphasis shall be given to the cabling and the interconnection of all of the components.

The Contractor shall demonstrate a prototype assembly using the proposed components. This demonstration shall take place at a Contractor selected site or at the factory. These conformance tests shall be completed prior to the delivery of any completed assemblies to the project site. Any deviations from these specifications that are identified during this testing shall be corrected prior to shipment of the assembly to the project site.

The Contractor shall install the CCTV dome camera assembly at the locations indicated in the Plans. The CCTV Dome Camera Assembly shall be mounted on a pole, wall, or other structure as indicated in the plans.

Camera assembly cables shall be terminated in the Equipment Cabinet, as indicated in the Plans. This cabinet includes communication and power interfaces. Power supplied to the CCTV dome camera shall be 24 VAC.

The Contractor shall terminate the composite cable with sufficient length to accommodate all required camera functions in the equipment cabinet and at the dome. The Contractor shall terminate the cable at both ends.

Appropriate connectors shall be furnished and installed to interface the in-cabinet components to the integrated dome camera assembly. The Contractor shall mount the in-cabinet components in the equipment cabinet and connect them to AC power, communications, and video feeds.

Testing. The Contractor shall test each installed CCTV Dome Camera Assembly. The test shall be conducted from the field cabinet using the standard communication protocol and a laptop computer. The Contractor shall verify that the camera can be fully exercised and moved through the entire limits of Pan, Tilt, Zoom, Focus and Iris adjustments, using both the manual control and presets. In addition, a video monitor and an oscilloscope shall verify that the video signal meets or exceeds the specified requirements. The Contractor shall maintain a log of all testing and the results. A representative of the Contractor and a representative of the Engineer shall sign the log as witnessing the results. Records of all tests shall be submitted to the Engineer prior to accepting the installation.

Documentation. One copy of all operations and maintenance manuals for each CCTV component shall be delivered for each assembly installed. In addition, full documentation for all software and associated protocols shall be supplied to the Department on a 3.5-inch floppy disk(s) and a CD-ROM. The Department reserves the right to provide this documentation to other parties who may be contracted with in order to provide overall integration or maintenance of this item.

Warranty. The Contractor shall warranty all materials and workmanship including labor for a period of two years after the completion and acceptance of the installation, unless other warranty requirements prevail. The warranty period shall begin when the Contractor completes all construction obligations related to this item and when the components for this item have been accepted, which shall be documented as the final completion date in the construction status report. This warranty shall include repair or replacement of all failed components via a factory authorized depot repair service. All items sent to the depot for repair shall be returned within two weeks of the date of receipt at the facility. The depot location shall be in the United States. Repairs shall not require more than two weeks from date of receipt and the provider of the warranty shall be responsible for all shipping costs.

The depot maintainer designated for each component shall be authorized by the original manufacturer to supply this service. A warranty certificate shall be supplied for each component from the designated depot repair site indicating the start and end dates of the warranty. The certificate shall be supplied at the conclusion of the system acceptance test and shall be for a minimum of two years after that point. The certificate shall name the Department as the recipient of the service. The Department shall have the right to transfer this service to other private parties who may be contracted to perform overall maintenance of the facility.

Method of Measurement. The Closed Circuit Television Dome Camera bid item will be measured for payment by the actual number of CCTV dome camera assemblies furnished, installed, tested, and accepted.

Basis of Payment. Payment will be made at the contract unit price for each CLOSED CIRCUIT TELEVISION DOME CAMERA including all equipment, material, testing, documentation, and labor detailed in the contract documents for this bid item.

CCTV DOME CAMERA HIGH MAST TOWER INSTALLATION

Description. This work consists of furnishing installing, and testing a CCTV dome camera mounting, and counterweight if required, high mast tower luminaire power cable with CCTV camera signal and power cables included in its construction, and a high mast tower video signal processing and power cabinet on specified high mast towers.

Submittals. The Contractor shall submit manufacturer's data sheets for the camera mounting adapter, counterweight, luminaire power cable with CCTV cables, and the enclosure and all components used in the construction of the video signal processing and power cabinet. The Contractor shall submit shop drawings showing the installation of the electrical and fiber optic components within the video signal processing and power cabinet. The drawings shall include cabinet plans and schematics with each cable and conductor labeled as they will be in the enclosure, and special care taken to show the routing of the fiber optic cable to avoid bending the fiber optic cable to a radius smaller than recommended by the fiber optic cable manufacturer.

Materials. The CCTV dome camera to mounted on the high mast tower ring is furnished separately under CLOSED CIRCUIT TELEVISION DOME CAMERA elsewhere in this specification.

The camera-mounting bracket shall be furnished by the manufacturer of the high mast tower or approved equivalent. The camera bracket shall mount without the use of any adapters to the tenon arm of the luminaire ring. It shall accept the camera dome into a mounting socket and be sealed to the camera so as to maintain positive pressure in the dome once the dome is installed. The camera-mounting bracket shall have provisions to accept a counterweight to balance the luminaire ring. The camera mounting bracket, counterweight, and dome camera shall all have provisions for attaching a safety chain.

The special high mast tower luminaire ring power cord shall be of similar construction to the standard high mast tower luminaire ring power cord used for high mast towers without camera installations, including the same number and gauge of power conductors as the standard cord. The special cable shall also include two 18 AWG copper conductors for the CCTV dome camera power, and one RG-6 coaxial cable for the CCTV dome camera signal. The additional cables shall be incorporated into the construction of the cable inside the same outer jacket. Separate cabling for the CCTV dome camera is not acceptable. The special cable luminaire power conductors shall be terminated identically to the standard cable. The video power cable shall be equipped with a plug, Amphenol 97-3106A-12DS-3P. The video signal cable shall terminate into a standard BNC connector.

CONSTRUCTION REQUIREMENTS

The CCTV dome camera to mounted on the high mast tower ring is installed separately under CLOSED CIRCUIT TELEVISION DOME CAMERA elsewhere in this specification.

The dome camera, camera mounting bracket, and counterweight shall be installed on the high mast tower ring under the supervision of the Engineer. All three shall be attached to the luminaire ring by a safety chain that is completely independent of the joints and fasteners that normally connect them together and to the luminaire ring. The safety chain shall be rated to support at a minimum 10 times the combined weight of all three components.

The special cable shall be installed in place of the standard high mast tower luminaire cable. The standard cable, if furnished, shall be returned to the Engineer in its original packaging. At existing towers the standard cable shall be removed, coiled and be returned to the Engineer. The special cable shall be trained and attached in an identical fashion to the standard cable. All connections at the luminaire ring shall be made inside the luminaire ring junction box and inside the camera mounting bracket. The end of the cable inside the tower shall be connected to the power connector, the video power and signal cables to the pigtail connectors extending from the video signal processing and power cabinet.

Configuration and testing. The operation of the CCTV dome camera shall be tested as part of the testing required under CLOSED CIRCUIT TELEVISION DOME CAMERA. All equipment shall be tested and verified as operational in accordance with the manufacturer's specifications and so that the video signal is produced and control of the camera from a remote location enabled to the satisfaction of the Engineer.

Method of Measurement. CCTV DOME CAMERA HIGH MAST TOWER INSTALLATION and CCTV DOME CAMERA HIGH MAST TOWER INSTALLATION, EXISTING TOWER will be counted on an-each basis, for each camera installed, configured, and operation in compliance with this specification and to the satisfaction of the Engineer.

Basis of Payment. This work will be paid at the Contract unit each for CCTV DOME CAMERA HIGH MAST TOWER INSTALLATION and CCTV DOME CAMERA HIGH MAST TOWER INSTALLATION, EXISTING TOWER which shall be payment in full for all material, labor, equipment, tools and all incidentals necessary for the completion of this work as described herein and elsewhere in the Contract documents.

CCTV CAMERA DOME CAMERA, SIGN TRUSS INSTALLATION

Effective Date: January 5, 2004

Description. This work shall consist of installing a complete and operating closed-circuit television (CCTV) camera on an existing sign truss.

Materials.

Sign Pole
Trunnion Support Beam
Clamps
Nuts/Bolts

CONSTRUCTION REQUIREMENTS

The Contractor shall install all hardware specified herein, tools, equipment, materials, supplies, and manufactured articles, and shall perform all operations necessary to install a complete CCTV camera as shown on the Plans and specified herein.

All external screws, nuts, and locking washers shall be stainless steel; no self-tapping screws shall be used unless specifically approved by the Engineer.

All wiring shall meet the requirements of the National Electric Code (NEC). All wire shall be cut of proper length before assembly. No wire shall be doubled back to take up slack. Wires shall be neatly laced into cable with nylon lacing or plastic straps. Cable shall be secured with clamps. Service loops shall be provided at all connections.

Method of Measurement. This item shall be measured in units of each for CLOSED CIRCUIT TELEVISION DOME CAMERA, SIGN TRUSS INSTALLATION installed.

Basis of Payment. This work shall be paid for at the Contract unit price each for CLOSED CIRCUIT TELEVISION DOME CAMERA, SIGN TRUSS INSTALLATION, complete in place, at each site. The payment will be compensation for the camera pole, trunnion support beam(s), clamps, nuts, bolts, and any other component incidental to the installation of a CCTV on a sign truss.

CLOSED-CIRCUIT TELEVISION CABINET

Description. The Contractor will furnish and install closed-circuit television cabinets on high mast light towers as shown in the plans.

Materials.

General. The Contractor shall furnish the following items as specified.

CCTV Cabinet. The CCTV Cabinet shall be a Hoffman Enclosures Model A20H1610SS6LP, Electromate Enclosures Model E-20H1610SSLP, or approved equal. The cabinet shall be NEMA 4X compliant.

The nominal dimensions of the cabinet shall be 20 inches high by 16 inches wide by 10 inches deep.

The cabinet shall be fabricated of 14 gauge Type 304 or Type 316L stainless steel. All seams shall be continuously welded and ground smooth with no holes or knockouts. The cabinet shall be fabricated with a rolled lip around three sides of the door and on all sides of the enclosure openings to exclude liquids and contaminants. A stainless steel door clamp assembly shall assure a watertight seal. A seamless gasket shall be included to assure a watertight and dust-tight seal.

The cabinet shall have provisions for padlocking in the closed position. The lock shall be Corbin #2 and two keys shall be supplied to the Department with each lock. The keys shall be removable in the locked position only.

A data pocket of high impact thermoplastic material shall be provided. The nominal dimensions of this pocket shall be 12 inches by 12 inches.

Collar studs shall be provided for mounting the stainless steel backboard panel.

The cabinet shall be unpainted. Cover, sides, top, and bottom shall have a smooth brushed finish.

The cabinet shall mount on the high-mast lighting towers, using the fabricated bolt pattern.

CONSTRUCTION REQUIREMENTS

General. The Contractor shall prepare and submit a shop drawing detailing the complete closed-circuit television cabinet installation. The shop drawings shall identify the installation and specifications of all components to be supplied, for approval of the Engineer.

The Contractor shall install the CCTV cabinet as indicated in the Plans. The Contractor shall verify the mounting criteria and dimensions based upon the tower or pole being provided. Any adjustments in the dimensions for the mounting brackets shall be approved by the Engineer.

The Contractor shall install the cabinet on the tower or pole as indicated in the Plans.

Documentation. One copy of all operations and maintenance manuals for each CCTV cabinet shall be delivered for each assembly installed.

Warranty. The Contractor shall warranty all materials and workmanship including labor for a period of two years after the completion and acceptance of the installation, unless other warranty requirements prevail. The warranty period shall begin when the Contractor completes all construction obligations related to this item and when the components for this item have been accepted, which shall be documented as the final completion date in the construction status report. This warranty shall include repair and/or replacement of all failed components via a factory authorized depot repair service. All items sent to the depot for repair shall be returned within two weeks of the date of receipt at the facility. The depot location shall be in the United States. Repairs shall not require more than two weeks from date of receipt and the provider of the warranty shall be responsible for all return shipping costs.

The depot maintainer designated for each component shall be authorized by the original manufacturer to supply this service. A warranty certificate shall be supplied for each component from the designated depot repair site indicating the start and end dates of the warranty. The certificate shall be supplied at the conclusion of the system acceptance test and shall be for a minimum of two years after that point. The certificate shall name the Department as the recipient of the service. The Department shall have the right to transfer this service to other private parties who may be Contracted to perform overall maintenance of the facility.

Basis of Payment. Payment will be made at the Contract unit price for each CLOSED-CIRCUIT TELEVISION CABINET including all equipment, material, testing, documentation, and labor detailed in the Contract documents for this bid item.
(EK – 03/19/2004)

CLOSED CIRCUIT TELEVISION CABINET EQUIPMENT

Effective Date: May 27, 2004

Description. The Contractor will furnish and install closed-circuit television cabinet equipment in a closed-circuit television cabinet as shown on the plans.

Materials.

CCTV Cabinet Equipment

Stainless Steel Panel. The cabinet shall be furnished with a stainless steel panel. This panel shall have nominal dimensions of 17 inches by 13 inches. It shall mount on the collar studs fabricated with the CCTV cabinet.

Fiber Optic Video Transmitter. The fiber optic video transmitter shall provide simplex transmission of NTSC video from the CCTV cabinet and duplex communications of camera-control, asynchronous data. Optic video and data transmission shall use one single mode fiber operating in the 1310/1550 nm windows using simple wavelength division multiplexing.

Mechanical and environmental requirements include the following:

Nominal dimensions:	7 inches by 5 inches by 1.5 inches
Operating Temperature Range:	-40°C to +70°C (minimum)
Storage Temperature Range:	-40°C to +75°C (minimum)
Relative Humidity Range	0% to 95% (non-condensing)
MTBF	75,000 hours (minimum)

Optical requirements include:

Connector:	ST
Optical Power Budget	15 dB (minimum) using 9/125 μ m single mode fiber
Operational Wavelengths	WDM using 1310/1550 nm and a single fiber

Video/data requirements include:

Video connector	BNC
Data connector	9-pin EIA RS-232, 25-pin EIA RS-232 connector, or terminal block
Data rates	1200-9600 bps, asynchronous
Input signal	0.5 – 2.0 V pk-pk (1 V nominal)/75 ohms impedance
Bandwidth	5 Hz – 7.0 MHz (minimum)
Differential Gain	$\leq 5\%$
Differential Phase	$\leq 5^\circ$
Tilt	$\leq 1\%$
Signal-to-Noise Ratio	50 dB with 10 dB of attenuation

The equipment shall operate from either 120 VAC or 12 VDC; maximum power requirements shall not exceed 15 watts.

Closed Circuit Television Camera Power Supply. The Closed Circuit Television Camera Power Supply shall supply power to the camera dome assembly. The requirements include:

Input voltage	120 VAC \pm 10%
Output voltage	24 VAC \pm 10%
Operating Temperature Range:	-40°C to +70°C (minimum)
Storage Temperature Range:	-40°C to +75°C (minimum)

The power supply shall include an AC power indicator with power on/off switch. All outputs shall be fused. The power supply shall be sized for the dome units being supplied, considering pan/tilt, heating, and blower requirements, and shall not be less than 100 VA.

Over-voltage Protection. Over-voltage protection shall be provided on the power conductors, camera control conductors, and the video cables. The specific protection is based on the elements being protected.

Incoming Power Protection. The incoming power shall be protected with a filtering surge protector that absorbs power line noise and switching transients. The specified performance shall be as follows:

Peak current	20 kA (8x20 μ s waveshape)
Life Test	5% change
Clamp voltage	280 V typical @ 20 kA
Response time	\leq 5 ns
Continuous service current	10 amps max. 120 VAC/60 Hz
Operating Temperature	-40°C to +75°C (minimum)
Nominal dimensions	7.15 inches by 3.13 inches by 2.3 inches

Video Cable Protection. The coaxial cable from the camera shall be protected with gas tubes and silicon avalanche devices. The units shall include re-settable fuses to protect against sneak currents. Specific requirements include:

Frequency	0 to 20 MHz
Peak surge current	20 kA (8x20 μ s waveshape)
Technology	Hybrid, solid-state
Attenuation	0.1 dB at 10 MHz
Response time	\leq 1 ns
Protection	Line-to-shield
Input/output connectors	BNC
Impedance	75 ohms
Temperature range	-40°C to +75°C (minimum)
Humidity	0% to 95% (non-condensing)
Clamping voltage	6 V
Nominal dimensions	4.5 inches by 1.5 inches by 1.25 inches

The video cable protector shall be UL listed.

Camera Control Cable Protection. The camera control cable protector shall protect the RS-422/RS-485 signal leads going to the camera dome assembly. Specific requirements include:

Technology	Hybrid, solid-state
Response time	\leq 5 ns
Protection	Line-to-ground
Input/output connectors	terminal block
Temperature range	-40°C to +75°C (minimum)
Humidity	0% to 95% (non-condensing)
Clamping voltage	7.25 V (maximum); \leq 7.0 V (typical)
Nominal dimensions	4.5 inches by 3.3 inches by 1.8 inches

The protector shall protect a minimum of four conductors. [Transmit Data (2 wires) and Receiver Data (2 wires)]

The Contractor shall include all necessary wires and cables necessary to interconnect the components of the CCTV cabinet. The Contractor shall provide a furcation kit to break-out, protect the individual fibers of the 6-fiber cable. The Contractor shall install ST-type connectors on these fibers.

CONSTRUCTION REQUIREMENTS

General. The Contractor shall prepare and submit a shop drawing detailing the complete closed-circuit television cabinet equipment installation. The shop drawings shall identify the installation and specifications of all components to be supplied, for approval of the Engineer. Particular emphasis shall be given to the cabling and the interconnection of all of the components.

The Contractor shall demonstrate a prototype assembly using the proposed components. This demonstration shall take place at a Contractor selected and Engineer approved location. These conformance tests shall be completed prior to the delivery of any completed assemblies to the project site. Any deviations from these specifications that are identified during this testing shall be corrected prior to shipment of the assembly to the project site.

Appropriate connectors shall be furnished and installed to interface the in-cabinet components to the integrated dome camera assembly. The Contractor shall mount the in-cabinet components in the equipment cabinet and connect them to AC power, communications, and video feeds.

Testing. The Contractor shall test each installed CCTV Cabinet Equipment. The test shall be conducted from the field cabinet using the standard communication protocol and a laptop computer. The Contractor shall verify that the camera can be fully exercised and moved through the entire limits of Pan, Tilt, Zoom, Focus and Iris adjustments, using both the manual control and presets. In addition, a video monitor and an oscilloscope shall verify that the video signal meets or exceeds the specified requirements.

The Contractor shall repeat the test at the communications shelter associated with the CCTV camera. This test confirms the distribution portion of the video circuit, that is, the portion of the circuit from the CCTV camera to the digital video encoder.

The Contractor shall maintain a log of all testing and the corresponding results. A representative of the Contractor and a representative of the Engineer shall sign the log as witnessing the results. Records of all tests shall be submitted to the Engineer prior to accepting the installation.

Documentation. One copy of all operations and maintenance manuals for each CCTV component shall be delivered for each assembly installed. In addition, full documentation for all software and associated protocols shall be supplied to the Department on a 3.5-inch floppy disk(s) and a CD-ROM. The Department reserves the right to provide this documentation to other parties who may be Contracted with in order to provide overall integration or maintenance of this item.

Warranty. The Contractor shall warranty all materials and workmanship including labor for a period of two years after the completion and acceptance of the installation, unless other warranty requirements prevail. The warranty period shall begin when the Contractor completes all construction obligations related to this item and when the components for this item have been accepted, which shall be documented as the final completion date in the construction status report. This warranty shall include repair and/or replacement of all failed components via a factory authorized depot repair service. All items sent to the depot for repair shall be returned

within two weeks of the date of receipt at the facility. The depot location shall be in the United States. Repairs shall not require more than two weeks from date of receipt and the provider of the warranty shall be responsible for all return shipping costs.

The depot maintainer designated for each component shall be authorized by the original manufacturer to supply this service. A warranty certificate shall be supplied for each component from the designated depot repair site indicating the start and end dates of the warranty. The certificate shall be supplied at the conclusion of the system acceptance test and shall be for a minimum of two years after that point. The certificate shall name the Department as the recipient of the service. The Department shall have the right to transfer this service to other private parties who may be Contracted to perform overall maintenance of the facility.

Method of Measurement. The CLOSED-CIRCUIT TELEVISION CABINET EQUIPMENT bid item will be measured for payment by the actual number of closed-circuit television cabinet – operational or closed-circuit television cabinet – strategic furnished, installed, tested, and accepted.

Basis of Payment. PAYMENT WILL BE MADE AT THE CONTRACT UNIT PRICE FOR EACH CLOSED-CIRCUIT TELEVISION CABINET EQUIPMENT INCLUDING ALL EQUIPMENT, MATERIAL, TESTING, DOCUMENTATION, AND LABOR DETAILED IN THE CONTRACT DOCUMENTS FOR THIS BID ITEM.

TEMPORARY CCTV CAMERA STATIONS

Description.

General. Temporary Closed Circuit Television (CCTV) Camera Stations have been installed in Contract 62733. The existing system includes camera stations and central equipment utilizing pole-mounted cameras, pole-mounted outdoor codec assemblies, central hardware and dedicated voice grade telephone line communications. The codec assemblies and central equipment are the product of TLC Watch, Inc.

The work under Contract 62583 shall include the relocation of temporary CCTV camera stations during construction, the maintenance of the temporary CCTV Camera stations, and the removal of the temporary CCTV camera stations.

The work under Contract 62583 shall also include the installation of additional field temporary CCTV camera stations, additions to the central hardware to support the added station(s), and the maintenance and removal of the temporary CCTV Camera stations installed under this contract.

Locations for stations may be indicated on the plans or designated by the Engineer. In either case, the exact location shall be confirmed and approved by the Engineer prior to installation.

Materials and Installation.

Temporary CCTV Camera Stations

Each camera station consists of a temporary wood pole, a pole-mounted dome camera with lowering device, a pole-mounted control and communications interface unit, interconnecting wiring and cabling, all connected to nearby 120-volt electrical power and to a dedicated voice-grade phone line.

Temporary wood poles shall be 80-foot wood poles. Additional poles shall be taken from state stock material in storage at the IDOT Rodenburg Maintenance Yard in Schaumburg. The contractor shall make arrangements with the Engineer not less than seven (7) business days in advance for pick-up of a pole or poles. The contractor is responsible for handling, transport and installation of the pole.

Poles shall be installed in ground to a depth no less than 10 feet, and shall otherwise be installed in conformance with Article 808.03 of the Standard Specifications.

Cameras are Phillips "EnviroDome" or similar with RS485 control. New cameras installed under Contract 62583 under the pay item TEMPORARY CCTV CAMERA STATION shall conform to the requirements specified for CLOSED CIRCUIT TELEVISION CAMERA contained elsewhere in these specifications. The cameras shall be attached to the wood pole with an externally mounted manual lowering device as manufactured by MG Squared of Birmingham, Alabama, or approved equal. The camera shall be mounted not less than 5 ft. from the top of the pole and the lowering device shall lower the camera within 3 ft. of grade level so that it may be serviced without the use of ladder. The camera-lowering device shall be not more than 4 ft. above the grade.

Pole-mounted control and communications interface units shall be fully compatible with the existing central system and shall be TLC800 NEMA 4X units, as manufactured by TLC Watch Inc. The units shall be complete with codec assembly, associated environmental temperature controls and modem, lightning and surge protection and all associated wiring and appurtenances for a complete installation. The unit shall accept a 120-volt feeder from an existing IDOT power source such as a controller cabinet. In an extreme case, utility service drop may be used as approved by the Engineer. Telephone line wiring direct from the utility or as otherwise provided by wiring extension from the utility delivery interface point shall be used. All extended power and the telephone line shall be included under this item.

Each station shall be complete with wiring between the camera and the control and communications interface unit, all as recommended by the camera manufacturer.

Power feeder and telephone line wiring shall be run aerially unless, for a particular location, Engineer approves the underground installation in unit duct. Unless otherwise indicated, power wiring shall be 2#6 with a #6 ground and telephone cable wiring shall be 3 pair No. 19 gauge. For anticipated station relocation, certain extra slack may be provided as designated by the Engineer. This wiring will be separately measured for payment.

Each station is complete with a modem card at the central equipment. Combined set-up, testing and configuration of station and central equipment by manufacturer's personnel shall be provided as required.

Temporary CCTV Camera Station, Relocations. Temporary CCTV Camera Station relocations shall be as required to accommodate ongoing construction and shall be as approved or as designated by the Engineer. Existing power feeder cables and telephone wiring shall be carefully handled and shall be re-used to the extent practical. All the necessary extension of power and the phone line wiring to relocate the station shall be included under this item. New power and telephone cabling, if needed, shall be with the approval of the Engineer. The Contractor shall be responsible for damage to existing cabling from mishandling or pole removal operations, and when so determined by the Engineer, shall provide cabling for the new location, to the length of the damaged spans, without additional payment.

Temporary CCTV Camera Station Removals, with Salvage. Temporary CCTV Camera Stations, shall be removed, as designated by the Engineer, and salvaged to state stock. It is anticipated that most or all of the stations will be removed at the same time but it is possible that some may be designated for removal at different times. Cameras, lowering devices, and control and communications interface units shall be disconnected and removed from poles before poles are removed, and these shall be carefully packed and protected, as approved by the Engineer and delivered and unloaded at a storage location within District 1, as designated by the Engineer. Poles shall be carefully removed, bundled and delivered to a state stock storage location within District 1, as designated by the Engineer. All equipment shall be delivered within 3 days of removing it from operation. The Contractor shall provide a list of equipment that is to remain the property of the State, including model and serial numbers, where applicable.

Temporary CCTV Station Maintenance. The Contractor shall be fully responsible for maintenance of all items installed or in service under Contract 62733 and all new items installed under Contract 62583. Existing and proposed temporary CCTV systems are shown in general locations on the plans, and shall not be construed as an exact representation of the field conditions. It remains the Contractor's responsibility to visit the site to inspect, confirm and ascertain the exact condition of each station. The Contractor shall be responsible for maintaining the electric power service and the telephone service to each location through all stages of construction. The Contractor shall coordinate work with the other Contractors to minimize relocations of these services and to maintain the operation of the temporary CCTV systems without interruption.

The Contractor will not be responsible for the central equipment maintenance or other non-related camera stations installed under other Contracts, but shall be responsible for modem cards and any failure thereof that are installed as part of this Contract work.

The Contractor shall promptly correct any deficiency of the temporary CCTV systems upon notification by the Engineer. All deficiencies shall be corrected within 48 hours. Repair delays without an acceptable explanation will be cause for denying payment. The Contractor shall coordinate with the State's Advanced Systems Maintenance Contract (ASMC) Contractor relative to set-up, configuration and ongoing system operation.

Damage caused by the Contractor's operations shall be repaired at no additional cost to the Contract. The Contractor at no additional cost shall repair damage caused by the other Contractors to the State.

Basis of Payment. This work shall be paid at the Contract unit price each, as applicable, for:

TEMPORARY CCTV CAMERA STATION
TEMPORARY CCTV CAMERA STATION, RELOCATE
TEMPORARY CCTV CAMERA STATION, REMOVE AND SALVAGE

Maintenance of the temporary CCTV Camera systems shall be paid for at the Contract unit price per calendar month or fraction thereof for TEMPORARY CCTV CAMERA STATION MONTHLY MAINTENANCE

(CTE – 1/05/2005)

UNINTERRUPTIBLE POWER SUPPLY UPGRADE

Description. This specification defines the electrical and mechanical characteristics and requirements for a continuous-duty three-phase, solid-state, uninterruptible power supply (UPS) system. The UPS shall provide high-quality AC power for sensitive electronic equipment loads.

The UPS provided shall be a Liebert Npower or approved equivalent. The UPS and all appurtenances shall be delivered to a site specified herein. Included in the bid shall be all delivery and factory post installation inspection and verification charges.

The layouts of the various items of equipment, accessories, specialties, and wiring on the Drawings are diagrammatic, unless specifically dimensioned, and do not necessarily indicate every box, conduit, switch, wiring device or similar items required for a complete installation

Materials. All materials of the UPS shall be new, of current manufacture, high grade and free from all defects and shall not have been in prior service except as required during factory testing.

General. The maximum working voltage, current, and di/dt of all solid-state power components and electronic devices shall not exceed 75% of the ratings established by their manufacturer. The operating temperature of solid-state component sub-assembly shall not be greater than 75% of their ratings. Electrolytic capacitors shall be computer grade and be operated at no more than 95% of their voltage rating at the maximum rectifier charging voltage.

UPS module. The UPS module shall comply with the following:

Voltage. Input/output voltage specifications of the UPS shall be:

- Rectifier Input: 208 volts, three-phase, 4-wire-plus-ground.
- Output: 208 volts, three-phase, 4-wire-plus-ground.

Output Load Capacity. Specified output load capacity of the UPS shall be 40 KVA at 0.8 lagging power factor.

The UPS shall be designed to operate as an on-line, double-conversion, reverse-transfer system in the following modes:

Normal - The critical AC load is continuously supplied by the UPS inverter. The rectifier/charger derives power from a utility AC source and supplies DC power to the inverter while simultaneously float-charging a power reserve battery.

Emergency - Upon failure of utility AC power, the critical AC load is supplied by the inverter, which without any switching, obtains power from the battery. There shall be no interruption in power to the critical load upon failure or restoration of the utility AC source.

Recharge - Upon restoration of utility AC power, after a utility AC power outage, the rectifier/charger shall automatically restart, walk-in, and gradually assume the inverter and battery recharge loads.

Bypass - If the UPS must be taken out of service for maintenance or repair, or should the inverter overload capacity be exceeded, the static transfer switch shall perform a reverse transfer of the load from the inverter to the bypass source with no interruption in power to the critical AC load.

The AC input to the UPS shall comply with the following:

Voltage Configuration for Standard Units: three-phase, 4 -wire plus ground.

Voltage Range: +10%, -20% of nominal.

Frequency: Nominal frequency +/-5%.

Power Factor: Up to 0.96 lagging at nominal input voltage and full rated UPS output load with optional input filter. Minimum 0.80 lagging without optional input filter.

Inrush current: 800% of full load current maximum.

Current Limit: 115% of nominal AC input current maximum. 100% of nominal for optional generator operation.

Input Current Walk-In: 20 seconds to full rated input current maximum. Field selectable 5 through 20 seconds.

Current Distortion: 10% reflected THD maximum at full load when fitted with optional input filter. 30% THD maximum at full load without optional input filter.

Surge Protection: Sustains input surges without damage per criteria listed in ANSI C62.41 Category A and B.

The AC output/UPS inverter shall comply with the following:

Voltage Configuration: three-phase, 4-wire plus ground

Voltage Regulation:

- 0.5% three-phase RMS average for a balanced three-phase load for the combined variation effects of input voltage, connected load, battery voltage, ambient temperature, and load power factor.
- 1.0% three-phase RMS average for a 100% unbalanced load for the combined variation effects of input voltage, connected load, battery voltage, ambient temperature, and load power factor.

Frequency: Nominal frequency +/-0.1%.

Frequency Slow Rate: 1.0 Hertz per second maximum. Field selectable from 0.1 to 1.0 Hz per second.

Phase Displacement:

- 0.5 degree for balanced load,
- degrees for 100% unbalanced load.

Bypass Line Sync Range:

- 0.5 Hertz, Field selectable \pm 0.5 to 5.0 Hz.

Voltage Distortion:

- 1% total harmonic distortion (THD) for linear loads.
- 2.5% THD for 100% nonlinear loads (3:1 crest factor) without kVA/kW derating.

Load Power Factor Range: 1.0 to 0.7 lagging without derating.

Output Power Rating: Rated kVA at 0.8 lagging power factor.

Overload Capability:

- 125% for ten minutes (without bypass source).
- 150% for one minute (without bypass source).
- 200% for 10 cycles, pulse paralleling with the static switch.

Inverter Output Voltage Adjustment: +/-5% manual adjustment.

Voltage Transient Response:

- 100% load step: $\pm 2.5\%$.
- Loss or return of AC input power: $\pm 1.0\%$.
- Manual transfer of 100% load: $\pm 3.0\%$.

Transient Recovery Time: to within 1% of output voltage within one cycle.

N. Voltage Unbalance: 100% unbalanced load: $\pm 1\%$.

Fault Clearing: Sub-cycle current of at least 300%.

The UPS shall be able to withstand the following environmental conditions without damage or degradation of operating characteristics:

Operating Ambient Temperature: UPS Module: 32°F to 104°F (0°C to 40°C), Battery: 77 +/-9°F (25 +/-5°C).

Storage/Transport Ambient Temperature: UPS Module: -4°F to 158°F (-20°C to 70°C).

Battery: -4°F to 92°F (-20°C to 33°C)

Relative Humidity: 0 to 95%, non-condensing.

Altitude: Operating: to 6,600 ft. (2,000 meters) above Mean Sea Level. Derated for higher altitude applications. Storage/Transport: to 40,000 ft. (12,200 meters) above Mean Sea Level.

Audible Noise: Noise generated by the UPS under any condition of normal operation shall not exceed 65 dBA measured 1 meter from surface of the UPS.

Separate Battery Room. The batteries used in the separate battery room shall comply with the following:

Battery Cells: Flooded Battery Type, Manufacturer C&D Technologies XT4LC-13 or equal with Seismic Zone 1 mounting racks. Battery quantity and rack data shall be as outlined on plans.

Reserve Time: 8 hours at full load, 0.8 power factor, with ambient temperature between 20° and 30°C.

Recharge Time: to 95% capacity within ten (10) times discharge time.

Input Transformer. The input transformer shall be factory installed inside the UPS module cabinet without increasing the standard footprint.

Rectifier/Charger. The term rectifier/charger shall denote the solid-state equipment and controls necessary to convert incoming AC power to regulated DC power for input to the inverter and for battery charging. The rectifier/charger shall be a phase-controlled, solid-state SCR type with constant voltage/current limiting control circuitry.

The rectifier/charger unit shall be provided with AC input current limiting whereby the maximum input current shall be limited to 115% of the full input current rating. The rectifier/charger shall operate at a reduced current limit mode whenever the critical load is powered from the UPS static bypass circuit such that the maximum UPS input current will not exceed 115% of full load input current. In addition, the rectifier/charger shall have a separate battery current limit, adjustable from 0 to 15% of the full load input current. An optional second circuit shall limit the battery recharge current to zero when activated by a customer-supplied contact closure to signal a customer function such as generator operation.

The rectifier/charger shall contain a timed walk-in circuit that causes the unit to gradually assume the load over a 20-second time interval after input voltage is applied. Walk-in time shall be field selectable for 5 through 20 seconds.

Power semiconductors in the rectifier/charger shall be fused with fast-acting fuses, so that loss of any one power semiconductor shall not cause cascading failures.

The rectifier/charger shall have an output filter to minimize ripple voltage into the battery. Under no conditions shall ripple voltage into the battery exceed 1% RMS. The filter shall be adequate to insure that the DC output of the rectifier/charger will meet the input requirements of the inverter. The inverter shall be able to operate from the rectifier/charger with the battery disconnected.

Upon restoration of utility AC power, after a utility AC power outage and prior to a UPS automatic end-of-discharge shutdown, the rectifier/charger shall automatically restart, walk-in, and gradually assume the inverter and battery recharge loads.

In addition to supplying power for the inverter load, the rectifier/charger shall be capable of producing battery charging current sufficient to replace 95% of the battery discharge power within ten (10) times the discharge time. After the battery is recharged, the rectifier/charger shall maintain the battery at full charge until the next emergency operation.

There shall be DC over-voltage protection so that if the DC voltage rises to the pre-set limit, the UPS is to shut down automatically and initiate an uninterrupted load transfer to the static bypass line.

Inverter. The term inverter shall denote the solid-state equipment and controls to convert DC power from the rectifier/charger or battery to regulated AC power for supporting the critical load. The inverter shall use Insulated Gate Bipolar Transistors (IGBTs) in a phase-controlled, pulse width modulated (PWM) design capable of providing the specified AC output.

The inverter shall be capable of supplying current and voltage for overloads exceeding 100% and up to 200% of full load current. A status indicator and audible alarm shall indicate overload operation. The UPS shall transfer the load to bypass when overload capacity is exceeded.

The inverter shall be capable of supplying an overload current of 150% of its full-load rating for one minute. For greater currents or longer time duration, the inverter shall have electronic current-limiting protection to prevent damage to components. The critical load will be transferred to the static bypass automatically and uninterrupted. The inverter shall be self-protecting against any magnitude of connected output overload. Inverter control logic shall sense and disconnect the inverter from the critical AC load without the requirement to clear protective fuses.

The output voltage shall be maintained to within $\pm 2.5\%$ with a 0-to-100% step load change or a 100%-to-0 step load change. The output voltage shall recover to within 1% of nominal voltage within 1 cycle.

For linear loads, the output voltage total harmonic distortion (THD) shall not be greater than 1%. For 100% rated load of 3:1 crest factor nonlinear loads, the output voltage total harmonic distortion shall not be greater than 2.5%. The output rating is not to be derated in kVA nor kW due to the 100% nonlinear load with 3:1 crest factor.

A dry-type power transformer shall be provided for the inverter AC output. It shall have copper wiring exclusively. The transformers hottest spot winding temperature shall not exceed the temperature limit of the transformer insulation class of material when operating at full load at maximum ambient temperature.

Electronic controls shall be provided to regulate each phase so that an unbalanced loading will not cause the output voltage to go outside the specified voltage unbalance or phase displacement. With 100% load on one phase and 0% load on the other 2 phases or 100% load on 2 phases and 0% load on the other phase, the voltage balance is to be within 1% and the phase displacement is to be 120 degrees within ± 1 degree.

Power semiconductors in the inverter unit shall be fused with fast-acting fuses, so that loss of any one power semiconductor will not cause cascading failures.

For rapid removal of the inverter from the critical load, the inverter control electronics shall instantaneously turn off the inverter transistors. Simultaneously, the static transfer switch shall be turned on to maintain continuous power to the critical load.

The inverter shall be protected by the following disconnect levels:

- DC Overvoltage Shutdown
- DC Undervoltage Warning (Low Battery Reserve), user adjustable from 1 to 99 minutes
- DC Undervoltage Shutdown (End of Discharge)

To prevent battery damage from overdischarging, the UPS control logic shall automatically raise the shutdown voltage set point as discharge time increases beyond fifteen (15) minutes.

The inverter shall use a manual control to adjust the output voltage from +/- 5% of the nominal value.

The output frequency of the inverter shall be controlled by an oscillator. The oscillator shall be temperature compensated and hold the inverter output frequency to +/- 0.1% for steady state and transient conditions. Drift shall not exceed 0.1% during a 24-hour period. Total frequency deviation, including short time fluctuations and drift, shall not exceed 0.1% from the rated frequency.

Static Transfer Switch. A static transfer switch and bypass circuit shall be provided as an integral part of the UPS. The static switch shall be a naturally commutated high-speed static (SCR-type) device rated to conduct full load current continuously. The switch shall have an overload rating of 110% rated load continuously, 200% rated load for five seconds. The static transfer switch shall also have fault-clearing capabilities of 1100 amperes for 1 second, 3000 amperes for 10 cycles, and 6000 amperes peak for the first half cycle.

The static transfer switch control logic shall contain an automatic transfer control circuit that senses the status of the inverter logic signals, and operating and alarm conditions. This control circuit shall provide an uninterrupted transfer of the load to an alternate bypass source, without exceeding the transient limits specified herein, when an overload or malfunction occurs within the UPS, or for bypassing the UPS for maintenance.

The transfer control logic shall automatically turn on the static transfer switch, transferring the critical AC load to the bypass source, after the transfer logic senses any of the following conditions:

- Inverter overload capacity exceeded
- Critical AC load overvoltage or undervoltage
- Battery protection period expired
- UPS fault condition

The transfer control logic shall inhibit an automatic transfer of the critical load to the bypass source if any of the following conditions are present:

- Inverter/bypass voltage difference exceeding preset limits
- Bypass frequency out of limits
- Bypass out-of-synchronization range with inverter output

Retransfer of the critical AC load from the bypass source to the inverter output shall be automatically initiated unless inhibited by manual control. The transfer control logic shall inhibit an automatic retransfer of the critical load to the inverter if one of the following conditions exists:

- Bypass out of synchronization range with inverter output
- Inverter/bypass voltage difference exceeding preset limits
- Overload condition exists in excess of inverter full load rating
- UPS fault condition present

Maintenance Bypass Switch. A manually operated maintenance bypass switch shall be mounted in a separate adjacent cabinet and directly connect the critical load to the bypass AC input power source, bypassing the rectifier/charger, inverter, and static transfer switch. No wiring shall pass through the UPS cabinet.

All energized terminals shall be shielded to ensure that maintenance personnel do not inadvertently come in contact with energized parts or terminals. A means to de-energize the static switch shall be provided when the UPS is in the maintenance bypass mode of operation.

With the critical load powered from the maintenance bypass circuit, it shall be possible to check out the operation of the rectifier/charger, inverter, battery, and static transfer switch. When the application calls for the Maintenance Bypass Switch to be bolted to the UPS cabinet, the interconnecting cables are to be provided, pre-cut and pre-plugged.

The temporary battery power pack shall include sealed, lead-acid valve regulated battery cells housed in a separate cabinet that matches the UPS cabinet styling to form an integral system line-up. Battery cells shall be mounted on slide-out trays for ease of maintenance. A battery disconnect circuit breaker with undervoltage release (UVR) shall be included for isolation of the battery pack from the UPS module. The UPS shall automatically be disconnected from the battery by opening the breaker when the battery reaches the minimum discharge voltage level.

Casters and leveling feet shall also be provided with the battery power pack cabinet for ease of installation. When the application calls for the battery cabinet to be bolted to the UPS cabinet, the interconnecting cables are to be provided, precut and preplugged.

Display and Controls. The UPS shall be provided with a microprocessor based unit status display and controls section designed for convenient and reliable user operation. A graphical display shall be used to show a single-line diagram of the UPS, and shall be provided as part of the monitoring and controls sections of the UPS. All of the operator controls and monitors shall be located on the front of the UPS cabinet. The monitoring functions such as metering, status and alarms shall be displayed on the graphical LCD display. Additional features of the monitoring system shall include:

- Menu-driven display with pushbutton navigation
- Real time clock (time and date)
- Alarm history with time and date stamp
- Battery back-up memory

The following parameters shall be displayed:

- Input AC voltage line-to-line
- Input AC current for each phase
- Input frequency
- Battery voltage
- Battery charge/discharge current
- Output AC voltage line-to-line and line-to-neutral for each phase
- Output AC current for each phase
- Output frequency
- Percent of rated load being supplied by the UPS
- Battery time left during battery operation

The following alarm messages shall be displayed:

- Input power out of tolerance
- Input phase rotation incorrect
- Incorrect input frequency
- Charger in reduced current mode
- Battery charger problem
- Battery failed test
- Low battery warning (adjustable 1 to 99 minutes)
- Low battery shutdown
- DC bus overvoltage
- Bypass frequency out of range
- Load transferred to bypass
- Excessive retransfers attempted
- Static switch failure
- UPS output not synchronized to bypass power
- Input power single phased
- Input voltage sensor failed
- Inverter leg overcurrent in X-phase
- Output undervoltage

- Output overvoltage
- Output overcurrent
- System output overloaded
- Load transferred to bypass due to overload
- Overload shutdown
- Control error
- Critical power supply failure
- Load transferred due to internal protection
- External shutdown (remote EPO activated)
- Fan failure
- Overtemperature shutdown impending
- Overtemperature shutdown

An audible alarm shall be provided and activated by any of the above alarm conditions.

The following UPS status messages shall be displayed:

- Normal operation
- Load on maintenance bypass
- Load on UPS
- Load on static bypass
- System shutdown
- UPS on battery

UPS start-up, shutdown, and maintenance bypass operations shall be accomplished through the front-panel pushbutton controls. Menu-driven user prompts shall be provided to guide the operator through system operation without the use of additional manuals. Pushbuttons shall be provided to display the status of the UPS and to test and reset visual and audible alarms. A mimic screen shall be available on the LCD screen to depict a single-line diagram of the UPS, with switch positions and power flow.

The UPS shall be provided with a menu-driven On-Line Battery Test feature. The test shall ensure the capability of the battery to supply power to the inverter while the load is supplied power in the normal mode. If the battery fails the test, the system shall automatically do the following:

- Maintain the load through the UPS
- Display a warning message
- Sound an audible alarm

The battery test feature shall have the following user selectable options:

- DC bus voltage threshold (pass/fail value)
- Interval between tests (2 to 9 weeks)
- Date and time of initial test
- Enable/disable test

Input Filter. The rectifier/charger shall include an input filter to reduce reflected input current distortion to 10% THD at full load with nominal input voltage. Another benefit of the input filter shall be to maintain the input power factor at 0.90-0.96 lagging minimum from full load to half load with nominal input voltage.

External Maintenance Bypass Cabinet. A matching external maintenance bypass cabinet shall be provided to enable the UPS module to be completely isolated from the electrical system while the critical load is powered through the external maintenance bypass line. This optional cabinet shall provide make-before-break operation for transfers to and from the external maintenance bypass line with a single rotary switch. The following components shall be standard: single rotary switch with auxiliary contacts, inter-cabinet wiring, casters, and leveling feet. This matching cabinet shall bolt to the side of the UPS module with a barrier shield to separate the two cabinets. Only front access shall be required for installation and service.

Optional Remote Status Panel. A remote status panel shall be provided and shall include the following:

- Load on UPS LED
- Load On Bypass LED
- Battery Discharge LED
- Low Battery Reserve LED
- UPS Alarm Condition LED
- New Alarm Condition LED (for a second UPS alarm condition)
- Audible Alarm with Reset pushbutton
- Lamp Test/Reset pushbutton

The remote status panel shall be provided in a NEMA Type 1 enclosure for wall mounting.

Panelboards.

Panelboards must be circuit breaker or fusible switch type, of dead front construction, with voltage characteristics, bus size, main lugs only or main protective device, and number and size of branch circuits indicated on the Drawings.

Panelboards must be recessed or surface mounted as indicated on the Drawings, enclosed in a NEMA 1 gauge steel cabinet with steel trim, and door with continuous stainless steel piano concealed hinges and cylinder type locks.

Panelboards must be fully rated, labeled with their UL short circuit rating, and must have a service entrance label when required by the application. Series integrated ratings are not acceptable.

Circuit breakers must be of the industrial, bolt-on type. Number of poles and rating as indicated on the Drawings.

Panelboards must be designed for sequence phase connection of branch circuit devices to allow for the complete flexibility of circuit arrangement to evenly balanced the electrical load on each phase.

The manufacturers shall be Berthold Electric, Illinois Switchboard, Siemens/ITE, Cutler-Hammer, Square D, or approved equal.

Circuit breakers must be of the bolt-on type, industrial heavy-duty, quick-make, quick-break, single or multi-pole of the type specified herein and indicated on the Drawings.

Circuit breakers for 120 volt and 208 volt service must be 240 volt rated, must be of the "bolt-on" type and must have an interrupting rating of 10,000 amperes at 240 VAC. Trip settings must be as indicated on the Drawings.

Circuit breakers must be thermal magnetic type with common handle for a multiple pole circuit breakers. Circuit breakers must be a minimum 100 ampere frame and through 100 ampere trip sizes must take up the same pole spacing. Circuit breakers must be UL listed as type SWD for lighting circuits.

Molded case circuit breakers must provide circuit overprotection with inverse time delay and instantaneous tripping characteristics.

Circuit breakers must be operated by a toggle-type handle and must have a quick-make, quick-break over-center switching mechanism that is mechanically trip free. Automatic tripping of the breaker must be clearly indicated by the handle position.

Circuit breakers must be provided with copper bus and copper lugs to accommodate oversized cable due to voltage drop.

Contacts must be non-welding silver alloy. Arc extinction must be accomplished by means of DE-ION arc chutes.

Each panelboard breaker must be connected to the main bus with copper bus bar. Insulated cable is not acceptable.

Interiors must be completely factory assembled with bolt on devices. Interior must be designed so that circuit breakers can be added or replaced without disturbing adjacent units and without removing main bus connectors, and must be designed so that circuits may be changed without additional machining, drilling, or tapping. Spaces for future breakers must have bussing provided, of required capacity, for the maximum device that can be fitted into them.

Bus must be hard drawn electrolytic copper, having 98% conductivity and sized on a basis of 1000 amperes, maximum, per square inch of cross sectional area.

Neutrals, where called for, must be grouped and arranged on a common bus and each terminal must be stamped to indicate the number of the breaker with which it is associated. Neutral bussing must have a suitable compression lug for each feeder requiring a connection.

Each panelboard must be furnished with a full length ground bus drilled and tapped to accommodate a ground cable for each circuit breaker. Cable terminals must be provided.

Basic electrical materials and methods. Contractor shall distributed power by 208Y/120 volts, 3 phase, 4 wire +ground via conduits as indicated.

Provide branch circuit conduit and wire required to serve circuit numbers as indicated on the Panelboard Schedules to the designated equipment.

Provide galvanized rigid steel (GRS) conduit and fittings in all areas of this Project except for flexible conduit connections to equipment.

Provide complete system of copper AC wire and cable conductors.

Factory color code secondary distribution feeders and branch circuit wiring No. 8 AWG and smaller as follows.

208/120 Volts	
A	Black
B	Red
C	Blue
Neutral	White
Ground	Green

Code with colors other than those used for secondary distribution.

Colored pressure-sensitive plastic tapes may be used to color code wire in sizes No. 6 AWG and larger. Tape must be 3/4" or Y' wide and in specified colors.

Wire and cable for branch power circuits shall be type "THWN-AWG" copper conductors of not less than 98% conductivity with 600 volt insulation. 120 volt branch circuits extending more than 70 feet from the associated panel must be not less than No. 10 AWG to the first fixture or other current-consuming outlet. Branch power circuit wiring must be suitable for 60 degrees C operating temperature, of types appropriate for dry and wet locations. Use only solid conductor wire for sizes No. 12 and No. 10, and only stranded conductor wire for sizes No. 8 and larger.

The cable manufacturers shall be Carol, Okonite, Parelli, Rome, Triangle, or approved equal.

Drywall Partition. This item includes drywall partition framing, gypsum board, taped and sanded joint treatment, and Gypsum board accessories and fasteners. This specification also includes surface preparation and field application of paints and finishes for interior surfaces, and interior painting and finishing schedule.

References for Gypsum board include:

American Society for Testing and Materials (ASTM):

1. ASTM C36 Gypsum Wallboard.
2. ASTM C475 Joint Treatment Materials for Gypsum Wallboard Construction.
3. ASTM C514 Nails for the Application of Gypsum Wallboard.
4. ASTM C840 Application and Finishing of Gypsum Board.
5. ASTM C1002 Steel Drill Screws for the Application of Gypsum Board.
6. ASTM E90 Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.
7. ASTM E119 Fire Tests of Building Construction and Materials.

Gypsum Association (GA):

1. GA 201 Gypsum Board for Walls and Ceilings.
2. GA 216 Recommended Specifications for the Application and Finishing of Gypsum Board.
3. GA 600 Fire Resistance Design Manual.

Fire Rated Gypsum Board: ASTM C36; fire resistive type, UL rated; 5/8-inch thick, tapered edge.

Accessories:

- Acoustical Sealant: Non-hardening, non-skinning, for use in conjunction with gypsum board, as recommended by wallboard manufacturer.
- Corner Beads: Metal, 1-1/4 x 1-1/4
- Edge Trim: GA 201 and GA 216; Type LC L LK U exposed reveal bead.
- Joint Materials: ASTM C475; GA 201 and GA 216; reinforcing tape, joint compound, adhesive, and water.
- Fasteners for Metal Stud Application

Quality Assurance: Perform Work in accordance with ASTM C840.

References for painting include:

American Society for Testing and Materials (ASTM):

ASTM E 84 - Test Method for Surface Burning Characteristics of Building Materials.

Manufacturers. Subject to compliance with project requirements, manufacturer's offering specified items, which may be incorporated in the work, include the following:

Benjamin Moore and Company, Montvale, NJ (201) 573-9600.
Pittsburgh Paints, Pittsburgh, PA (800) 441-9695.
Sherwin-Williams Company, Cleveland, OH (800) 321-8194.

Product options and substitutions. Substitutions: Permitted.

Paints, Primers, Accessories:

Paints.

Manufacturer's "Best Grade" for each type specified.
Ready-mixed; pigments fully ground maintaining a soft paste consistency, capable of readily and uniformly dispersing to a complete homogeneous mixture.
Providing good flowing and brushing properties and be capable of drying or curing free of streaks or sags.

Primers and under coaters: Manufactured by same manufacturer as finish coat materials.

Paint Accessory Materials: Linseed oil, shellac, turpentine and other materials not specifically indicated herein but required to achieve the finishes specified of high quality and approved manufacturer.

Interior Paint Systems: Final Paint Color Selection shall be Department specified. Furnish manufacturer color sample cards to Department for color selection.

Quality Assurance:

Applicator Qualifications: Company specializing in performing Work of this Section with minimum five years documented experience.

Regulatory Requirements:

Surface Burning Characteristics in Accordance with ASTM E-84 for Class I or A finish:
Flame Spread (Non-Combustible Surfaces): Less than 25.
Smoke Density (Non-Combustible Surfaces): Less than 450.
Provide paint and coating materials that conform to Federal, State, and Local restrictions for Volatile Organic Compounds (VOC) content.

Delivery, Storage, and Handling:

Transport, handle, store, and protect products. Deliver paint materials in sealed original labeled containers, bearing manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and/or reducing. Store paint materials at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's published instructions. Prevent fire hazards and spontaneous combustion.

Interior Nonload-Bearing Partition Framing: ASTM A 653 and ASTM C 645; galvanized sheet steel, channel shaped, punched for utility access, depth as indicated on Drawings, gages as indicated below unless indicated on Drawings.

1. 358ST22 - 3-5/8 Inch Studs - Unbraced Length 17 Feet or Less: Minimum 22 gage. Limiting heights are for 5/8 inch thick gypsum board panels on each side of partition and 5 pounds per square foot uniform load perpendicular to partition.

Partition Floor Tracks and Runners: ASTM A 653 and ASTM C 645; galvanized sheet steel, channel shaped, same depth and gage as studs, tight fit; solid web.
22 Gage Studs: CR22 x stud size.

Wall Furring and Partition Bracing: ASTM A 653 and ASTM C 645; galvanized sheet steel.
Studs: ST22 - 2-1/2 inch deep, 22 gage.
Hat-Shaped Channels (as needed): 7/8 inch deep x 1-1/2 inch wide, 25 gage.
Clip Angles: 2 inches x 2 inches x 16 gage x 1/4 inch less than stud width.

Partition Framing Fasteners: Corrosion-resistant self-drilling self-tapping steel screws.
22 Gage Framing: ASTM C 1002; 3/8 inch Type S pan head.

Partition Floor Track Anchorage Device: Low velocity powder-actuated drive pins; minimum 0.140 inch shank diameter x 1-1/2 inch shank length with 7/8 inch diameter washer.
DX 451 System using X-DNI Pins with R23 washers, by Hilti, Tulsa, OK. (800) 879-8000.
Ramset/Red Head System using 4700SD Pins, by ITW Ramset/Redhead, Wood Dale, IL (708) 350-1858.

Wood Blocking Attached to Partition Framing:

PS 20; S4S. Maximum of 19 percent moisture content, surfaced dry, No. 2 any species graded under WWPA grading rules or No. 3 Grade Southern Pine graded under SPIB grading rules. Full sized, sound lumber without splits, warps, wane, or loose knots.

Security Mesh: 1/2 inch #16 galvanized carbon steel flattened expanded metal sheets or 22ga. sheet metal.

Work shall reference the following standards:

ASTM A 653 - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.

ASTM C 645 - Specification for Non-Structural Steel Framing Members.

ASTM C 754 - Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.

ASTM C 954 - Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 inches to 0.112 inches in Thickness.

PS 20 - American Softwood Lumber Standard.

SPIB: Grading Rules.

WWPA: Western Lumber Grading Rules.

Doors and Hardware. Door and hardware shall be provided to allow access to and from the new Storage Room.

New door and frame shall match the existing Battery Room door in size, material, finish and hardware, unless noted otherwise by the Department. The new door shall swing in the direction shown on the Contract drawing. The door shall have a keyed entrance, with the required key matching that of the existing Battery and UPS Rooms.

Fabricate unit rigid, neat, and free from warp or buckle. Provide welded frames. Weld exposed joints continuously; grind, dress, and make smooth, flush and invisible. Reinforce unit to receive surface applied finish hardware. Prepare frame for silencers. Provide three single rubber silencers. Primer: Air-dried. Door manufacturer shall be company specializing in manufacturing similar type products with minimum 5 years documented experience. Installer shall be company specializing in performing similar type work with minimum 5 years documented experience. Installed Door Assembly shall conform to NFPA 80 for fire rated minute label as per existing Battery and UPS Room door labels. Transport, handle, store, and protect door and frame with resilient packaging. Break seal on-site to permit ventilation.

Hardware shall conform to NFPA Standard No. 80, 101 and Americans With Disabilities Act (ADA). Provide keying and master keying and higher master keying, if required, to match existing Battery and UPS Room Locks such that the same key open all three doors. Include 3 nickel silver keys for each lock, and 3 of each master key. Lock manufacturer shall furnish a keyway to match Department's existing keyway. Keyway used shall require Department's authorization letter to accompany each order for keys and key blanks. All keys shall be stamped "Do Not Duplicate" on plain bows. Locks shall be installed for building security (during the normal period of construction) with temporary construction keys; shall be individually keyed as required and subject to a single master key. At completion of building, permanent keys shall be shipped directly to Department's appointed representative. Proof of delivery shall be submitted to Engineer prior to final review of Project.

Finish Hardware Supplier Shall Be member of National Builders Hardware Association (NBHA); provide services of regular member of American Society of Architectural Hardware Consultants (ASAHC). Be responsible for suitability of all finish hardware; verify that items specified will function in designated locations. Be responsible for refinements, materials and specified thickness. Package and label each item of hardware separately. Each package shall contain appropriate fastenings, instructions and installation templates. Should marking on any item become separated from item after delivery, return item to supplier for remarking before attempting to install it.

Battery Circuit Breaker. A battery circuit breaker shall be provided to isolate the battery from the UPS. This breaker shall have an undervoltage release (UVR) and auxiliary contacts, and shall be in a separate wall mounted NEMA-1 enclosure. The battery breaker provides a manual disconnecting means, short circuit protection, and overcurrent protection for the battery system. When opened, there shall be no battery voltage in the UPS enclosure. The UPS shall be automatically disconnected from the battery by opening the breaker when the battery reaches the minimum discharge voltage level.

Internal Modem/Dial Out Pager. The UPS shall come with an internal modem capable of dialing out from the UPS to notify up to two remote computers, terminals, PC's, or pocket pagers when important events occur. The modem will also be capable of accepting incoming calls, with the appropriate security, and connecting to a remote terminal, computer or PC, to perform all those functions normally available on the front panel including viewing monitoring screens. The pocket pager interface shall automatically call up to two (2) designated state employees on the Department's leased alpha-numeric paging system. Interface requirements can be obtained from "Metrocall" paging service at 630-376-1610.

CONSTRUCTION REQUIREMENTS

Standards. The UPS shall be designed in accordance with the applicable sections of the current revision of the following documents. Where a conflict arises between these documents and statements made herein, the statements in this specification shall govern.

ANSI C62.41 (IEEE 587)
ASME
CSA 22.2, No. 107.1
FCC Part 15, Class A
ISO 9001

National Electrical Code (NFPA-70)
NEMA PE-1
OSHA
UL Standard 1778

The UPS shall be ETL listed per UL Standard 1778 Uninterruptible Power Supplies, and shall be CSA Certified.

Proposal Submittals. Submittals with the proposal shall include:

System configuration with single-line diagrams.
Functional relationship of equipment including weights, dimensions, and heat dissipation.
Descriptions of equipment to be furnished, including deviations from these specifications.
Size and weight of shipping units to be handled by installing Contractor.
Detailed layouts of customer power and control connections.
Detailed installation drawings including all terminal locations.

UPS Delivery Submittals. Submittals upon UPS delivery shall include a complete set of submittal drawings and one (1) instruction manual that shall include a functional description of the equipment with block diagrams, safety precautions, instructions, step-by-step operating procedures and routine maintenance guidelines, including illustrations.

Installation. Carefully handle wires and cables during installation. Make joints and splices in an approved manner, and equivalent electrically and mechanically to the conductor itself.

Base conduit fill in accordance with National Electrical Code requirements. All home runs between panel and first junction box from panel must contain not more than nine (9) conductors including equipment grounding wire.

Branch circuit and control wiring must be not less than #12 AWG wire unless noted otherwise.

Terminate stranded control cables in #12 AWG size and smaller into solderless lugs, then connect lug to terminal part.

Neatly group circuits in panelboards and tie with seine twine, or nylon wire ties.

Do not pull splices of any kind into any raceway. Make splices and taps in a junction box, pullbox or other accessible enclosure.

Warranty. The UPS manufacturer shall warrant the UPS module against defects in materials and workmanship for 12 months after initial start-up or 18 months after ship date, whichever period expires first.

The battery manufacturer's standard warranty shall be passed through to the end user.

Manufacturer Qualifications. A minimum of twenty year's experience in the design, manufacture, and testing of solid-state UPS systems is required. The system shall be designed and manufactured according to world class quality standards. The manufacturer shall be ISO 9001 certified.

Factory Testing. Before shipment, the manufacturer shall fully and completely test the system to assure compliance with the specification.

Wiring. Wiring practices, materials and coding shall be in accordance with the requirements of the National Electrical Code (NFPA 70). All bolted connections of bus bars, lugs, and cables shall be in accordance with requirements of the National Electrical Code and other applicable standards. All electrical power connections are to be torqued to the required value and marked with a visual indicator.

Provision shall be made for power cables to enter or leave from the top or bottom of the UPS cabinet.

Construction and Mounting. The UPS unit, comprised of input transformer, rectifier/charger with input filter, inverter, static transfer switch, and output transformer, shall be housed in a single free-standing NEMA type 1 enclosure. Cabinet doors/covers shall require a tool for gaining access. Casters and stops shall be provided for ease of installation. Front access only shall be required for expedient servicing, adjustments, and installation. The UPS cabinet shall be structurally adequate and have provisions for hoisting, jacking, and forklift handling. The maintenance bypass switch shall be mounted separately in its own adjacent cabinet with input and output wiring independent of the UPS cabinet.

The UPS cabinet shall be cleaned, primed, and painted with the manufacturer's standard color. The UPS shall be constructed of replaceable subassemblies. Printed circuit assemblies shall be plug connections. Like assemblies and like components shall be interchangeable.

Cooling. Cooling of the UPS shall be by forced air. Low-velocity fans shall be used to minimize audible noise output. Fan power shall be provided by the UPS output.

The thermal design, along with all thermal and ambient sensors, shall be coordinated with the protective devices before excessive component or internal cabinet temperatures are exceeded.

Grounding. The AC output neutral shall be electrically isolated from the UPS chassis. The UPS chassis shall have an equipment ground terminal. Provisions for local bonding shall be provided.

Field Quality Control. The following inspections and test procedures shall be performed by factory-trained field service personnel during the UPS startup. Upon completion of the inspections and any necessary changes, the service personnel shall provide "Factory Certification" that the complete installation is properly installed and compatible with its intended purpose.

Visual inspections shall include:

- Inspect equipment for signs of damage
- Verify installation per drawings
- Inspect cabinets for foreign objects
- Verify neutral and ground conductors are properly sized and configured
- Inspect battery cases
- Inspect battery for proper polarity
- Verify all printed circuit boards are configured properly

Mechanical inspections shall include:

- Check all control wiring connections for tightness
- Check all power wiring connections for tightness
- Check all terminal screws, nuts, and/or spade lugs for tightness

Electrical inspection shall include:

- Check all fuses for continuity
- Confirm input voltage and phase rotation is correct
- Verify control transformer connections are correct for voltages being used
- Assure connection and voltage of the battery string(s)

Service Personnel. The UPS manufacturer shall directly employ a nationwide service organization, consisting of factory trained field service personnel dedicated to the start-up, maintenance, and repair of UPS and power equipment. The organization shall consist of regional and local offices.

The manufacturer shall provide a fully automated national dispatch center to coordinate field service personnel schedules. One toll-free number shall reach a qualified support person 24 hours/day, 7 days/week, and 365 days/year. If emergency service is required, response time shall be 20 minutes or less.

An automated procedure shall be in place to insure that the manufacturer is dedicating the appropriate technical support resources to match escalating customer needs.

Replacement Parts Stocking. Parts shall be available through an extensive network to ensure around-the-clock parts availability throughout the country.

Recommended spare parts shall be fully stocked by local field service personnel with back-up available from national parts center and the manufacturing location. The national parts center Customer Support Parts Coordinators shall be on-call 24 hours/day, 7 days/week, and 365 days/year for immediate parts availability. Parts from the national parts center shall be shipped within 4 hours on the next available flight out and delivered to the customer's site within 24 hours.

UPS Maintenance Training. Maintenance training courses for customer employees shall be available by the UPS manufacturer. This training is in addition to the basic operator training conducted as a part of the system start-up.

The training course shall cover UPS theory, location of subassemblies, safety, battery considerations and UPS operational procedures. The course shall include AC to DC conversion and DC to AC inversion techniques as well as control, metering, and feedback circuits to the Printed Circuit Board (PCB) level. Troubleshooting and fault isolation using alarm information and internal self-diagnostics should be stressed.

Maintenance Contracts. A complete offering of preventive and full service maintenance Contracts for both the UPS system and battery system shall be available. An extended warranty and preventive maintenance package shall be available. Warranty and preventive maintenance service shall be performed by factory-trained service personnel.

Delivery. All equipment, wiring and appurtenances shall be delivered to the inside loading dock at:

Illinois Department of Transportation – District 1
201 West Center Court
Schaumburg, IL. 60196

All delivery and unloading costs shall be included in the bid.

Panelboards. Install equipment in strict accordance with the approved shop drawing and equipment manufacturer's instructions.

Each surface mounted panelboard must be supported and mounted away from the wall with "C" shaped channel. Channel must be fiberglass, when stray current control isolation is required, and hot dipped galvanized steel for normal applications. Minimum separation between equipment and wall must be one inch.

Equipment must be installed with work space clearances required by the Code.

Install equipment to permit maintenance and replacement of parts, and must be clear of openings with swinging or moving doors, partitions or access panels.

Each panelboard must be mounted with the top a maximum of 6'-6" above) finished floor unless indicated otherwise on the Drawings.

Drywall Partition. Verify that site conditions are ready to receive work. Opening dimensions are to match the requirements of manufacturers for the items interfacing with wall. In the event of any discrepancies between manufacturers required opening dimensions and dimensions as shown on the Contract Drawings, the manufacturers required opening dimensions shall prevail.

Gypsum Board

Gypsum Board Installation:

Single layer:

Apply face out with long dimension horizontal.

All abutting ends and edges shall occur over studs.

Joints on opposite sides of a partition shall occur on different studs.

Joints at openings shall be located so no end joint will align with edges of openings.

Fasteners shall be located 3/8-inch minimum to 1/2 inch maximum from edges and ends of wallboard.

Fasteners shall be a maximum of 8 inches o.c. on walls.

Fire Rated Construction: Conform to UL design requirements for the stated assemblies.

Install gypsum board in accordance with manufacturer's instructions.

Place corner beads at external corners. Place edge trim where gypsum board abuts dissimilar materials. Use longest length practical.

Joint Treatment: Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes. Feather coats onto adjoining surfaces so that camber is maximum 1/16 inch. Tape joints and corners of cementitious backing board.

Tolerances: Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

Drywall Type Usage: Fire rated: All locations.

Submittals: Product Data: Provide data on metal framing, gypsum board, and joint tape. Indicate items to be provided.

Painting. The primary color scheme for walls shall be as approved by the Department. The Contractor shall provide a color scheme with samples to the Department for approval.

Cleaning. All work shall be conducted so as to allow continuous and uninterrupted operation of Traffic Management Center. As work proceeds and upon completion, promptly remove paint where spilled, splashed, or spattered. During progress of work keep premises free from any unnecessary accumulation of tools, equipment, surplus materials, and debris. Collect waste, cloths, and material, which may constitute a fire hazard, place in closed metal containers and remove daily from site. Upon completion of work leave premises neat and clean.

Protection. Protect other surfaces from paint and damage. Repair damage as a result of inadequate or unsuitable protection.

Schedule of Items to be Painted:

Painted finishes shall be provided for, but not limited to, the following items.

- All interior surfaces as scheduled on Drawings including, but not limited to:
 - Hollow metal doors and frames.
 - Metal opening frames and trim.
 - Gypsum wallboard.
 - Mechanical grilles, registers, and diffusers, if not pre-finished by manufacturer.

Do not paint the following Items:

Pre-finished items, such as acoustical ceiling materials, mechanical, and electrical equipment, unless touch-up paint is required. Use touch-up paint furnished by manufacturer.

UL, FM, and other code-required labels.

Equipment identification, performance rating, and nameplates.

Site Conditions:

Environmental Requirements:

All existing drywall surfaces in Battery Room are to be prepared for new treatment, including priming, patching and sanding as required.

Apply paint finishes only when moisture content of surfaces is within manufacturer's acceptable ranges for type of finish being applied.

Surface temperatures or surrounding air temperature to be above 40 degrees F before applying alkyd finishes, above 45 degrees F for interior latex, and 50 degrees F for exterior latex work. Minimum for varnish and transparent finishes is 65 degrees F.

Provide continuous ventilation and heating facilities to maintain temperatures above 45 degrees F for 24 hours prior to, during and 48 hours after application of finishes.

Do not apply paint in areas where dust is being generated.

Provide lighting level in areas being painted of 80-foot candles measured mid-height at substrate surface.

Maintenance:

Extra Materials:

Provide one gallon of each color, type and sheen to Department.

Label each container with color, type, texture, and room locations, in addition to the manufacturer's label.

Submittals:

Procedures for submittals.

Product Data: Submit product data for each type of paint specified. Technical data sheets indicating manufacturer's catalog number, paint type description, and VOC content. Painting Schedule listing surfaces to be painted with cross-reference to the specific painting and finishing system and application. Identify each paint material by manufacturer's catalog number and general classification.

Samples: Submit color brush-out sample for each paint color and sheen specified.

Three samples on 8 1/2 inch x 11-inch card stock for color and sheen verification.

Identify each sample by paint manufacturer, paint type, color, and sheen.

Assurance/Control Submittals:

Test Reports: Submit manufacturer's Material Safety Data Sheets (MSDS) for each paint type specified.

Certificates: Manufacturer's certificate that Products meet or exceed specified requirements.

Qualification Documentation: Submit applicator documentation of experience indicating compliance with specified qualification requirements.

Contractor to verify of existing conditions before starting work. Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work. Verify that building framing components are ready to receive Work. Verify that rough-in utilities are in-place and located where required. Report in writing to Department prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work

until unsatisfactory conditions have been corrected. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Department.

Install studs and fasteners in accordance with manufacturer's published instructions and ASTM C 754. Provide metal stud spacing of 16 inches on center, maximum. Align stud web openings horizontally. Splice studs with minimum 8 inch nested lap, fasten each stud flange with minimum two screws. Construct corners using minimum three studs. Double stud at wall openings and door jambs- maximum 2 inches from each side of openings. Place studs at a minimum 2 inches from abutting walls. Install framing between studs for attachment of mechanical and electrical items. Install intermediate studs above and below openings to match wall stud spacing. Fasten studs adjacent to door frames, partition intersections, and corners to top and bottom runner flanges in double-stud fashion with metal lock fastener tools. Securely fasten studs to jamb and head anchor clips of door and borrowed-light frames. Place horizontally a cut-to-length section of runner with web-flange bend at each end, fasten with minimum one screw per flange. Position a cut-to-length stud (extending to top runner) at vertical panel joints over door frame header.

Site Tolerances:

Maximum Variation From True Position: 0.125 inches in 10 feet.

Maximum Variation From Plumb: 0.125 inches in 10 feet.

Inspect metal framing erection, placement, spacing, fasteners, and connections to building. Inspect security mesh installation, fastener type, spacing, and attachment to metal framing.

Doors and Hardware. Verify that field measurements, surfaces, and conditions are as required, and ready to receive Work. Report in writing to Engineer prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Department.

Install door and frame in accordance with manufacturer's published instructions, of size, and at locations indicated. Coordinate with adjacent wall construction for anchor placement. Field paint door and frame to match existing Battery and UPS Room finish, and as approved by the Department. The frame is to be mounted to the studding in such a manner to prevent a spreading of the frame from the studs of less than 1/2 inch.

Coordinate frame installation with size, location, and installation. Coordinate with door opening construction, doorframe, and door hardware installation.

Site Tolerances:

Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

Inspect door and frame installation, alignment, attachment to structure, and operation. Adjust hardware for smooth and balanced door movement. Cleaning installed Work.

Product Data: Indicate door materials, gauges, configurations, and location of cutouts hardware

reinforcement, and finish. Shop Drawings: Indicate door elevations, internal reinforcement, and closure method. Assurance/Control Submittals, Certificates: Manufacturer certificate indicating that Products meet or exceed specified requirements.

Fasteners: Furnish hardware complete with all screws, through bolts and other fasteners attachment of hardware. Hardware installer shall drill pilot holes where necessary for all screws. Repair or replace doors, panels or other material damaged by hardware installation. Hardware supplier to inspect completed installation and list, in writing, all hardware installation deficiencies. Submit copy to Engineer.

Adjusting and Checking: Hardware supplier shall assist Contractor in adjusting and checking installation of finish hardware. Check, test and adjust moving parts prior to date of substantial completion. Furnish to Department special tools required to adjust and maintain hardware.

Demolition. The extent of Demolition Work is that Work necessary, and required to facilitate the new construction indicated. Demolition shall be such that all construction, new and existing, can be performed, and completed in accordance with the construction documents. The Contractor shall visit the project site and familiarize himself with the existing conditions and project requirements. Verify the scope of the Work under this Section including salvage material.

Method of Measurement. The work of UNINTERRUPTIBLE POWER SUPPLY UPGRADE shall be measured for payment on an "Lump Sum" basis, which shall include all related facility and equipment construction, basic electrical material and methods, delivery, installation, battery removal, battery installation, and demolition including testing of equipment and components specified herein.

Basis of Payment. Payment for work of UNINTERRUPTIBLE POWER SUPPLY UPGRADE must include the Contract lump sum price as shown in the schedule of prices for electrical work. (EK – 09/02/2004)

2070 LITE CONTROLLER

Description. This work shall consist of furnishing a Model 2070 Advanced Transportation Controller (ATC) Lite as shown in the Plans including all necessary hardware and accessories required for use as a 2070 Lite Controller. The 2070 Lite Controller along with its associated components will be part of the ramp metering and vehicle sensing subsystem known as the surveillance system.

Materials. Materials shall be according to the following:

General. The Model 2070 Lite ATC shall comply with the Caltrans 2002 Transportation Electrical Equipment Specifications (TEES) and meet or exceed the requirements as outlined in the Advanced Transportation Controller Standard Specification by the Joint AASHTO/ITE/NEMA ATC Committee minus the VME chassis.

The Model 2070 Lite ATC unit shall be modular in design and configurable for a variety of traffic management applications. In addition, the Model 2070 Lite ATC shall be compatible with Type 170, 170E, and NEMA specified controller equipment. In addition, the Model 2070 Lite ATC shall mate with Type 170 and ITS style cabinets.

Hardware. The Model 2070 Lite ATC unit shall consist of a metal housing that is 7 inches high by 19 inches wide by 10 inches deep and weighs less than 25 lbs with the following components:

- Serial motherboard
- Single 96-pin DIN connectors for all plug-in boards
- Liquid-Crystal Display (LCD), 8 lines, 40 characters per line, back-light 8 inch by 40 inch
- 2 keypads on panel for programming

CPU (Engine Board). A plug on board with two (2) predefined 50 pin connectors shall be provided. The Motorola 68360 microprocessor computer shall be provided with the minimum requirements defined below and will be mounted on the engine board, along with the various crystals and communications circuitry:

- 25 Mhz
- 4 MB of DRAM
- 512 KB SRAM
- 8 MB or flash memory
- 256 K battery-backed SRAM
- Data key
- Real-time time of day clock

Operating System. The Model 2070 Lite ATC shall be capable of running the standard Microware OS-9 operating system as well as multi-tasking and DOS like commands.

Field I/O Modules. The following common features shall be provided:

- 614 Kbaud data rate to CPU
- Parallel I/O ports – 64 bits each input and 64 output
- SDLC compatible communication with CPU module
- External EIA-485 port connector
- Optically isolated modules to provide protection from lightning and surges

Power Supply. A power supply shall be provided with the following requirements:

- 10 amps
- Power consumption – 25 or 75 watts (typical) and 120 watts (maximum)
- 100 watt quadruple industrial-grade outlet supply
- 50 Khz switching regulator
- Storage system for memory backup without batteries
- Internal safety circuitry senses and measures

The cabinet shall be equipped with two-stage surge suppression, which incorporates both silicon avalanche diode and MOV components and technology. The surge suppression shall be equipped with status and maintenance LED indicators.

Communications Modules. The communications modules shall conform to EIA-232 specifications, and the two leftmost slots on the motherboard shall be made available for dual communications modules

Miscellaneous Features. The following miscellaneous and optional features shall also be provided with the Model 2070 Lite ATC:

- Direct access to serial ports from the application software
- A self-contained, independent power supply module
- Input protection
- +5 VDC standby power using capacitor backup
- Safety circuitry to monitor line voltage and output

Environmental. All components shall operate within the following environments:

Temperature range: -34.6 F to 165 degrees Fahrenheit
Humidity (inside cabinet): 5 to 95%, non-condensing

Application Software. Application software and associated licenses shall be provided with each Model 2070 Lite ATC unit. The application software shall be designed to operate on the Model 2070 controller hardware platform, and shall allow the Model 2070 Lite ATC to continuously control the ramp meters as well as poll and monitor the volume, occupancy and speed of vehicles passing over the detector loops at locations shown on the Plans. The Model 2070 Lite ATC application software shall then process and communicate this data at the system polling rate of 30 seconds when requested in ASCII character strings to a computer workstation located at the IDOT Traffic Systems Center (TSC). The application software shall also have the following features:

- Contain a minimum of 7 metering rates/plans (i.e., 6 plans plus non-metering)
- Provide for the following metering selection methods:
 - Local Traffic Responsive
 - Time of Day
 - Fixed
- Serial interfaced with 3M Canoga detectors or equal
- Operate as a data collection point for loop detector data
- User Interface accessible at the field cabinet
- User Interface accessible remotely through the fiber optic communications network
- Store detector data (minimum of 16 detectors)
 - Five (5) minute intervals for 2 days
 - Fifteen (15) minute intervals for one week
- Accommodate two-head signal assemblies
- Diverse programming configuration capabilities
- Support high-speed system communications using AB3418 or NTCIP protocols
- Allow special software control configurations
- Provide user-definable cabinet input/output function mappings
- Provide easy-to-use menu driven interface with spreadsheet style data entry and multi-table parameter database
- Provide security and password protected access
- Provide extensive status information on communications, detector diagnostics, and inputs/outputs
- Generate extensive reports that include the date and time of occurrence on Local Alarm Log, Communications Fault Log, Detector Fault Log, System Detector Log, MOE Log, Speed Log, and Volume Count Log

- Provide operations manual
- Provide communications protocol documentation
- Provide an acceptance test plan (5 copies) to the Engineer
- Conduct the approved acceptance test plan on each controller prior to field installation
- Provide two (2) hands-on six (6) hour training sessions for up to twenty (20) participants each
- Provide telephone support during normal business hours (8:00 AM to 5:00 PM) for two years

CONSTRUCTION REQUIREMENTS

Installation. The Model 2070 Lite ATC unit shall be installed and connected inside the Model 334 Cabinet at the locations as shown on the Plans and according to the manufacturer's instructions. The Contractor shall install all cables and ancillary equipment, connecting the Model 2070 Lite ATC to the Ramp Meters and Detectors.

Surge and over-voltage protection shall be installed on all loop lead-in cables and all power conductors.

All cables shall be neatly dressed and labeled with their function and physical connection.

Testing. The Contractor shall power up the unit and self-test the unit using available software. Applications software shall be uploaded, configured, and validated. This testing shall be accomplished prior to installing the unit in the field cabinet.

Documentation. Three copies of all operations and maintenance manuals for each Model 2070 Lite ATC unit shall be delivered for each assembly furnished. In addition, full documentation for all software and associated protocols shall be supplied to the Department on a 3.5-inch floppy disk(s) and a CD-ROM. The Department reserves the right to provide this documentation to other parties who may be Contracted with in order to provide overall integration or maintenance of this item.

Warranty. The Contractor shall warranty all materials and workmanship including labor for a period of two years after the completion and acceptance of the installation, unless other warranty requirements prevail. The warranty period shall begin when the Contractor completes all construction obligations related to this item and when the components for this item have been accepted, which shall be documented as the final completion date in the construction status report. This warranty shall include repair and/or replacement of all failed components via a factory authorized depot repair service. All items sent to the depot for repair shall be returned within two weeks of the date of receipt at the facility. The depot location shall be in the United States. Repairs shall not require more than two weeks from date of receipt and the provider of the warranty shall be responsible for all return shipping costs. The depot maintainer designated for each component shall be authorized by the original manufacturer to supply this service.

A warranty certificate shall be supplied for each component from the designated depot repair site indicating the start and end dates of the warranty. The certificate shall be supplied at the conclusion of the system acceptance test and shall be for a minimum of two years after that point. The certificate shall name the Department as the recipient of the service. The Department shall have the right to transfer this service to other private parties who may be Contracted to perform overall maintenance of the facility.

Basis of Payment. Payment will be made at the Contract unit price for each 2070 LITE CONTROLLER including all equipment, material, testing, documentation, and labor detailed in the Contract documents for this bid item.
(EK – 03/19/2004)

LED DYNAMIC MESSAGE SIGN FULL-MATRIX CONFIGURATION

Description. This specification shall govern the furnishing and installation of walk-in LED dynamic message signs (DMS), with 18-inch characters, in designated field locations as shown in the plans and as detailed in this specification. The display shall be a full matrix configuration of **27 pixels high by 105 pixels wide**. All display elements and modules shall be solid state. No mechanical or electromechanical elements or shutters shall be used.

The field locations where dynamic message signs are to be installed shall be as follows:

1. DMS-30: SB Dan Ryan Expressway near 83rd St.
2. DMS-02: NB Dan Ryan Expressway near 83rd St.
3. DMS-03: NB Dan Ryan Expressway near 57th St.
4. DMS-31: SB Dan Ryan Expressway near Garfield Blvd.
5. DMS-32: SB Dan Ryan Expressway near Pershing Rd.
6. DMS-04: NB Dan Ryan Expressway near 35th St.
7. DMS-08: NB Dan Ryan Expressway near Chicago River.

Terminology. Due to the varying definitions used in Dynamic Message Sign technology, this section defines specific terms as they apply to this specification.

Sign: The sign housing and its contents.

Sign Controller: Located in a ground cabinet or in the sign (as detailed in this specification), the sign controller specifies the message to be displayed. Messages can be selected either remotely from the central controller, locally from a laptop computer or from the front panel of the sign controller.

Central Controller: The MS Windows NT Server computer system and related software, which operates the system from a remote control site.

Laptop Computer: This computer can operate both as a remote client to the central controller and/or a maintenance terminal at the sign controller. In its maintenance terminal operation, an operator can connect the laptop computer to the sign controller

and run diagnostic tests on the sign or select and program messages for that sign. In its remote client operation, an operator can dial-in to the central controller and gain full access to the functions of the central.

Workstation: This computer operates as a remote client to the central controller. A workstation operator can dial-in to the central controller and gain access to the functions of the central by using the appropriate access codes.

LED: Light Emitting Diode

Pixel: Any of the small discrete elements that, when arranged in a pixel matrix, create a character. A pixel contains a cluster of LEDs.

Pitch: Distance measured from center to center of adjacent pixels within a matrix. This distance is measured both horizontally and vertically.

Poll: The central controller and laptop computer are said to “poll” a sign when they request the sign’s status information. The term is derived from the periodic status polling, which a central can perform, but is loosely used to refer to any status request.

Message: Text; the information shown on the sign.

Display: The message seen by the motorist. A display may include more than one page of text (an alternating display). Any character or set of characters of a display may be flashed (a flashing display).

Neutral State: Sign is blank, or displaying a predefined message that is displayed regularly.

WYSIWYG: What You See IS What You Get. In this specification, this is the functionality of the LED DMS system where the central, workstation or laptop display mimics the actual message that is visibly displayed on the sign on an individual pixel basis.

Materials. All materials furnished, assembled, fabricated or installed under this item shall be new, corrosion resistant and in strict accordance with the details shown in the plans and as detailed in this specification. All details and functionality listed in this specification will be thoroughly inspected and tested by the department. Failure to meet all details and functionality detailed in this specification shall be grounds for rejection of the equipment.

The equipment design and construction shall utilize the latest available techniques with a minimum number of different parts, subassemblies, circuits, cards and modules to maximize standardization and commonality. The equipment shall be designed for ease of maintenance. All component parts shall be readily accessible for inspection and maintenance. Test points shall be provided for checking essential voltages.

All field equipment shall remain fully functional over an ambient temperature range of –40°F to + 149°F with relative humidity of up to 95%. All field equipment enclosures shall be designed to and shall withstand the effects of sand, dust, and hose-directed water. All connections shall be watertight.

(a) LED DMS

General. The sign shall be designed for a minimum life of 20 years, and constructed so as to present a clean and neat appearance. Poor workmanship shall be cause for rejection of the sign.

Sign Housing Construction. The size of the sign including housing and mounting brackets shall be 26'-1" Wide, 8'6" High, and 45 ¼" Deep. It shall weigh 4000 pounds. Signs greater than these measurements may require additional review time to evaluate the structural adequacy of the Department's standard sign trusses.

The sign housing shall have adequate room inside the sign housing for maintenance personnel. There shall be 18 inches of clear area between all equipment along the entire length of the sign housing from the 18-inch walkway up to 6 feet above the 18-inch walkway.

The sign housing shall be capable of withstanding a wind loading of 120 M.P.H. without permanent deformation or other damages, and the performance of the sign shall not be impaired due to continuous vibration caused by wind, traffic or other factors. This includes the visibility and legibility of the display.

The equipment within the sign housing shall be protected from moisture, dust, dirt and corrosion. The sign shall be constructed of aluminum alloy 5052-H32 or 3003-H14 which shall not be less than 1/8" thick, unless otherwise specified in this document. Framing structural members shall be made of aluminum alloy 6061-T6 or 6063-T5.

All external screws, nuts, and locking washers shall be stainless steel. No self-tapping screws shall be used. All parts shall be made of corrosion resistant materials, such as plastic, stainless steel or aluminum. All materials used in construction shall be resistant to fungus growth and moisture deterioration. An inert dielectric material shall separate dissimilar metals.

All welding shall be by an inert gas process in accordance with the American Welding Society (AWS) Standards, ANSI/AWS D1.2-97. The LED DMS manufacturer's welders and welding procedures shall be certified by an ANSI/AWS Certified Welding Inspector to the 1997 ANSI/AWS D1.2-97 Structural Welding Code for Aluminum. Proof of certification of all the LED DMS manufacturer's welders and applicable welding procedures shall be supplied with the submittals. The name, phone number and address of the ANSI/AWS Certified Welding Inspector that certified the LED DMS manufacturer's welders and procedures shall also be provided with the submittals.

The number of seams shall be kept to a minimum. All exterior seams and joints shall be sealed to form a rain and weather tight enclosure.

All exterior seams shall be continuously welded by an inert gas process, except for the KYNAR 500 coated fascia material.

The skin material shall be stitch welded to the internal structural members to form a unitized structure.

The housing face will be of three-piece construction, consisting of internal structural members, external fascia panels and lens panel assemblies.

There shall be no exposed fasteners or welds on the housing face.

The internal Structural Members shall:

- Accommodate both display module mounting and air distribution.
- Retain the display modules in a manner to facilitate easy and rapid removal of each display module without disturbing adjacent display modules

The External Fascia Panels shall:

- Be extruded aluminum
- Be designed to minimize heat conduction between the exterior surfaces and the interior components.
- Be finished with a matte-black, licensed-factory-applied KYNAR 500 Resin, fluropolymer-based coating system.

The border and therefore, the external fascia perimeter panels shall be a minimum of 12 inches wide.

The external fascia panels shall be thermally isolated from the rest of the sign housing. The Engineer shall approve the design and materials used to accomplish this.

The Lens Panel Assembly shall consist of a KYNAR 500 coated aluminum mask over a clear glazing.

The Lens Panel Assembly shall be:

- Modular in design
- Interchangeable with no misalignment with the LED pixels
- Removable from within the main sign housing
- Sealed with a closed-cell resilient gasket

The Lens Panel Aluminum Mask shall be:

- 0.090 inch minimum thickness
- Finished with a matte-black, licensed-factory-applied, KYNAR 500 Resin, fluropolymer-based coating system
- Perforated to provide an aperture for each pixel on the display modules. Each aperture shall be as small as possible, without blocking the LED light output at the required viewing angle.

The Lens Panel Clear Glazing shall be:

- 90% UV opaque polycarbonate-LEXAN XL or equivalent
- ¼-inch thick minimum
- Clear in color
- Laminated and sealed to the inside of the lens panel aluminum mask using the 3M Scotch VHB joining system to form the lens panel assembly

The lens panel shall be heated to prevent fogging and condensation. An eight watt-per-foot, self-regulating, heat tape shall be provided along the bottom of the message area, between the glazing and the display modules. The sign controller shall control the heat tape. All heat tape terminal blocks shall be covered for safety.

The face will be finished with a matte-black, licensed-factory-applied, KYNAR 500 Resin, fluoropolymer-based coating system. All other exterior surfaces will be a natural aluminum mill finish. All interior surfaces will be a natural aluminum mill finish. No painted surfaces shall be allowed. A certification shall be required from the licensed-factory KYNAR 500 coated for all aluminum face materials.

The face shall be uniform in appearance and completely free from distortion, gouges and any other flaws or defects.

The bottom panel of the housing shall have a minimum of four drain holes, with snap-in, drain filter plug inserts, in each section formed by internal structural members. Water drain filter plug inserts shall be replaceable.

A three point lockable aluminum access door shall be provided at each end of the housing as shown in the plans to enable easy access to the walk-in housing. This shall make it possible for a single maintenance person to easily access the display modules.

This access door shall be 6' – 8" X 2' - 0" minimum. The door will be fitted with a handle operated locking mechanism, closed cell neoprene gasket and a stainless steel hinge.

The locking mechanism shall be a heavy-duty, industrial-strength, three-point, dead-bolt, center-case lock with a zinc finish. There shall be a handle on both the inside and the outside of the door. These handles shall be heavy-duty, industrial strength with a zinc finish on the inside handle and a chrome-plated finish on the outside handle. The outside handle shall be padlock-able.

Included in the door assembly shall be a device to hold the door open at 90 degrees

The sign housing shall have a continuous 18-inch wide walkway extending the full length of the sign. The walkway shall be made of 1/8 inch diamond tread 6061-T6 or 3003-H22 aluminum. All edges of the walkway grating must be finished to eliminate sharp edges or protrusions.

The housing shall be designed to accommodate mounting on the rear vertical plane.

The exterior mounting assemblies shall be 6061-T6 aluminum alloy extrusions, 3/16-inch minimum thickness.

The angular alignment of the sign housing shall be adjustable in the vertical direction from zero (0) degrees to ten (10) degrees down in one degree increments to optimize the viewing angle.

Where directed by the Engineer, the mounting fixtures and structures shall be designed for a horizontal angular adjustment to optimize viewing angle. The mounting fixture and structural designs and/or modifications shall be approved by the Engineer prior to fabrication. The submitted drawings for mounting fixture and structure designs and/or modifications shall be done by an Illinois Licensed Professional Engineer, shall be dated and shall bear the Engineer's seal and a signature.

Environmental Controls. A humidity sensor shall be provided and sensed by the sign controller from zero percent to 100 percent relative humidity in one percent or fewer increments. The sensor shall operate and survive from 0 percent to 100 percent relative humidity. The sensor shall have an accuracy that is better than +/- five percent relative humidity.

The sign controller shall read the internal temperature sensors, external ambient temperature sensor and the humidity sensor. The sign controller shall use these readings in an algorithm that turns on the heat tape and/or the fans at the appropriate times to reduce both frost on the face of the sign and condensation on the display modules and other electronic circuitry.

The ventilation system shall be a positive-pressure, filtered, forced-air system which cools both the display modules and the sign housing interior. Negative pressure systems that use exhaust fans are not acceptable.

The sign housing shall have two exhaust ports. Each exhaust port shall be filtered and protected by an aluminum hood assembly.

The ventilation system shall have a minimum of four fans. The fans shall be located on the intake side to produce a positive pressure system. Air shall be drawn into the sign housing through hoods near the top of the housing, then filtered before reaching the fan units.

The inlet and exhaust filters shall be electrostatic and shall be sized to properly accommodate the air flow and pressure drop requirements of the ventilation system. The inlet filters shall have an Initial Atmospheric Dust Spot Efficiency of 64 at 20 cm/s in accordance with ASHRAE 52.1. Filters shall be easily removable from within the sign housing without the use of tools.

The sign shall have two filter cartridges for air intake. Each filter cartridge shall contain a minimum of 60 filter media changes that will be automatically changed (advanced) when commanded by the sign controller. For each filter cartridge, the effective filtration area of each filter media change shall be a minimum of four square feet of filter media. Changing (advancing) the filter media shall be fully automatic and shall not require manual assistance. The sign controller shall read the solid state air flow sensors, the internal temperature sensors and the outside (ambient) temperature sensor and use this information in an algorithm to automatically change (advance) the filters when appropriate. Each time the filters are changed, the sign controller will notify the central controller at the next poll. The sign and central controllers will track the number of remaining changes. When a filter fails to change, the sign controller will notify the central controller of this failure at the next poll. Each filter cartridge shall be easily removable from within the sign housing without the use of tools and the filter media shall be replaceable.

There shall be an aluminum air plenum for each hood assembly and its associated filter. The air plenums will be sealed and designed to keep any water that gets through the hoods from getting into the sign housing interior. All water that builds up between the hoods and the filters shall drain to the exterior of the sign housing.

Each fan shall be capable of providing a minimum of one sign housing volume change per minute at the pressure drop developed throughout the entire ventilation system with all fans operating. The fans shall have ball or roller bearings, shall be permanently lubricated and shall require no periodic maintenance. The fans are to be positioned in such a manner so as to provide a balanced air flow to the ventilation system in the event of failure of any fan.

The sign shall have a minimum of two 100% solid state air flow sensors. Adequate air flow shall be automatically tested once a day and tested on command from the central controller or laptop computer. Inadequate airflow will cause the filter to be advanced and the airflow retested. If the airflow is still inadequate an error message is to be sent to the central controller or laptop computer when the sign controller is polled by the central controller or laptop computer.

Each of the three message lines shall be ventilated by an efficient forced air system. The air shall be directed to provide equal distribution of air to the bottom of each display module along each message line. Air shall be ducted directly from the fans to ducts at the bottom of each message line.

The duct at the bottom of each message line shall evenly distribute air into the cavity between each display module and the lens panel. The air shall then be exhausted out of the top of each display module. Air flow shall be sufficient to exchange a minimum of one volume of air every two (2) seconds in the void between each display module and the lens panel. Air shall also be directed uniformly to the back of the display modules.

All duct work that impedes access to any sign components shall be easily removable, without tools, for servicing of these components.

All ductwork shall be 0.040 minimum aluminum and shall be designed to be extremely efficient with minimal pressure drop throughout the system.

The ventilation system shall be activated by multiple temperature sensors. There shall be a minimum of one sensor located near the middle of each module line, at the top of the display module in the exhaust stream from the cavity between the display module and the lens panel. There shall be an additional temperature sensor located to accurately measure the ambient temperature outside the sign housing. The temperature sensors shall have an accuracy of +/- 1.5 degrees C and a range from -40 to +70 degrees C.

The temperatures from the sensors shall be continuously measured and monitored by the sign controller. A temperature reading greater than a user selectable critical temperature shall cause the sign to go to blank and the sign controller shall report this error message to the central controller.

The ventilation system shall be equipped with a manual override timer to provide ventilation for service personnel. The timer will have a maximum on-time of 1 hour.

The LED modules and electronic equipment shall be protected by a fail-safe, back-up fan control system in the event of an electronic fan control failure or shutdown of the sign controller.

Enough baseboard heaters shall be provided to warm the interior of the walk-in housing to 30 degrees F above ambient. A wind-up timer in the sign and remotely from the laptop and central computers shall control these heaters.

Interior Lighting, Wiring, and Equipment. The sign housing shall be furnished with a minimum of four incandescent lamps and three GFI duplex outlets. The lamps shall be spaced evenly above the walkway. The duplex outlets shall be spaced evenly on the back wall no more than three feet above the walkway. A 12-hour timer for the lights shall be located near the door. The light timer shall not incorporate a hold feature.

The lights shall be enclosed in heavy-duty fixtures. Each fixture shall have a die-cast aluminum housing, a twist-on guard secured by four set screws and a porcelain socket. There shall be a clear glass globe inside the twist-on guard. The globe shall be gasketed and fully enclose the lamp.

Inside the sign housing, all 120 VAC service lines shall be independently protected by a thermo magnetic circuit breaker at the sign housing entry point. All 120 VAC wiring shall be located in conduit, pull boxes, raceways or control cabinets as required by the National Electric Code (NEC). No 120 VAC wiring shall be exposed to the inside or outside of the sign housing. The sign housing shall not be considered as a raceway or control cabinet.

An aluminum, 39-inch by 12-inch minimum, fold-up work space for the laptop computer and an aluminum, 2.5-inch deep by 11-inch wide by 10-inch high minimum document holder shall be mounted on the back inside wall of the sign housing.

Electronic Components. The presence of power transients or electromagnetic fields, including those created by any components of the system, shall have no deleterious effect on the performance of the system. The system shall not conduct or radiate signals which will adversely affect other electrical or electronic equipment including, but not limited to, other control systems, data processing equipment, audio, radio and industrial equipment.

All electronic components, except printed circuit boards, shall be commercially available, easily accessible, replaceable and individually removable using conventional electronics repair methods.

All workmanship shall comply with ANSI/IPC-A-610B Class 2 titled "Acceptability of Electronic Assemblies", ANSI/IPC-7711 titled "Rework of Electronic Assemblies", and ANSI/IPC-7721 titled "Rework and Modification of Printed Boards and Electronic Assemblies".

All electronic components shall comply with Section Electronic Materials and Construction Methods, located in this document.

All Printed Circuit Boards (PCBs), except for the LED mother board, power supply PCBs and 2070 Lite PCBs, shall be completely conformal coated with a 0.010 inch (10 MIL) minimum thickness silicone resin conformal coat. The LED mother boards shall be completely conformal coated, except at the pixels on the front of the PCB, with a 0.010 inch(10 MIL) minimum thickness silicone resin conformal coat. The material used to coat the PCBs shall meet the military specification: MIL-I-46058C Type SR.

Printed Circuit Boards (PCB) design shall be such that components may be removed and replaced without damage to boards, traces or tracks.

Only FR-4 0.062 inch minimum thickness material shall be used. Inter-component wiring shall be copper clad track having a minimum weight of 2 ounces per square foot with adequate cross section for current to be carried. Jumper wires will not be permitted, except from plated-through holes to component.

All PCBs shall be finished with a solder mask and a component identifier silk screen.

All components shall be of such design, fabrication, nomenclature, or other identification so as to be purchased from a wholesale electronics distributor, or from the component manufacturer, except for printed circuit board assemblies:

Circuit design shall be such that all components of the same generic type, regardless of manufacturer, shall function equally in accordance with the specifications.

All discrete components, such as resistors, capacitors, diodes, transistors, and integrated circuits shall be individually replaceable. Components shall be arranged so they are easily accessible for testing and replacement.

The DC and AC voltage ratings as well as the dissipation factor of a capacitor shall exceed the worst case design parameters of the circuitry by 50%. A capacitor which can be damaged by shock or vibration shall be supported mechanically by a clamp or fastener. Capacitor encasements shall be resistant to cracking, peeling and discoloration.

Resistors shall be within 5% of tolerance over the specified temperature range. Any resistor shall not be operated in excess of 50% of its power rating.

All transistors, integrated circuits, and diodes shall be a standard type listed by EIA and clearly identifiable.

Display Modules. Display modules shall be assembled to form a full matrix configuration of 27 by 105 pixels. The LED VMS shall consist of three lines of 21 display modules per line. This allows the display of three lines of 15 5x7 characters per line with double column spacing between characters. Each display module shall include an LED display circuit board. A piggyback daughter board shall attach directly to every third LED board. The daughter board shall control one to three LED boards. A single ribbon cable shall connect the daughter board to the LED boards it controls that are not directly attached to the daughter board. The LED board shall contain 45 LED pixels arranged into a 5x9 matrix. The daughter board shall contain the solid state electronics necessary to control pixel data and read pixel status.

All LED boards and daughter boards shall be fully interchangeable and shall not require any address switches or adjustment when interchanged or placed in service.

Replacement of a complete display module shall be possible without the use of any tools.

The display module shall consist of two electronic sub-assemblies, an LED mother board and a daughter board.

The daughter board shall receive control signals and display data from the sign controller via a standard ribbon cable. The display module shall contain the control and memory elements and provide the signals to switch and read the LED pixels.

The LED board shall contain all LEDs required to form 45 pixels. Pixels shall be arranged uniformly to display an 18-inch dot-matrix character in five columns wide and seven pixels high. All LEDs shall be individually and directly mounted to the LED circuit board to form the LED board. The LED circuit board shall be a single, 0.062 inch, FR4, flat black printed circuit board. The LED board shall support the Daughter board.

All LEDs shall be mounted so that their mechanical axis is normal +/- 1.00 degree to the face of the sign to ensure brightness uniformity over the face of the sign. The sign manufacturer shall propose a method, acceptable to the engineer, to test the LEDs in the display modules to ensure They meet this criteria.

Each pixel shall have a device attached to the printed circuit board (PCB) to hold and protect the LEDs. These devices shall:

1. Hold the LEDs perpendicular to the display modules within 0.5 degree,
2. Prevent the LEDs from being crushed or bent during handling,
3. Protect the LEDs from damage when the display module is laid on the front surface (the side that the LED lamps are located),
4. Be easily removable from the display module PCB without any tools,
5. Not put any stress on the LEDs due to differentials of expansion and Contraction between the device and the LEDs over the herein specified temperature range,
6. Not become loose or fall off during handling or due to vibrations,
7. Not block airflow over the leads of the LEDs,
8. Securely hold each LED while allowing a gap between the device and a minimum of 95% of the body of each LED for airflow,
9. Not block the light output of the LEDs at the required viewing angle,
10. Be black in color to maximize contrast.

The daughter boards shall connect to a single control ribbon cable common to each line of display modules.

Epoxy encapsulation of the LEDs will not be permitted.

Hoods or visors shall not be used.

The LEDs shall be protected from the outside environmental conditions, including moisture, snow, ice, wind, dust, dirt and UV rays.

The LEDs shall be AlInGaP, Precision Optical Performance 1-3/4 diodes. The diodes shall have a 15 degree viewing angle with an amber color and a wavelength of 590 nanometers. The cone perimeter shall be defined by its 50% intensity points. The LEDs shall have standoffs that hold the base of the LEDs 3.5mm ± 1.0mm off the printed circuit board to promote cooling of the LEDs. Through-hole LEDs mounted flush to the printed circuit board are not acceptable. Surface-mount LEDs are not acceptable.

Each pixel shall be 40 candela at 20mA. 40 candela shall be attained by the sum of the brightness of the individual LEDs in each pixel. The brightness of each LED shall be measured in accordance with the CIE Test Method A, as described in CIE 127-1997, Technical Report: Measurement of LEDs. The LED brightness and color bins that are used in each pixel shall be provided to the engineer for approval.

Certification shall be provided, with the submittals, from the LED manufacturer that demonstrates that the LEDs were tested and binned in accordance with the CIE Test Method A.

Each pixel shall be a maximum of 1-3/8 inches in diameter. The LEDs in each pixel shall be clustered to maximize long range visibility. All pixels shall have equal color and on-axis intensity. All pixels in all signs in this project, including the spare parts, shall have equal color and on-axis intensity. The method used to provide the equal color and intensity, as stated above, shall be included in the submittals and approved by the Engineer.

Each pixel shall contain two strings of LEDs. The pixel strings shall be powered from a regulated DC power source and the LED current shall be maintained at 28 milliamperes or less per string to maximize life of the pixel. The failure of an LED in one string within a pixel shall not affect the operation of any other string or pixel. Pixel power drawn from the DC supplies shall not exceed 1.5 watts per pixel, including the driving circuitry.

The LEDs shall be individually mounted directly to a printed circuit board and shall be easily replaceable and individually removable using conventional electronics repair methods.

The voltage to the LED modules and associated electronics shall not exceed 25 VDC. The power supplies shall be paralleled in a diode OR configuration such that one supply may completely fail and the sign will still be supplied with enough power to run 100% of all pixels at 100% duty cycle at 65 degrees C. Functioning supplies must current-share to within 10%. The combined effect of line (97 to 135 VAC) and load (10% to 100%) on the power supplies shall not exceed 1.0%. The efficiency of the power supplies shall be 75% or greater at 120 VAC and maximum load. The power supplies shall have a power factor of 0.95 or greater at 120 VAC from 50% to 100% of maximum load.

All LED module power supply voltages shall be continuously measured by the sign controller. The sign controller shall provide these voltage readings to the central controller or laptop computer when the sign controller is polled by the central controller or laptop computer. When a voltage drops below a critical value, the under voltage will be reported on the next poll from the master controller or laptop computer.

There shall be a power distribution system that connects each display module to all power supplies and minimizes the voltage drop over the face of the sign. The voltage measured at the display modules shall not vary more than 50 millivolts over all the display modules in the sign with 17 pixels on at 100% intensity in each and every display module.

The signs shall be capable of displaying ASCII characters 32 through 126 (including all upper and lower case letters and digits from 0 to 9) at any location in a message line. If shown in the plans, a special graphics character shall be substituted for any of these characters.

The sign shall normally display single stroke (5 X 7) characters with double-column spacing between characters. The operator shall be able to display compressed (4 X 7), expanded (6 X 7) or double-stroke (7 X 7) character fonts and change the default spacing between characters. The spacing options shall be one, two or three pixel columns. Font access privileges shall be assigned by the system supervisor.

The display modules shall be rectangular, and shall have an identical horizontal and vertical pitch between pixels. The pitch shall be 2.750 inches.

The separation between the last column of one module and the first column of the next shall be equal to the horizontal distance between the columns of a single display module.

The separation between the last row of one module and the first row of the next shall be equal to the horizontal distance between the rows of a single display module.

The characters shall be legible under all light conditions at a distance of 1100 feet within a 15 degree cone of vision centered around the optical axis of the pixel. The cone perimeter shall be defined by its 50% intensity points.

The sign shall be the proper brightness in all lighting conditions for optimum legibility. It shall be bright enough to have a good target value, but not to the point where the pixels bloom, especially in low ambient light level conditions.

The brightness and color of each pixel shall be uniform over the entire face of the sign within the 15 degree cone of vision from 1100 feet to 200 feet in all lighting conditions. Non-uniformity of brightness or color over the face of the sign under these conditions shall be cause for rejection of the sign.

Three (3) photocells shall be installed on the sign. These devices shall permit automatic light intensity measurement of light conditions at each sign location. These photocells shall be mounted in a manner to measure front, rear and ambient light conditions.

Automatic adjustment of the LED brightness shall occur in small enough increments so that the brightness of the sign changes smoothly, with no perceivable brightness change between adjacent levels. Provision shall be made to prevent perceivable brightening of the sign due to stray headlights shining upon the photo sensors at night.

Pixel brightness shall be controlled by pulse width modulation of the DC current. The pixel current waveform shall have a frequency of 100 +/- 5 Hertz at nighttime brightness levels and 2400 +/- 120 Hertz at daytime brightness levels with an adjustable duty cycle of 0.03 to 99.9% in 0.5% or finer increments. Brightness shall be manually settable from the front panel of the controller and remotely from the central computer in 1% increments. Brightness control shall be able to be returned to automatic from the sign controller front panel and the central computer.

Two separate types of pixel status feedback shall be provided to the central controller from the local sign controller. These include a pixel test and a pixel read.

Pixel Test: The pixel test shall be performed from the central controller on command and automatically once a day. During a pixel test, the full operational status of each string of LEDs in each pixel shall be tested and then transmitted to the central controller or laptop computer. This pixel status test shall distinguish the difference between half out, full out, half stuck-on and fully stuck-on pixels. A list of defective pixels shall be provided, listing pixel status, line number, module number, column number and row number for each defective pixel. The pixel test may briefly disturb the displayed message for less than 0.5 seconds.

Pixel Read: The pixel read shall be performed during both message downloads and during every sign poll from the central controller or laptop computer. The pixel read shall perform a real-time read of the displayed message and shall return the state of each pixel to the central controller as it is currently displayed to the motorist, including any errors. This shall allow the central controller operator to see what is visibly displayed to the motorist on an individual pixel basis. During a pixel read, the state of each pixel (full-on, half-on or off) in the sign shall be read by the sign controller to allow the central controller or laptop computer to show the actual message, including static, flashing and alternating messages, that is visibly displayed on the sign in a WYSIWYG format. This pixel reading shall take place while a message is displayed on the sign without disturbing the message in any way. Any flashing, flickering, blinking, dimming, or other disturbance of the message during this pixel read shall be cause for rejection of the sign.

The pixel read shall be an actual real time read of the current flowing through each string of LEDs at the time of the associated sign poll or message download and shall not be accomplished by simulating errors based on the last pixel test.

Power Requirements and TVSS. The sign and its sign controller shall be capable of operating with 120/240 VAC, 40 amp per leg, 60 hertz, single-phase power, and shall tolerate a +/- 15V swing in voltage.

The sign shall have a 40 amp two-pole (common trip) main, 120/240 VAC, single phase, four wire load center with 16 circuit capability. Each circuit in the sign shall be powered from a separate circuit breaker.

The system shall be protected by two stages of transient voltage suppression devices including MOVs and spark gap arrestor. If enabled by the central controller, tripping of both stages of surge protection shall prevent power from reaching any components of the sign until the surge protection has been replaced. Tripping of each stage of the surge protection shall cause the sign controller to call central and report the error condition (for dialup operation) or report the error condition to central on the next poll (for multi-drop operation).

Communication lines shall be protected by two stages of transient voltage suppression devices. Tripping of each stage (or both if tripped simultaneously) of the

surge protection shall cause the sign controller to call central and report the error condition (for dialup operation) or report the error condition to central on the next poll (for multi-drop operation). There shall be an option that is either enabled or disabled and is selected and downloaded from the central controller to the sign controller. When this option is enabled, tripping of both stages of surge protection shall disconnect the communication lines until the surge protection has been replaced. When this option is disabled, the sign will continue to function normally after both stages of surge protection are tripped.

(b) 2070 Lite Sign Controller.

General. The sign controller shall be a multiple-sourced, non-proprietary, 19 inch rack mountable, Type 2070 Lite traffic controller meeting the latest CALTRANS Specifications and shall be provided with resident software stored in non-volatile memory. The sign controller shall be programmed to receive sign control commands from the central controller or laptop computer, transmit responses as requested to the central controller or laptop computer, monitor sign and message status and control sign operation and message displays.

The 2070 Lite shall perform all communication, control and feedback functions and shall be the only sign controller apart from dedicated microcontrollers that control hardware. No intermediate sign controlling device or protocol converters shall be used. Proprietary sign controllers shall not be used.

A quick reference card shall be supplied with the controller to reference the major keypad commands and any permanent, stored messages.

The 2070 Lite controller will have power-up and auto-restart capabilities with a programmable default message (including a blank message) when recovering from a power off condition. A watch dog circuit will be utilized to provide automatic reset to the 2070 controller and the modem. The central computer shall be capable of remotely commanding a controller and modem reset.

Functionality. The sign controller shall be capable of being controlled from the central controller or the laptop computer.

The controller software shall be capable of performing the following functions:

Display a message, including:

1. Static messages
2. Flashing messages
3. Alternating messages

It shall be possible to separately vary the flashing and alternating frequencies.

Flashing messages shall have the following adjustable timing:

1. Message time on from 0.5 to 5.0 seconds in 0.1 second increments
2. Message time off from 0.5 to 5.0 seconds in 0.1 second increments

It shall be possible to flash any character or set of characters in any message.

Alternating messages shall have the following adjustable timing:

1. Primary message time on from 0.5 to 5.0 seconds in 0.1 second increments
2. Primary message time off from 0 to 5.0 seconds in 0.1 second increments
3. Alternate message time on from 0.5 to 5.0 seconds in 0.1 second increments
4. Alternate message time off from 0 to 5.0 seconds in 0.1 second increments

It shall be possible to flash any character or set of characters in an alternating message at the adjustable frequencies listed above for flashing messages. The flashing period shall be a submultiple of the alternating on-time it is associated with.

Report errors and failures, including:

1. Power failure
2. Power recovery
3. Pixel string failure
4. Low airflow
5. Over a user selectable critical temperature
6. Power supply failure

Message and status monitoring:

The sign controller shall respond to the central controller whenever it receives a request for status (a poll). The return message shall be capable of providing the following information:

1. Actual message that is visibly displayed on the sign on an individual pixel basis (full-on, half-on or off)
2. Current sign illumination level
3. Local Control Panel switch position (central, local or local override mode)
4. Error and failure reports
5. Temperature readings
6. LED power supply voltage levels
7. Origin of display message transmission (laptop, 170 or central)
8. Heater status
9. Heat tape status
10. Beacon status
11. Uninterruptible power supply status
12. AC Surge protection status
13. Communication line surge protection status

Severe error condition response:

In dial-up mode, the sign controller shall initiate a call to the central controller and report any severe error conditions. In multi-drop mode, the sign controller shall report severe error conditions to the central controller during the next polling.

The severe error conditions are:

1. AC power failure
2. AC power recovery
3. Surge protection has been tripped
4. The sign housing door is open

Each time the sign controller is polled by the DMS Master Controller or laptop computer, the sign controller shall test the operational status of the sensors listed below and return this information to the DMS Master Controller. This operational status test shall determine if each of the following sensors are functioning properly:

1. Each temperature sensor
2. Each photocell
3. Humidity sensor
4. Each airflow sensor
5. Each LED power supply sensor

The sign controller shall provide a library with a minimum of 50 permanent messages, consisting of 30 or less characters per line, stored in PROM. The sign controller shall also be able to accept a downloaded library from the central or laptop computer of a minimum of 25 changeable messages stored in non-volatile RAM. These messages may be called for display on the sign from the keypad on the front panel of the controller.

The sign controller shall also be capable of displaying messages on the sign that are downloaded from the central controller or laptop computer, but are not located in the library stored in non-volatile memory of the sign controller.

The sign shall normally display single stroke (5 X 7) characters with double-column spacing between characters. The sign shall also be able to display compressed (4 X 7), expanded (6 X 7) or double-stroke (7 X 7) nominal character fonts or change the default spacing between characters. The spacing options shall be one, two or three pixel columns. Each font may be edited and downloaded to the sign controller from the central controller or laptop computer at any time without any software or hardware modifications.

The sign controller shall monitor the photo cell circuits in the sign and convert the measured light intensity into the desired pixel brightness. The photo circuit readings shall be correlated with a brightness table in the sign controller. The brightness table shall have a minimum of 255 brightness levels. Automatic adjustment of the LED

driving waveform duty cycle shall occur in small enough increments so that brightness of the sign changes smoothly, with no perceivable brightness change between adjacent levels. The brightness table in each individual sign controller shall be adjustable from the central controller and can be customized according to the requirements of the installation site. Each sign shall have its own, independent brightness table.

Brightness shall be manually settable from the front panel of the controller and remotely from the central computer in one percent increments from one to 99 percent.

There shall be a means to adjust how rapidly the sign responds to changes in ambient light as measured by the photocells. This can be used, for example, to prevent the sign from changing its brightness due to a vehicle's headlight momentarily hitting the sign. The adjustment shall be made from the central controller or laptop computer and shall have two different settings, one for daytime control and one for nighttime control, with the day/night ambient light threshold also being an adjustable value. In addition, there shall be a means to specify different weighting factors for each photocell, to specify how prominently each photocell figures in the calculation of nighttime ambient light.

In the event of a power failure, the sign controller shall activate a programmable default message (which can be a blank message) and shall report the AC power failure to the central controller.

The operational status of each pixel in the sign shall be automatically tested once a day and tested when a pixel test is requested from the central controller or laptop computer. A list of defective pixels shall then be transmitted to the central controller or laptop computer, listing pixel status, module number, column number and pixel number. This pixel status test shall distinguish the difference between half-out, full-out, half stuck-on and fully stuck-on pixels. This test shall not affect the displayed message for more than 0.5 seconds.

When the sign controller is polled and when messages are downloaded from the central controller or laptop computer, each pixel in the sign shall be read and its current state (full-on, half-on or off), for the currently displayed message, shall be returned to the central controller or laptop computer. This will allow the central controller or laptop computer to show the actual message that is visibly displayed on the sign on an individual pixel basis in a WYSIWYG format. (This is different from the pixel test listed above.) This pixel status read shall not affect the displayed message in any way. The pixel read shall be an actual real time read of the current flowing through each string of LEDs at the time of the associated sign poll or message download and shall not be accomplished by simulating errors based on the last pixel test.

There shall be no perceivable blinking, flickering or ghosting of the pixels at any time, except during a pixel test as described above. The displayed message will not be affected in any way at any time for the pixel status read as described above.

The operational status of the ventilation system, including the fans and filters, shall be automatically tested once a day and tested on command from the central controller, laptop computer or front panel of the sign controller. Any failure will cause an error message to be sent to the central controller or laptop computer when the sign controller is polled by the central controller or laptop computer.

The sign controller shall read the internal temperature sensors, external ambient temperature sensor and the humidity sensor. The sign controller shall use these readings in an algorithm that turns on the heat tape and/or the fans at the appropriate times to reduce both frost on the face of the sign and condensation on the display modules and other electronic circuitry.

Temperature sensors shall be continuously measured and monitored by the sign controller. A temperature greater than a user selectable critical temperature shall cause the sign message to go to blank and the sign controller shall report this error message to the central controller. This user selectable critical temperature shall be capable of being changed by the central controller or laptop computer. The central controller and laptop computers shall have the ability to read all temperature measurements from the sign controller.

All LED module power supply voltages shall be continuously measured by the sign controller. The sign controller shall provide these voltage readings to the central controller or laptop computer when the sign controller is polled by the central controller or laptop computer.

In the event the central controller fails to communicate with the sign controller within a programmable time limit, the sign shall activate a programmable default message (which can be a blank). This function shall apply only when the sign controller is in central control mode.

Failure of any sign shall not affect the operation of any other sign in the system.

The sign controller shall perform a consistency check of messages downloaded from the central controller or laptop computer to ensure that the message will fit in the display area of the sign. If any part of the message fails this check, the downloaded message shall not be displayed.

The sign controller internal time clock shall ensure that a message is taken down at the correct time, even in the event of a communications loss.

The sign controller shall maintain its internal time clock during power outages less than 255 minutes and display the proper message when power is restored.

The sign controller shall be able to put a self-updating time, temperature and/or date display on the sign.

The sign controller shall allow a moving arrow to be displayed by the central controller or laptop computer. The moving arrow shall be on one line with a standard

message on the other lines. The moving arrows shall be from the left or right and shall start from one end or in the middle of the sign and continue to the end of the sign.

The sign controller shall have a special function output bit to control an auxiliary blank-out sign. This shall be a closure to ground capable of sinking at least 10 ma. It shall be controlled from the central controller.

The sign controller shall be capable of being remotely reset from the central controller.

Modes of Operation. The mode of operation determines which level of control governs the DMS message selection. The three modes of operation are:

Central Mode: The local control panel switch is off and the central controller controls and monitors the sign.

Local Mode: The local control panel switch is on and the laptop computer or front panel of the sign controller is used to locally control the sign. The central controller only monitors the sign (i.e. status poll).

Local Override: The local mode has been overridden by the central to allow the central to control the sign in case the local control panel switch was unintentionally left in local mode.

- (c) Laptop Computer. Laptop computer shall be used for local control of DMS in event of a master controller failure, communications failure to DMS master controller, remote operation and for routine maintenance and trouble-shooting of field hardware. Two laptop computers shall be provided regardless of the number of signs installed. The laptop computer shall provide on-site processing of all commands the sign controller has been programmed for. The laptop computer shall have the capability to function as both a DMS remote terminal and a maintenance terminal. The DMS vendor shall supply a copy with each laptop computer and two additional copies of the remote terminal and maintenance software. The DMS vendor shall provide the Department a license allowing the Department and Department's agents (electrical maintenance Contractor EMC) to use the terminal software on as many laptop computers as required for system maintenance and operation. The laptop computers shall be utilized in the Department's training.

The laptop computer shall be equal to or exceed Ruggedized Notebook model Rough Rider 3 Series:

- Water proof, shock resistant
- ISO-9001 compliant
- 810-E and 465C military specifications
- 14.1" TFT LCD, sunlight readable
- Pentium M, 1.6 GHz

- 512 Mb RAM
- 64 MB Video Memory
- 30GB UTA hard drive, removable
- Removable 3.5" floppy drive
- Lithium battery
- 256K on-die cache
- 1 serial, 1 parallel, USB, ext. display, keyboard and mouse ports
- I-EEE 1394 fire wire
- Windows 2000 (CD and manual)
- 1 year manufacturer warranty
- Back light rubber keyboard, water-proof
- 10-32 VDC car adapter / charger
- -20°C low-temperature operating
- Two ¾ size PCI cards
- Bay 1: CDRW
- Bay 2: 56.5K + 100 base T module
- Pelican Case (Ruggedized case, not leather)
- Extra primary battery

CONSTRUCTION REQUIREMENTS

General. The DMS, including the sign housing and all modules and assemblies shall be designed and manufactured in the USA by the DMS manufacturer. The company that designs and manufactures the LED DMS shall be currently ISO 9001 certified as of the bid date for this project and shall have received its ISO 9001 certification a minimum of three years prior to the bid date for this project. The scope of this company's ISO 9001 certification shall be for the Design, Manufacture, Installation, Maintenance and Sales of Dynamic Message Sign Systems. The facility where this company actually designs and manufactures the LED DMS shall be ISO 9001 certified. This company, this scope and the address of this facility shall all be listed on the ISO 9001 certificate. This ISO 9001 certificate shall be provided with the bid. The name, phone number and address of both the Authorized ISO 9001 Registrar that certified this company and the Authorized ISO 9001 Accreditation Body that accredited this Registrar shall be provided with the bid. Failure to fully comply with these requirements and to provide all this information will cause this company's equipment and software to be rejected. ISO 9002 and ISO 9003 certifications are not adequate and do not meet this requirement.

The LED DMS Signs and System shall be fabricated by an established DMS manufacturer having the minimum of:

1. 10 years experience, under the current corporate name, in the design and manufacturing of State Highway or Interstate Highway, permanently-mounted, overhead dynamic message signs and central control systems installed in freeway service. This 10 years of experience shall include the complete design and manufacturing of all aspects of the dynamic message signs, including the electronic hardware, software and sign housings.
2. 100 State Highway or Interstate Highway, permanently-mounted, overhead dynamic message signs installed in freeway service, under the current corporate name.
3. NTCIP – compliant LED DMS that successfully passed NTCIP tests that were administered by industry accepted independent companies.

The manufacturer of the LED DMS Signs and System shall submit documentary evidence and reference data for the above requirements from a minimum of three (3) different states that have been successfully operating a highway LED dynamic message sign system, and that completely meets these specifications, manufactured and supplied by this manufacturer, for a period of no less than five (5) years. Reference data shall include the name and address of the organization, and the name and telephone number of an individual from the organization who can be contacted to verify the above requirements. The name of the DMS manufacturer that meets these experience requirements shall have the same corporate name as the DMS manufacturer that meets the ISO 9001 requirements stated elsewhere in this specification. This information shall be provided prior to documentation submittal. Failure to furnish the above references will be sufficient reason for rejection of the supplier's equipment.

Submittals. Shop drawings shall be submitted in accordance with Article 801.08 of the Standard Specifications and as specified in these special provisions.

Prior to purchase or fabrication of any equipment or materials for use in this project, the Contractor shall submit, for review by the Engineer, appropriate catalog cuts sheets, and specifications for all standard, off-the-shelf items and shall submit shop drawings and other necessary data for all non-catalog or custom-made items.

The Contractor shall furnish five sets of submittal data directly to the Engineer. Two copies of this information, with appropriate notations, will be returned to the Contractor after the review.

If reprinted literature, such as catalog cut sheets, is used to satisfy the submittal data requirements, there shall be no statements on the literature which conflict with the requirements of the Contract documents. Any such statements shall be crossed off and initialed by the Contractor. Explanation of how specifications shall be met pertaining to items changed from the literature shall be documented in writing and included with the submittal information.

All items shall be submitted together.

Each submittal shall contain sufficient information and details to permit full evaluation of each item, and its interrelationships among the various items shall be carefully addressed.

The Contractor shall prepare and submit detailed shop drawings for each sign type indicating types of materials proposed for each component of each sign, parts lists, assembly techniques, layout of all display elements and wiring schematics. The shop drawings shall also illustrate in detail how the Contractor proposes to mount and connect the DMS sign case to the sign support structure (truss). The DMS sign case shall include any support mechanism necessary for the installation of the DMS sign case that is not included in the truss. These drawings shall be submitted to the Engineer for review and approval prior to fabrication of any sign. Parts lists shall include circuit and board designation, part type and class, power rating, component manufacturer and mechanical part manufacturer.

As part of the submittals for the DMS assembly, the Contractor shall submit an engineering drawing illustrating the DMS character set including 26 upper case letters, 10 numerals, a dash, a plus sign (+), and slash. The Contractor shall also submit complete technical information, shop drawings, photographs, graphs, circuit diagrams, instruction manuals, security provisions, and any other necessary documents to fully describe the DMS assembly and associated equipment.

Installation. All signs must be made operational within 5 working days after being erected. This includes the complete installation of all necessary power, control, and communication equipment, raceways, and cables which are required to operate the sign. Operation of the sign shall as a minimum include the ability to display messages and to remotely change the messages being displayed.

In cases where either the permanent or temporary power and communication lines can not be connected as shown within the 5 working day period other measures shall be taken to make the system operational. These measures shall be as follows and shall be at no additional cost to the Contract. Temporary power shall be from either an existing IDOT service or an on-site generator. The generator shall be supplied by the Contractor and kept secure and in continuous operation until the permanent power feed can be connected. Communications shall be provided via a dial-in cellular connection and shall provide remote message entry and status polling. The Contractor shall arrange for and provide the temporary cellular phone connection and all local and remote equipment and software, as recommended by the sign manufacturer, to facilitate remote control and monitoring of the sign from the TSC. The equipment and software shall remain the property of the Department, and the Contractor shall remain responsible for phone charges until the permanent communications are complete, tested, and accepted, at which time the Contractor may terminate service and the Department may make separate phone arrangements. Submittal information shall include product data and interconnection diagrams for the remote phone programming provisions. All temporary connections must be approved by the Engineer prior to installation.

Liquidated damages of \$3,000 per day shall be paid by the Contractor for each day in excess of the 5 working days for which the sign has been erected but not put into operation.

All signs will be installed on sign trusses which are either existing or furnished by others under a separate Contract. No new sign trusses will be furnished as part of this Contract.

All sign trusses which are furnished by others will also be erected by others. The walkways, mounting brackets, and all other hardware required to secure the sign to the truss shall be furnished by others. The Contractor for this Contract will be responsible for delivering the sign to the site and furnishing and installing all conduit and wire required to be mounted to the sign truss. Mounting of signs to new trusses will be done by the Contractor which supplies the truss according to the following list. Contractor must coordinate with each of these Contracts to ensure that the proper walkways, mounting brackets, trusses, conduit penetrations, conduits in foundations, and all other pertinent items are supplied to ensure proper mounting and connection of the sign. This coordination must include as a minimum, furnishing DMS shop drawings to each Contract and reviewing sign truss shop drawings before they are released for fabrication.

1. DMS-30, Contract 62695
2. DMS-02, Contract 62694
3. DMS-03, Contract 62301
4. DMS-31, Contract 62303
5. DMS-32, Contract 62303
6. DMS-04, Contract 62301

Where signs are to be installed on existing trusses the Contractor shall be solely responsible for the entire installation of the new signs on the existing trusses. This includes any temporary removal of the truss and re-erection which may be required to properly mount the sign as well as modifications to or replacement of the existing mounting brackets, walkway, truss mounted conduit and junction boxes, and all other items necessary to properly mount the new sign. Where existing signs must first be removed from the existing trusses this removal work shall be paid for under a separate pay item.

The following is a list of signs which are to be installed on existing trusses:

1. DMS-08, Mounting of sign to existing truss shall be as described in and paid for under Section, NEW DMS – CHICAGO RIVER. STRUCTURE NUMBER 150161094L053.5.

There are two unique sign, controller, and communication medium configurations on this project as follows:

1. DMS-30, DMS-02, DMS-03, DMS-32, DMS-04, and DMS-08 will have cabinet mounted sign controllers and communicate back to the TSC Central Controller via a dedicated fiber optic link.
2. DMS-31 will have the sign controller mounted in the sign housing and communicate back to the TSC Central Controller via a dedicated fiber optic link.

Signs DMS-30 and DMS-02 will be installed prior to the completion of the new fiber optic communication network and as such will require a temporary leased line connection to the TSC. Sign DMS-08 will also require a temporary leased line connection, but shall re-use the existing line and modem. Furnishing of the leased line and the modem necessary for communication will be paid for under a separate pay item. Disconnection of this line and removal of the modem when the signs are switched over to the fiber optic network shall be considered incidental to this pay item along with any additional testing that will be required to verify proper operation of the sign on the fiber optic network. The modem shall be salvaged and returned to the TSC after removal.

The Contractor is responsible for integrating all types of installations into the existing Central Control system at the Traffic Systems Center in Oak Park, IL. The NTCIP driver shall be provided to the successful DMS vendor for system integration.

The Contractor shall provide additional parts to create two (2) additional character matrixes, two (2) load modules to drive a character module, one (1) LED power supply and one complete sign controller unit. The cost of additional parts shall be considered incidental to the price for each DMS.

The DMS manufacturer's technical representative shall provide on-site technical assistance in the following areas:

1. Sign to controller cabling
2. Initial sign turn on and test

The initial powering up of the sign(s) shall not be executed without the permission of the DMS manufacturer's technical representative.

Equipment shall be warranted for a minimum of five years against defects and/or failure in design, materials and workmanship. Unless otherwise specified in the invitation for bids, warranty coverage shall become effective on the date of final acceptance of the system by the Department. The Contractor shall assign to the Department all manufacturer's normal warranties or guarantees, on all such electronic, electrical and mechanical equipment, materials, technical data, and products furnished for and installed on the project. Defective equipment shall be repaired or replaced, at the manufacturer's option, during the warranty period at no cost to the Department.

Testing and Training. The equipment covered by this specification shall be subjected to design approval tests (DAT), factory demonstration tests (FDT), stand-alone tests, systems tests and 72 hour and 90 day test periods to determine conformance with all the specification requirements. The Engineer may at his discretion accept certification by an independent testing lab in lieu of the design approval tests to verify that the design approval tests have previously been satisfactorily completed. The DMS vendor shall arrange for and conduct the tests in accordance with the testing requirements stated herein. Unless otherwise specified, the DMS vendor is responsible for satisfying all inspection requirements prior to submission for the Engineer's inspection and acceptance. The Contract periods will not be extended for time lost or delays caused by testing prior to final Department approval of any items. The Engineer reserves the right to have his representative witness any and all tests. The results of each test shall be compared with the requirements specified herein. Failure to conform to the requirements of any test shall be counted as a defect, and the equipment shall be subject to rejection by the Engineer. Rejected equipment may be offered again for a retest provided that all non-compliances have been corrected and retest by the DMS vendor and evidence thereof submitted to the Engineer.

Final inspection and acceptance of equipment shall be made after installation at the designated location as shown on the plans, unless otherwise specified herein.

The DMS vendor shall provide five (5) copies of all design approval, factory demonstration, stand-alone and system test procedures and data forms for the Engineer's approval at least sixty (60) days prior to the day the tests are to begin. The test procedures shall include the sequence in which the tests will be conducted. The test procedures shall have the Engineer's approval prior to submission of equipment for tests.

The DMS vendor shall furnish data forms containing all of the data taken, as well as quantitative results for all tests. The data forms shall be signed by an authorized representative (company official) of the equipment manufacturer. At least one copy of the data forms shall be sent to the Engineer.

The DMS vendor shall be responsible for providing the test fixtures and test instruments for all of the tests.

Design approval tests shall be conducted by the DMS vendor on one or more samples of equipment of each type, as approved by the Engineer, to determine if the design of the equipment meets the requirements of this Specification.

If the design approval tests have not previously been satisfactorily completed by an independent testing lab and accepted by the Engineer, the Engineer shall be notified a minimum of thirty (30) calendar days in advance of the time these tests are to be conducted.

The design approval tests shall cover the following:

1. The DMS sign system equipment shall successfully perform all the functionality requirements listed in this specification under the following conditions in the order specified below:
 - a. The equipment shall be stabilized at -40°F (-40°C). After stabilization at this temperature, the equipment shall be operated without degradation for two (2) hours.
 - b. Moisture shall be caused to condense on the equipment by allowing it to warm up to room temperature in an atmosphere having relative humidity of at least 40% and the equipment shall be satisfactorily operated for two (2) hours while wet.
 - c. The equipment shall be stabilized at 149°F (65°C). After stabilization, the equipment shall be satisfactorily operated for two (2) hours without degradation or failure.
2. The equipment shall meet the specified performance requirements when the nominal input voltage is 115 V +/- 15 V. The equipment shall be operated at the extreme limits for at least 15 minutes during which the operational test of the FDT shall be successfully performed.
3. The equipment shall meet the performance requirements when subjected to the power service transient specified in 2.1.6 "Transient, Power Service", of the NEMA standard TS1.
4. The equipment shall meet its performance requirements when subjected to a temperature of 149°F (65°C) and a relative humidity of 90%. The equipment shall be maintained at the above condition for 48 hours. At the conclusion of the 48 hour soak, the equipment shall meet the requirements of the operational test of the FDT within 30 minutes of beginning the test.
5. The equipment (excluding cabinets) shall show no degradation of mechanical structure, soldered components, or plug-in components and shall operate in accordance with the manufacturer's equipment specifications after being subjected to the vibration tests as described in Section 2.2.5, "Vibration Test", of the NEMA standard TS1.
6. The sign housing electronics shall be separately capable of withstanding a high-energy transient having the following characteristics repeatedly applied to the AC input terminals:

A ten microfarad oil filled capacitor charged to 1000 VDC \pm 5% shall be discharged into the power input terminals a minimum of three times for each polarity. Immediately following this test the unit under test shall perform all of its defined functions upon the restoration of normal AC power.

If the unit fails the design approval test, the design fault shall be corrected and the entire design approval test shall be repeated. All deliverable units shall be modified without additional costs to the Department, to include design changes required to pass the design approval tests.

The DMS vendor shall be responsible for conducting Factory Demonstration Tests on all units at the DMS Vendor's Manufacturing Facility. These tests shall be performed on each unit supplied. The Engineer shall be notified a minimum of thirty (30) calendar days before the start of tests. The DMS Vendor shall pay for all travel expenses, including airfare, rental car, hotel, meals, etc., for up to three (3) department personnel for the Factory Demonstration Tests on the first unit at the vendor's manufacturing facility. All equipment shall pass the following individual tests:

1. Each sign shall be examined carefully to verify that the materials, design, construction, markings and workmanship comply with the requirements of the Specification.
2. The wiring shall be checked to determine conformance with the requirements of the appropriate paragraphs in the Specifications.
3. Each sign shall be operated long enough to permit equipment temperature stabilization, and to check and record an adequate number of performance characteristics to ensure compliance with the requirements of this Specification. Equipment functionality will be thoroughly tested to verify complete compliance with all areas of this Specification.

If any unit fails to pass its demonstration test, the unit shall be corrected and another unit substituted in its place and the test successfully repeated. If a unit has been modified as a result of a demonstration test failure, a report shall be prepared and delivered to the Engineer prior to shipment of the unit. The report shall describe the nature of the failure and the corrective action taken. If a failure pattern develops, the Engineer may direct that design and construction modifications be made to all units without additional cost to the Department or extension of the Contract period.

The DMS vendor shall conduct an approved stand-alone test of the equipment installation at the field site. The test shall, as a minimum, exercise all stand-alone (non-network) functional operations of the field equipment with all of the equipment installed as per the plans, or as directed by the Engineer. Approved data forms shall be completed and turned over to the Engineer as the basis for review and rejection or acceptance. At least thirty (30) working days' notice shall be given prior to all tests to permit the Engineer or his representative to observe each test.

If any unit fails to pass its stand-alone test, the unit shall be corrected or another unit substituted in its place and the test successfully repeated. If a unit has been modified as a result of a stand-alone test failure, a report shall be prepared and delivered to the Engineer prior to the re-testing of the unit. The report shall describe the nature of the failure and the corrective action taken. If a failure pattern develops, the Engineer may direct that design and construction modifications be made to all units without additional cost to the Department or extension of the Contract period.

The DMS vendor shall conduct approved DMS system tests on the field equipment with the central equipment. The tests shall, as a minimum, exercise all remote control functions and display the return status codes from the controller. Approved data forms shall be completed and turned over to the Engineer as the basis for review and for rejection or acceptance.

If system tests fail because of any components(s) in the subsystem, the particular components(s) shall be corrected or substituted with other components(s) and the tests shall be repeated. If a component has been modified as a result of the system test failure, a report shall be prepared and delivered to the Engineer prior to retest.

After the installation of the DMS system is completed and the successful completion of the System Test, the DMS vendor shall conduct one continuous 72-hour full operating test prior to conducting a 90-day test period. The type of test to be conducted shall be approved by the Engineer, and shall consist primarily of exercising all control, monitor and communications functions of the field equipment by the central equipment.

The 90-day test period shall commence on the first day after the successful completion of the approved 72-hour continuous full operating test period. During the 90-day test period, downtime, due to mechanical, electrical and/or other malfunctions, shall not exceed five (5) working days. The Engineer may extend the 90-day test period by a number of days equal to the downtime in excess of five (5) working days. The Engineer will furnish the DMS vendor with a letter of approval stating the first day of the 90-day test period.

Final system acceptance shall be defined as when all work and materials provided for in this item have been furnished and completely installed, and all parts of the work have been approved and accepted by the Engineer and the Dynamic Message Sign System has been operated continuously and successfully for ninety (90) calendar days with no more than five (5) working days downtime due to mechanical, electrical and/or other malfunctions.

Operational and maintenance training for the entire system shall be provided to designated personnel during installation, testing and debugging. This training shall be provided through practical demonstrations and other related technical procedures. Training shall be limited to a maximum of 15 people and shall be provided at a time and location approved by the Engineer. The training shall include, but not be limited to, the following:

1. Hands-on operation of all sign control hardware
2. Explanation of all system commands, their function and usage
3. Insertion of data
4. Required preventative maintenance
5. Servicing procedures
6. System trouble-shooting or problem identification procedures

A minimum of 40 hours of instruction shall be provided for the operational and maintenance procedures for the system. The DMS vendor shall submit an agenda for the training and one complete set of training materials along with the qualification of proposed instructors to the Engineer for approval at least 30 days before the training is to begin. The Engineer will review material and approve or request changes. After approval, the vendor shall provide a minimum of 5 copies of the training material that will become the property of the Department after training period is over.

The DMS vendor shall videotape the entire training on VHS tapes and shall provide the tapes to the Engineer for later use. The training shall be conducted at District One Traffic Systems Center building where the control room is located, after the completion of all system integration tests. The schedule of training sessions shall be established by the DMS vendor, with the approval of the Engineer.

Final Documentation. The Contractor shall provide to the Engineer the following as-built documentation of the complete installed equipment prior to testing. Sufficient documentation shall be provided to reflect "as-built" conditions and to facilitate operation, maintenance, modification and expansion of the system or any of its individual components. Manufacturer supplied documentation which covers the intent of this requirement may be used, subject to the approval of the Engineer.

Operator's Manuals: A manual containing a general description and detailed operating and installation instructions shall be provided for each different type or model of equipment. Five copies of the manual shall include the following information:

1. A general description of the equipment including all information necessary to describe the basic use or function of the system components. This shall include a general block diagram presentation of the equipment. Where auxiliary equipment is required, tabular charts shall be included, list such equipment. These charts shall include the nomenclature physical and electrical characteristics and functions of the auxiliary equipment, unless such information is contained elsewhere in an associated manual. In the latter case, a reference shall be made to the location of the information pertaining to the auxiliary equipment.
2. The theory of operation of the system components in a clear, concise manner supported by simplified schematics, logic, data flow diagrams, one-function diagrams, etc. Timing and waveform diagrams and voltage levels shall be shown as required. A logical development shall be used starting with a system block level and proceeding to a circuit analysis. Circuit analysis shall be detailed whenever circuits are not normally found in standard text books. This application of new theoretical concepts shall be fully described. Where the design allows operation in a number of different modes, an operational description of each mode shall be included.
3. In simple, clear language, the routine of operation, from necessary preparations for placing the equipment into operation, to securing the equipment after operation. This section shall contain appropriate illustrations, with the sequence of operations presented in tabular form wherever feasible.
4. The manufacturer's recommended procedures and checks necessary for preventive maintenance. This shall be specified for pre-operation, weekly, monthly, quarterly, semi-annual, annual and "as required" checks as necessary to assure reliable equipment operation. Specification, including tolerances, for all electrical, mechanical, and other applicable measurement, adjustments, or both, shall be listed.
5. Data necessary for isolation and repair of failure or malfunctions, assuming the maintenance technicians to be capable of analytical reasoning using the information provided in the submittal information. Accuracies, limits, and tolerances for all electrical, physical or other applicable measurements shall be described. General instructions shall be included for disassembly, overhaul and reassembly, including shop specifications or performance requirements.
6. Detailed instructions shall be given only where failure to follow special procedures would result in damage to the equipment, improper operation, danger to operating or maintenance personnel. Consumption of excessive person hours, etc. Such instructions and specifications shall be included only for such maintenance as maybe accomplished by specialized technicians and engineers in a modern electromechanical shop. The instructions shall describe special test set-up, components fabrication, the use of special tools, jibs and test equipment.

7. A detailed physical description of size, weight, special mounting requirements, electrical connections, and all other pertinent information necessary for proper installation and use of the equipment shall be provided.
8. The parts list shall contain all information required to describe the characteristics of the individual parts, as required for identification. It shall include a list of all equipment within a group and list all assemblies, sub-assemblies and replacement parts of units. The tabular arrangement shall be an alphanumeric order of the schematic reference symbols and shall give the associated description, manufacturer's name and part number. A table of contents or some other convenient means shall be provided for the purpose of identifying major components, assemblies, etc.
9. Schematic diagrams shall be complete and accurate as required to supplement the text material and to allow the books to be a self-contained technical information source. Maximum size of these diagrams shall be limited to allow their use in close proximity to the equipment, in the class room, etc., part reference symbols, test voltages, waveforms and other aids to understanding of the circuits function shall be included on the diagrams. Test voltages, waveforms and other aids to understanding of the circuits function may be shown on either the simplified schematics and other drawings (as required in the above sections) on theory of operation or maintenance or on the schematic diagrams required for this section. The overall scope of information shall not be less, however, than that stated for the schematic diagrams.

The DMS vendor shall provide manuals and data for the computer software system and components thereof. These shall include the following:

1. Computer programmer's manuals and computer user's manuals (5 copies each). Include manuals for any CPU language used by the Contractor for this project. Include instructions for performing a back-up of all software and message libraries.
2. Two original copies of the computer's operating system manual and compiler and assembly language manuals and an instruction manual for translating source to object code.
3. Manufacturer's documentation (including schematics) for all plug in circuit cards used in the microcomputer chassis.
4. Computer program logic in flow chart form (5 copies).
5. Narrative descriptions of programs and input output formats (5 copies).
6. Two copies of source programs, for master and sign controller software, shall be provided on 3½" diskettes or CD-ROM. An unrestricted license for software use by the Department shall be provided to the Engineer.
7. DMS vendor shall provide the communication protocol used between the DMS master controller and the DMS sign controller for use by the Department without any restrictions.

Final documentation shall reflect all field changes and software modifications and shall be provided before installation. Final documentation shall be approved prior to final system acceptance has begun. This document shall include drawings of conduit layouts, cable diagrams, wiring lists, cabinet layouts, wiring diagrams and schematics for all elements of the communications system. This shall also include detailed drawings identifying by cable type, color-coded function, the routing of all conductors (pairs) in the communications system. Upon completion of the installation, the Contractor shall submit these plans, maps, and/or drawings to reflect an as built condition, incorporating all changes made during installation, such as in pair identification and routing.

Method of Measurement. The LED Dynamic Message Sign Full-Matrix Configuration bid item will be measured for payment by the actual number of LED Dynamic Message Sign Full-Matrix Configuration assemblies furnished, installed, activated, tested, and accepted and shall be counted, each.

Basis of Payment. This item shall be paid for at the Contract unit price for each LED DYNAMIC MESSAGE SIGN FULL-MATRIX CONFIGURATION assembly which shall be payment in full for the material and work described herein.

(CTE – 1/21/2005)

NEW DMS – CHICAGO RIVER. STRUCTURE NUMBER 1S 0161 094L053.5

Description. This pay item shall consist of the removal of the existing walkway structure as shown on the plans. It will also include fabricating, furnishing and erecting new walkway structure as well as installing of the new Dynamic Message Sign (DMS) as shown on the plans and in accordance with notes located on the plan sheets. The new DMS shall rest on the new walkway structure and shall utilize the existing connections to the main truss structure. The existing truss sign structure must be preserved and free of any damage.

Materials. See plan sheets for all materials specifications.

CONSTRUCTION REQUIREMENTS

General. The new DMS and walkway structure shall be installed as shown in the plans.

Method of Measurement. NEW DMS - CHICAGO RIVER will be measured on a lump sum basis as described above.

Basis of Payment. This item shall be paid for at the Contract lump sum price for NEW DMS – CHICAGO RIVER.
(EK – 08/16/2004)

CABINET, MODEL 334 EQUIPMENT, DYNAMIC MESSAGE SIGN

Description. This specification shall govern the furnishing and installation of dynamic message sign (DMS) control systems in designated field locations and associated equipment cabinets as shown in the plans and as detailed in this specification.

Materials.

The DMS control system shall consist of the following major items:

(a) 2070 Lite Sign Controller

The controller shall be as described in and paid for under specification section: LED DYNAMIC MESSAGE SIGN FULL MATRIX CONFIGURATION.

(b) Cabinet

The cabinet shall be as described in specification section: CABINET, MODEL 334. The cabinet shall be paid for under pay item: CABINET, MODEL 334, DYNAMIC MESSAGE SIGN.

(c) Multi-drop Modem

Modem shall only be furnished with cabinet DMS-02. The modem shall be suitable for temporary communication over leased lines until these signs are transferred to the fiber optic communication lines. Modem shall match the communications characteristics of the modems at the Traffic Systems Center office, and have an operating temperature range -37 to +74° C. Example modems are Models 419SA and 496SA.

(d) Fiber Optic Data Transceiver

The fiber optic data transceiver (FODT) shall provide the interface between the sign controller and the fiber optic communication network. The FODT shall be an ethernet switch meeting the requirements of the port server as described in CABINET, MODEL 334 EQUIPMENT, DMS/SYSTEM DETECTOR. The serial interface functionally described in the referenced section shall only be required if the sign controller does not have built in RJ-45 10 BaseT capability.

(e) System Interface Boards

Interface boards shall be as required by the DMS manufacturer to communicate between the sign and sign controller.

CONSTRUCTION REQUIREMENTS

General. The Contractor shall prepare a shop drawing which details the complete DMS control cabinet assembly and all components to be supplied. The submittal shall fully document the interconnection of all of the components and the cabling. Detailed drawings shall also be provided indicating the proposed layout of the cabinet.

One copy of all operations and maintenance manuals for each DMS control cabinet assembly's components shall be delivered for each assembly installed.

The operations training and warranty for the DMS control cabinet must be the same as those provided for the DMS sign.

All equipment furnished under this pay item must be approved as being compatible with the DMS by the DMS manufacturer prior to procurement of the equipment.

Installation. All equipment, terminal blocks, connectors, wires, and connections necessary to complete the installation and make the control system operational shall be considered incidental to this pay item.

Testing. The Engineer reserves the right to inspect and/or factory test any completed assemblies, prior to delivery of the material to the project site. The purpose of the test is to verify that all aspects of the DMS control cabinet are fully compliant with the specifications. Any deviations from these specifications that are identified during such testing shall be corrected prior to shipment of the assembly to the project site.

The Operational Standalone test shall also verify that all functions of the system are fully operational. A test procedure shall be supplied for approval by the Engineer a minimum of one week prior to the scheduled start of this test.

Method of Measurement. The CABINET, MODEL 334 EQUIPMENT, DYNAMIC MESSAGE SIGN bid item will be measured for payment by the actual number of CABINET, MODEL 334 EQUIPMENT, DYNAMIC MESSAGE SIGN assemblies furnished, installed, activated, tested, and accepted, and shall be counted, each.

Basis of Payment. Payment will be made at the Contract unit price for each CABINET, MODEL 334 EQUIPMENT, DYNAMIC MESSAGE SIGN assembly which shall be payment in full for the material and work described herein.
(CTE – 08/30/2004)

CABINET, MODEL 334 EQUIPMENT, UNINTERRUPTIBLE POWER SYSTEM

Description. This specification shall govern the furnishing and installation of uninterruptible power systems (UPS) in designated field locations and associated equipment cabinets as shown in the plans and as detailed in this specification.

A UPS shall be provided to supply power to the LED dynamic message sign (DMS) when there is an AC power failure. This system shall provide sufficient power to allow the sign to properly operate for a minimum of twenty-four (24) hours under the following conditions:

- LEDs driven at 100% brightness (Overbright) for up to two (2) hours
- LEDs driven at 30% brightness (Daytime) for up to twelve (12) hours
- LEDs driven at 5% brightness (Nighttime) for up to ten (10) hours
- 30% of the pixels on
- Ambient temperatures of -40 degrees C to +50 degrees C
- Fans and heaters off

Materials.

The UPS shall consist of the following major items:

(a) Batteries

The batteries shall be 12-volt, sealed, deep cycle, zero-maintenance, absorbed glass mat batteries. The batteries shall feature pressure regulated, non-removable safety vent valves. Under any charging condition, the batteries shall not produce greater than 2% hydrogen gas. The batteries shall not be restricted from shipment by air and shall pass DOT 49 CFR Sec. 173.159.

A sufficient quantity of batteries shall be supplied to provide 12 hours of sign operation under the criteria given in this specification.

(b) Cabinet

The cabinet shall be as described in specification section: CABINET, MODEL 334. The cabinet shall be paid for under pay item: CABINET, MODEL 334, UNINTERRUPTIBLE POWER SYSTEM.

(c) Intelligent Battery Charger

An intelligent battery charger shall be provided to charge the batteries. This charger shall have the following features:

- Over temperature protection
- Input voltage range from 90 to 135 VAC
- Current limited
- Short circuit protected
- Total reverse polarity protection
- Charger output specifically for AGM battery type
- Charge voltage compensated for temperature
- Battery voltage sensor

(d) A DC to AC Inverter

An inverter shall be provided to convert the 12 VDC battery power to the 120 VAC power required by the sign. This inverter shall have a minimum efficiency of 80% at the rated load and have a sine wave output.

(e) Local Control Panel

The local control panel shall be provided to allow connection of a laptop computer to the sign for testing and maintenance purposes. The panel and laptop computer shall be the interface to all local command and monitoring functions at the sign. The panel shall contain the following assemblies:

- Power-on indicator
- Waterproof local/remote switch
- Local control LED indicator
- Sign controller reset push-button switch
- Sign to ground voice communication RJ-11 jack
- RS-232 connection for the portable laptop computer
- RS-232 cable a minimum of 4 feet long to connect the laptop computer

The voice, data, and control cables shall be terminated with a single CHAMP type IDC connector on each end. All voice, data, and control cables and connections between the sign controller and local control panel shall be provided under this item.

The UPS shall be interfaced with the sign controller such that the sign controller can read the battery voltage sensor and use its value in an algorithm to estimate the remaining battery life. The sign controller shall report this estimate to the central controller at each poll.

During each poll, the sign controller shall also report fans and heaters that are not operational under battery backup that would otherwise be operational under AC power for the current environmental conditions.

CONSTRUCTION REQUIREMENTS

General. The Contractor shall prepare a shop drawing which details the complete UPS assembly and all components to be supplied. The submittal shall fully document the interconnection of all of the components and the cabling. Detailed drawings shall also be provided indicating the proposed layout of the cabinet.

One copy of all operations and maintenance manuals for each UPS assembly's components shall be delivered for each assembly installed.

The operations training and warranty for the UPS must be the same as those provided for the DMS sign.

All equipment furnished under this pay item must be approved as being compatible with the DMS by the DMS manufacturer prior to procurement of the equipment.

Installation. All equipment, terminal blocks, connectors, wires, and connections necessary to complete the installation and make the UPS operational shall be considered incidental to this pay item.

Testing. The Engineer reserves the right to inspect and/or factory test any completed assemblies, prior to delivery of the material to the project site. The purpose of the test is to verify that all aspects of the UPS are fully compliant with the specifications. Any deviations from these specifications that are identified during such testing shall be corrected prior to shipment of the assembly to the project site.

The Operational Standalone test shall also verify that all functions of the system are fully operational. A test procedure shall be supplied for approval by the Engineer a minimum of one week prior to the scheduled start of this test.

Method of Measurement. The CABINET, MODEL 334 EQUIPMENT, UNINTERRUPTIBLE POWER SYSTEM bid item will be measured for payment by the actual number of CABINET, MODEL 334 EQUIPMENT, UNINTERRUPTIBLE POWER SYSTEM assemblies furnished, installed, activated, tested, and accepted, and shall be counted, each.

Basis of Payment. Payment will be made at the Contract unit price for each CABINET, MODEL 334 EQUIPMENT, UNINTERRUPTIBLE POWER SYSTEM assembly which shall be payment in full for the material and work described herein.

(CTE – 1/21/2005)

CABINET, MODEL 334 EQUIPMENT; SYSTEM DETECTOR, RAMP METER, RAMP METER/SYSTEM DETECTOR, OR DMS/SYSTEM DETECTOR; AND MODIFY EXISTING SURVEILLANCE CABINET

Description. This item shall consist of furnishing and installing the equipment in the model 334 surveillance cabinet.

Materials. The Contractor shall provide the following equipment items to be installed in the model 334 surveillance cabinet:

2070 LITE CONTROLLER (paid for under a separate pay item)
MAGNETO-INDUCTIVE VEHICLE DETECTOR (paid for under a separate pay item)
DETECTOR RACK
LOAD SWITCH
SOLID STATE FLASHER
FIBER OPTIC TERMINATION PANEL, 12F (paid for under a separate pay item)
PORT SERVER
DRY CONTACT TO ETHERNET CONVERTOR

Detector Rack. The Contractor shall furnish and install a Detector Rack with power supplies, loop interface panels, cables and harnesses complete in a surveillance cabinet as shown on the plans and as directed by the TSC Surveillance Engineer.

Detector Rack Power Supply. The power supply shall provide regulated DC power for up to 16 input channels. Input voltage shall be 120 VAC, 50/60 Hz. Output voltage (per channel):

Output Voltage VAC	Load Current (mA)
31.3	0
27.2	100
24.3	200
21.8	300

The power supply shall have one output indicator per channel. Indicators shall have high intensity red LEDs which shall indicate output status. Indicators shall illuminate when voltage is greater than or equal to 21.0 VAC \pm 1.0VDC and extinguish when voltage is less than 21.0 VDC \pm 1.0 VDC.

One power switch shall switch input line voltage for all channels. The power supply shall have the following characteristics:

- Dimensions 2.00" x 4.50" H x 6.875 D
- Weight approximately 2.5 Lbs.

The Connector shall be a 2 x 22 pin edge card connector with .156" spacing. The connector shall be centered or 4.50" dimension with the following pin assignments:

Pins	Assignment
1 & A	DC Common
2 & B	Channel 1
3 & C	Channel 2
4 & D	Spare
5 & E	Spare
Pins	Assignment
6 & F	Spare
7 & H	Spare
8 & J	Spare
9 & K	Spare
10 & L	Chassis Ground
11 & M	120 VAC Neutral
12 & N	120 VAC Line
13 & P	Spare
14 & R	Spare
15 & S	Spare
16 & T	Spare
17 & U	Channel 3
18 & V	Channel 4
19 & W	Spare
20 & X	Spare
21 & Y	Spare
22 & Z	Spare

The power supply shall fit in standard size card rack.

Detector Card Rack. The card rack shall be equal to or exceed an Econolite 16-position card rack with the loop interface panel.

The 16-position card rack shall be able to support eight 2-channel detectors, four 4-channel detectors or any combination needed.

The Contractor shall provide all labor and materials necessary to terminate the loops in the surveillance cabinet and extend the detector outputs to the FSK telemetry and connect the RS-232 port off the back panel of the card rack to the RS-232 drop and connect repeat data transceiver.

The Contractor shall supply each card rack with the RS-232 port pre-wired from the back plane of the card rack.

The RS-232 port connector shall plug into the RS-232 Drop and Repeat data transceiver without the aid of any adapters. The Contractor shall be responsible for coordination between manufacturers to ensure that the correct connector configuration is used.

The card rack shall be attached to the top shelf in the surveillance cabinet. No tools shall be required to remove the card rack from the shelf.

The loop interface panel shall be used for the purpose of connecting the field loops to the non-invasive, magneto-inductive vehicle detector.

The interface panels shall be manufactured from FR4 G10 fiberglass, .062" thick, with a minimum of 2 oz. of copper for all traces.

One 16-position interface panel shall be provided for each 16-position card rack.

Each interface panel shall be supplied with a ground terminal bus for termination of the homerun cable shield if elected to be terminated.

Each interface panel shall accommodate 16 independent field loops to be connected.

The loop interface panel shall be attached to the "C" unistrut channel on the side wall of the surveillance cabinet and connected to the card rack via the factory made 20 AWG, twisted pair, harness.

The card rack optically isolated FEP outputs shall be hard wired to the telemetry terminal strips. The telemetry terminal strips are the break point between the FSK telemetry swing rack and the card rack.

Lightning protection shall be mounted and provided for each field loop on the interface panel. Mounting holes shall be provided for the Edco SRA-6LC loop lightning protection device.

Load Switch. The Load Switch, when connected to the ramp meter controller, shall be used to control the ramp meter LED signals. The Load Switch shall comply with the following:

- Operating voltage: 80 to 135 VAC
- Maximum load current: 15 amperes
- Control signal voltage: +24 VDC
- Isolation: 2500 VDC and 10 MOhms
- Control signal inputs: Green (Walk), Yellow, and Red (Don't Walk)
- Temperature range: -20C to 74C
- Nominal dimension (H x W x D): 4.2 in X 1.75 in X 8.5 in

The Load Switch shall mate with any standard NEMA loadbay or with the model 334 cabinet output file. The load switch must be fully guaranteed against all failures due to manufacturing defects for at least two years from the time of installation.

Solid State Flasher. The Solid State Flasher, when connected to the ramp meter controller, shall be used to control the ramp meter warning flashing beacons. The Solid State Flasher shall comply with the following:

- Operating voltage: 80 to 135 VAC
- Maximum load current: 15 amperes
- Temperature range: -20C to 74C
- Nominal dimensions (H x W x D): 4.2 in X 1.75 in X 8.5 in

The Solid State Flasher shall flash alternately at the rate of not less than fifty nor more than sixty flashes per minute. A radio interference filter shall be supplied with the Solid State Flasher. The Solid State Flasher shall mate with any standard NEMA loadbay or with the model 334 cabinet output file. The Solid State Flasher must be fully guaranteed against all failures due to manufacturing defects for at least two years from the time of installation.

Port Server. The port server shall be a fully integrated port server and fiber optic Ethernet switch. The port server shall act as a bridge between a high-speed Internet Protocol (IP) Ethernet network and low-speed serial devices. The port server shall comply with the following:

- Minimum of two (2) DB-9 or DB-25 male connectors.
- Shall provide serial communication at speeds 10000 bps and above
- Shall support point-to-point and point-to-multi-point modes.
- The serial interface shall be RS-232 DTE

The fully integrated Ethernet switch which shall comply with the following:

- Minimum of four (4) RJ-45 10/100TX Ethernet ports
- Shall provide auto-negotiation on 10/100TX ports
- Shall support 100BaseFX using single-mode fiber optic cable with either a LC or SC connector.
- Shall support the following network services: HTTP Telnet, and Com-port control.
- Shall provide a HTML web browser user interface for configuration and monitoring of the unit.

The port server shall provide bi-directional data transfer.

The port server shall comply with the following environment requirements:

- Shall operate on 120VAC
- Shall operate as specified over temperature range of -20 C to +70 C.

Dry Contact to Ethernet Converter. The dry contact to Ethernet converter shall transmit dry contacts over an Ethernet network. The converter shall have a minimum of six (6) input channels for contact closure monitoring.

The dry contact to Ethernet converter shall comply with the following:

- Electric Interface Dry contact
- Number of input channels: minimum of 6
- Contact ratings: 10-100 VDC, 0.5A, 10 watts
- Network interface 10BaseT Ethernet network interface with a RJ45 connector
- Power supply: 9-24 VDC

The converter shall include software for configuration and input channel monitoring.

CONSTRUCTION REQUIREMENTS

General. The Contractor shall install, provision, and test all equipment. The Contractor shall prepare a shop drawing, which details all of the equipment to be supplied under this bid item. The submittal shall consist of the standard catalogue descriptions and user or installation manuals for each component. The information submitted must be sufficient to verify that the equipment is compliant with all of requirements included in the material specifications. In addition, schematics shall be included which detail the interconnection of all of the components to other system components.

The Contractor shall demonstrate a prototype assembly using the proposed components. This demonstration shall take place at a Contractor selected and Engineer approved location. These conformance tests shall be completed prior to the delivery of any completed assemblies to the project site. Any deviations from these specifications that are identified during this testing shall be corrected prior to shipment of the assembly to the project site.

The Contractor shall develop and submit for the Engineer's approval, a detailed test plan that verifies that each component is compliant with the specification and that all of the interconnection cables are operational and properly configured. This test shall use standard manufacturer operating and diagnostic software. At the test, each component will be inspected to verify that it has been delivered according to the approved shop drawings.

The Contractor shall label all cables and ports using permanent cable tags. These labels shall identify the function of the cables and the ports the cables are connected to.

Installation. The Model 2070 Lite ATC unit shall be installed and connected inside the Model 334 Cabinet at the locations as shown on the Plans and according to the manufacturer's instructions. The Contractor shall install all cables and ancillary equipment, connecting the Model 2070 Lite ATC to the Ramp Meters and Detectors.

Surge and over-voltage protection shall be installed on all loop lead-in cables and all power conductors.

All cables shall be neatly dressed and labeled with their function and physical connection.

Testing. The Contractor shall power up the Model 2070 Lite ATC and self-test the unit using available software. Applications software shall be uploaded, configured, and validated. This testing shall be accomplished prior to installing the unit in the field cabinet. After the unit is installed in the cabinet, the Contractor shall apply power and verify the unit is operating correctly. Tests previously used for bench checking shall be repeated and documented.

The Contractor shall test the operation of the 2070 Lite Controller as a subsystem with the vehicle detection systems operational, using CCTV video as ground truth for ramp meter operations and volumes, and a calibrated radar gun for speed. Traffic data produced by the 2070 Lite Controller shall be within 5% of ground truth (actual traffic counts and speeds). A written copy of the test, with supporting videotape, shall be submitted to the Engineer at the end of the test for approval.

Documentation. One copy of all operations and maintenance manuals for each component shall be delivered for each assembly installed. In addition, full documentation for all software and associated protocols shall be supplied to the Department on a 3.5-inch floppy disk(s) and a CD-ROM. The Department reserves the right to provide this documentation to other parties who may be Contracted with in order to provide overall integration or maintenance of this item.

Warranty. The Contractor shall warranty all materials and workmanship including labor for a period of two years after the completion and acceptance of the installation, unless other warranty requirements prevail. The warranty period shall begin when the Contractor completes all construction obligations related to this item and when the components for this item have been accepted, which shall be documented as the final completion date in the construction status report. This warranty shall include repair or replace all failed components via a factory authorized depot repair service. All items sent to the depot for repair shall be returned within two weeks of the date of receipt at the facility. The depot location shall be in the United States. The provider of the warranty shall be responsible for all return shipping costs.

The depot maintainer designated for each component shall be authorized by the original manufacturer to supply this service. A warranty certificate shall be supplied for each component from the designated depot repair site indicating the start and end dates of the warranty. The certificate shall be supplied at the conclusion of the system acceptance test and shall be for a minimum of two years after that point. The certificate shall name the Department as the recipient of the service. The Department shall have the right to transfer this service to other private parties who may be Contracted to perform overall maintenance of the facility.

Basis of Payment. This item shall be paid for at the Contract unit price each for CABINET, MODEL 334 EQUIPMENT, EXIT RAMP QUEUE DETECTOR; CABINET, MODEL 334 EQUIPMENT, DMS/EXIT RAMP QUEUE DETECTOR; CABINET MODEL 334 EQUIPMENT, SYSTEM DETECTOR; CABINET, MODEL 334 EQUIPMENT, RAMP METER; CABINET, MODEL 334 EQUIPMENT, RAMP METER/SYSTEM DETECTOR; CABINET MODEL 334 EQUIPMENT, DMS/SYSTEM DETECTOR; and MODIFY EXISTING SURVEILLANCE CABINET. This shall be payment in full for all work and incidental items to install all equipment in the cabinet.

TABULATION OF CABINET, MODEL 334 BY CABINET TYPE:

Equipment	Exit Ramp Queue Det.	System Detector	Ramp Meter	Ramp Meter/System Detector	DMS/System Detector or Exit Ramp Queue Det.	Modify Existing Surveillance Cabinet
2070 Lite Controller		1	1	1	1 ⁽¹⁾	
Magneto-Inductive Detector card(s)	(see plans for quantities)					
Detector Rack	1	1	1	1	1	1
Load Switch	1		1	1		
Solid State Flasher			1	1		
Fiber Optic Termination Panel, 12F		1	1	1	1	1
Port Server		1	1	1	1	1
Dry Contact to Ethernet Converter		1	1	1	1	1

⁽¹⁾ Additional 2070 Lite controller used for DMS control paid for separately under LED DYNAMIC MESSAGE SIGN FULL-MATRIX CONFIGURATION pay item.
(EK – 10/16/2004)

HIGHWAY ADVISORY RADIO STATION

Description. This work item shall consist of the furnishing and installation of a complete Highway Advisory Radio (HAR) assembly at the location indicated in the Contract documents. The HAR station to be installed is HAR-02 as shown on the Drawings.

Materials. The Contractor shall provide a totally operational assembly including all cabling, terminations, and miscellaneous hardware. All components supplied shall be matched, tuned, and be compatible to form a fully operational and optimized assembly for operation on the FCC licensed frequency. The HAR assembly shall consist of the following major components.

(a) HAR Transmitter

- The AM transmitter shall be FCC certified as accepted and eligible for licensing under 47CFR Part 90.242.
- The AM transmitter shall be capable of transmitting at frequencies from 530 kHz up to 1710 kHz. The transmitter to be supplied shall be setup for the frequency obtained during the licensing procedure detailed under the construction methods of this specification. However, as the result of the final licensing steps, the engineer reserves the right to order a change in this frequency, prior to factory test or delivery of the equipment to the project site.

- The AM transmitter shall have an output power range of between 1 and 10 watts with continuously adjustable output power control.
- The AM transmitter shall have an external PL-259 UHF style RF output and ¼" audio headphone output.
- One set of closed earcup style headphones with a ¼" jack and an external speaker with amp and volume control must be furnished with the system. The speaker must be rated for a minimum of 3 watts.
- The AM transmitter shall be rack mountable in a standard 19" equipment rack and operate on a 24 VDC power supply.
- The AM transmitter shall include built-in audio compander processing and a LED audio level meter.
- The AM transmitter shall be designed specifically for use in Travelers Information Stations applications.

(b) HAR Transmitter Signal Synchronization System

- The three HAR stations installed under this project shall be synchronized with each other through the use of a GPS based system to minimize heterodyne interference in signal overlap areas.
- The synchronization system shall provide an oscillation phase-lock between stations to a common reference carrier, and shall stabilize the frequency of each transmitter in the system.
- The synchronization system must utilize an 8-channel or greater receiver and provide an accuracy of 10 MHz at 45nS.
- The synchronization system must be mountable in a standard 19" rack and operate on a 24 VDC power supply.

(c) HAR Antenna System

The antenna assembly shall consist of an antenna, antenna tower, grounding system, antenna tuning unit, and concrete foundation.

- The antenna shall be a high efficiency type with a designed signal intensity of 2.0mV/m at 2.25 miles with 10 watts of input power.
- The antenna shall be constructed of filament wound epoxy glass with an epoxy polyamide paint finish, and measure 44' in length. The antenna shall be capable of sustaining winds of 150 miles per hour dry, and 100 miles per hour with ¾" radial ice.

- The antenna tower shall be constructed of galvanized steel and be 21" square with a 48" height, the tower shall have a hinged bottom plate which allows the tower to tilt to a 90 degree angle during setup. The tower must also include a side mount for the antenna tuning unit.
- All hardware used in the antenna assembly shall be stainless steel except for the anchor bolts, which will comply with the Contract plans.
- The antenna tuning unit (ATU) shall be designed to accept the maximum transmitter power on a continuous 100% duty cycle basis. The ATU shall be supplied in a lockable weatherproof NEMA 4 enclosure to mount on the antenna tower supporting the antenna. The ATU shall also include a lightning arrester system with 18,000 Amps surge capacity and a clamping speed of less than 4 nS.
- A chemical uni-rod grounding system shall be supplied. A 20' copper pipe filled with non-toxic electrolytic salts shall be used. The area around the electrode shall be backfilled with conduction enhancing materials as specified by the manufacturer. Factory installed pigtail conductors shall be cadwelded to the pipe.
- Concrete foundation shall be as shown on the drawings.

(d) HAR Message Programmer (MP)

- The MP shall provide the system interface for receiving, storing, and playing messages. It should be remotely operable through DTMF tones allowing the operator to record messages, schedule message playback, and provide full access to the system through user selectable 10 digit security codes and pre-recorded voice prompts. Capabilities for playing an alternate audio source when no recorded messages are scheduled must also be provided.
- The MP shall provide 14.3 minutes of digital audio storage using solid state-DRAM type memory. The memory shall be backed up by rechargeable batteries providing one month of backup time.
- The MP shall be capable of storing up to 250 distinct messages of varying length and up to 20 message sequences consisting of up to 100 individual messages.
- The MP shall have one audio output channel and one audio input channel for a local microphone.
- The MP shall be mountable in a standard 19" equipment rack and operate on a 24 VDC power supply.

(e) HAR Power Supply and Metering Equipment

- The HAR power supply shall provide switching, fusing, and metering for AC and DC power, 24V power supply, and 10A float battery charger. The transmitter, message programmer, and Signal Synchronization System shall each be supplied directly from the rack mounted power supply.
- The rack mounted power supply shall provide the required DC voltage and power for the transmitter and recorder and shall operate from either 120VAC or a local battery supply. In the event of loss of AC power the power supply shall automatically switch to battery power. Batteries shall be provided to allow 6 days of continuous operation.
- A 120 V AC single phase surge protector shall be installed as a precautionary measure against possible damage resulting from voltage surges on all incoming power lines. The 120 V AC single phase surge protector shall be rated at 30,000 Amps and have a response time of less than 1 nS.
- An in-line meter shall be provided to measure forward and reflected power, and SWR. The meter shall be an analog type and rated at not less than 50 watts. The display shall have used selectable ranges allowing for accurate readings in the 0-10 watt range.

(f) HAR Equipment Rack

- The rack must be a standard 19" wide equipment rack conforming to E.I.A. standards, and supplied with all necessary mounting rails, and accessories.
- The rack must have 45 RU mounting space and be supplied with all shelves and equipment as shown on the drawings.

CONSTRUCTION REQUIREMENTS

General. The Skyway HAR location shall be installed and operational by the time that the fiber optic communication network is operational.

The FCC license for the Skyway HAR will be obtained by the Engineer.

The Contractor shall prepare a shop drawing which details the complete Highway Advisory Radio assembly and all components to be supplied. The submittal shall fully document the interconnection of all of the components and the cabling. Detailed drawings shall also be provided indicating the proposed layout of the rack.

Three copies of all operations and maintenance manuals for Highway Advisory Radio assembly components shall be provided.

On-site operations training shall be provided for a nominal 4 hours and for a minimum of ten (10) operation personnel. The training shall include the operation of the system and basic troubleshooting and maintenance procedures geared to pinpoint problems and remedies.

All components to be supplied under this specification shall be warranted for a minimum of two-years from the conclusion of the system acceptance test. This warranty shall include repair and/or replacement of all failed components via a factory authorized depot repair service. All items sent to the depot for repair shall be returned within two weeks of the date of receipt at the facility. The depot location shall be in the United States. Repairs shall not require more than two weeks from date of receipt and the provider of the warranty shall be responsible for all return shipping costs. The depot maintainer designated for each component shall be authorized by the original manufacturer to supply this service. A warranty certificate shall be supplied for each component from the designated depot repair site indicating the start and end dates of the warranty. The certificate shall be supplied at the conclusion of the system acceptance test and shall be for a minimum of two years after that point. The certificate shall name IDOT as the recipient of the service. IDOT shall have the right to transfer this service to other private parties who may be Contracted to perform overall maintenance of the facility.

Testing. The engineer reserves the right to inspect and/or factory test any completed assemblies, prior to delivery of the material to the project site. The purpose of the test is to verify that all aspects of the HAR are fully compliant with the specifications. Any deviations from these specifications that are identified during such testing shall be corrected prior to shipment of the assembly to the project site.

Subsequent to the installation of the equipment and obtainment of license, a Operational Standalone test shall be performed for each installed Highway Advisory Radio assembly. An HAR factory authorized and trained technician shall adjust each transmitter and test the system to insure compliance with 47 CFR Part 90.242. After the transmitter is fine tuned, a minimum of 10 sites within the coverage area will be selected by the Engineer for testing. The test procedure shall demonstrate to the Engineer that an acceptable signal is being obtained throughout the coverage area. If the tests reveal that the maximum field strength is not being obtained with the 10-watt input power setting, the supplier will prepare the necessary FCC applications to request a waiver which will allow the transmitter power to be adjusted upwards to achieve the maximum field strength allowable under 47FCR Part 90.242. Ground resistance and SWR measurements must also be taken and recorded as part of the testing procedures.

The Operational Standalone test shall also verify that all functions of the system are fully operational including the communication interface with IDOT headquarters. A test procedure shall be supplied for approval by the Engineer a minimum of one week prior to the scheduled start of this test.

Installation. Care should be taken to minimize disruption to the existing landscape and to avoid possible underground utilities or conduits.

The HAR must be connected to electric service from within the Skyway Communications Shelter. All necessary cable, conduit, and equipment required to provide a 120 VAC, 20A circuit to the HAR equipment shall be provided.

All HAR equipment except for the Antenna assembly shall be mounted in a 19" equipment rack installed inside the communication shelter.

Method of Measurement. The Highway Advisory Radio Station bid item will be measured for payment by the actual number of Highway Advisory Radio assemblies furnished, installed, activated, tested, and accepted, and shall be counted, each.

Basis of Payment. This work will be paid for at the Contract unit price each for HIGHWAY ADVISORY RADIO STATION which shall be payment in full for the material and work described herein.

(CTE – 11/29/2004)

HIGHWAY ADVISORY RADIO COMMUNICATION EQUIPMENT

Description. This work item shall consist of the furnishing and installation of equipment necessary to transmit the audio signal from the IDOT Communications Center to the central distribution point at the Skyway Communications Hut, and out to each of the three transmitters.

Materials. The Contractor shall provide a totally operational assembly including all cabling, terminations, and miscellaneous hardware. The Highway Advisory Radio (HAR) Communications Equipment shall consist of the following major components.

- (a) HAR Simulcast Equalization System (SES)
 - Furnished by IDOT. Contractor to relocate SES from IDOT Communications Center to Skyway Communications Hut.
- (b) Telephone Hybrid
 - The Telephone Hybrid shall be used to provide the audio/telephone interface between the SES and the telephone signal coming from the IDOT Communications Center.
 - The Telephone Hybrid shall be a rack mountable unit and shall be powered from a 120 VAC source.
 - The Telephone Hybrid shall use 100% digital signal processing architecture and shall accommodate a single analog telephone line.
 - The Telephone Hybrid shall include full touch-tone (DTMF) dialing capability, and shall provide simultaneous 2-wire and 4-wire operation.
 - The Telephone Hybrid shall include selectable options for auto-answer and disconnect, burst/adapt method, receive level and call progress/loop control.
 - The Telephone Hybrid shall include support for RS-232 controls.
- (c) Telephone to 10Base-T Ethernet Extender (TelEx)
 - The TelEx shall be used to convert the telephone signal coming from the IDOT Communications Center to an ethernet signal for transmission over the IDOT Communications Network.

- The TelEx shall be a rack mountable unit and operate from a 120 VAC power source.
- The TelEx shall have 10Base-T Ethernet connectivity and be compatible with PBX, Key Systems (POTS), and the other networking equipment installed on this project.
- The TelEx shall have a web based configuration user interface.
- The TelEx shall provide automatic phone connection upon power up and restoration of the LAN.
- The TelEx shall operate in the audio bandwidth from 300 to 3400 Hz.
- The TelEx shall have a LED status panel which provides visual indication of power to the unit and system functionality.

(d) Fiber Optic Audio Transceiver (FOAud)

- The FOAud shall be used to transmit the audio signal from the SES to each of two remote HAR locations.
- The FOAud shall be a stand alone unit and shall be operable from a 120 VAC power source.
- The FOAud shall have a 600 ohm input/output impedance, and a frequency response of between 20 and 20,000 Hz.
- The FOAud shall transmit data over a single, single mode fiber optic cable and have an optical power budget of not less than 17 dB.

CONSTRUCTION REQUIREMENTS

General. The equipment in this section will only be required after the fiber optic communications network has been put into operation. Equipment shall be installed at such time that the communications infrastructure is in place and the equipment can be put into operation to avoid having the equipment sitting idle and unused.

The Contractor shall prepare a shop drawing which details all Highway Advisory Radio Communications Equipment and all components to be supplied. The submittal shall fully document the interconnection of all of the components and the cabling. Detailed drawings shall also be provided indicating the proposed layout of the cabinet.

Three copies of the operations and maintenance manual for Highway Advisory Radio Communications Equipment shall be delivered.

Operations training shall be provided for a nominal 4 hours for a minimum of ten (10) operation personnel. The training shall include the operation of the system and basic maintenance and troubleshooting procedures geared to pinpoint problems and remedies.

The equipment shall be warranted the same as HIGHWAY ADVISORY RADIO STATION.

Installation. All equipment shall be installed in equipment racks as shown on the drawings. The SES must be relocated to the Skyway Communications Hut. Once the equipment has been installed, all adjustments to the delay, gain, and/or equalizer settings on the SES must be made such that there is no interference between HAR antennas and that a clear audible signal is heard throughout the entire HAR coverage area.

Testing. An operational test of all components shall be performed to verify that all functions of the system are fully operational. A test procedure shall be supplied for approval by the Engineer a minimum of one week prior to the scheduled start of this test.

In addition, the entire HAR coverage area shall be driven and a radio tuned to the HAR frequency shall be used to verify that there is no audible interference from adjacent HAR antennas. If interference is heard, the SES must be adjusted and the area re-surveyed. The HAR coverage area will include the Dan Ryan and portions of I-57, Bishop Ford, and I-90 which are in range of the antennas.

Method of Measurement. Highway Advisory Radio Communications Equipment shall be counted, lump sum.

Basis of Payment. This item will be paid for at the Contract unit price lump sum for HIGHWAY ADVISORY RADIO COMMUNICATIONS EQUIPMENT, which shall be payment in full for the material and work described herein.

(CTE – 11/29/2004)

HAR FLASHING BEACON ASSEMBLY

Description. This work shall consist of furnishing and installing HAR Flashing Beacon Assemblies in accordance with these Contract Documents. HAR Flashing Beacon Assemblies are attached to Highway Advisory Radio (HAR) Signs.

Materials. All materials furnished, assembled, fabricated, or installed shall be corrosion resistant. Each HAR Flashing Beacon Assembly shall consist of the following major components:

(a) Beacon Controller

- The beacon controller shall be capable of communicating with the control equipment located at the IDOT Communications Center through the use of DTMF tones sent out through the HAR transmitters.

- The beacon controller shall be a digitally tuned AM receiver with a field programmable DTMF decoder and stainless steel whip type antenna.
- The beacon controller shall have an external PL-259 UHF style RF output and ¼” audio headphone output. One set of closed earcup style headphones with a ¼” jack and an external speaker with amp and volume control must be furnished with the system. The speaker must be rated for a minimum of 3 watts.
- The beacon controller shall be supplied with a manual override switch for testing the beacon light.
- The beacon controller shall operate from a 120 VAC power source and be provided with a battery back up system to allow the same length of emergency operations during a power outage as the battery system supplied with the HAR transmitter stations.

(b) Beacon

- The beacon shall be a single 8” traffic signal head mounted to the HAR sign as indicated on the Contract documents.
- The beacon shall have a yellow polycarbonate housing.
- The beacon shall have an amber lens with polycarbonate construction.
- The beacon shall have a tunnel style visor with polycarbonate construction.
- The beacon shall have an LED lamp.

(c) Nema 3R Cabinet

- The NEMA 3R Cabinet shall be constructed of aluminum, sized to accommodate all of the beacon assembly components, and be provided with a padlocking mechanism.
- The NEMA 3R Cabinet shall be designed for mounting to the sign support structure. All equipment required to mount the cabinet to the sign support is considered to be part of this item.
- The NEMA 3R Cabinet shall be supplied with all shelving required to mount the equipment inside the cabinet.
- The NEMA 3R Cabinet shall be equipped with a main circuit breaker and AC surge protection on the incoming power feed.

- The NEMA 3R Cabinet shall be supplied with an exhaust fan, air filter, resistive heating element, and adjustable thermostat. The heating and cooling elements shall be sized to keep the cabinet within an acceptable operating range for all equipment housed inside the cabinet.

CONSTRUCTION REQUIREMENTS

General. The Contractor shall prepare a shop drawing which details the complete Highway Advisory Radio Flashing Beacon assembly and all components to be supplied. The submittal shall fully document the interconnection of all of the components and the cabling. Detailed drawings shall also be provided indicating the proposed layout of the cabinet.

One copy of all operations and maintenance manuals for each Highway Advisory Radio Flashing Beacon assembly components shall be delivered for each assembly installed.

On-site operations training shall be provided for a nominal 4 hours and for a minimum of ten (10) operation personnel. The training shall include the operation of the system and basic troubleshooting and maintenance procedures geared to pinpoint problems and remedies.

The equipment shall be warranted the same as HIGHWAY ADVISORY RADIO STATION.

Installation. The beacons shall be classified as “inbound” and “outbound” as shown on the drawings. The “inbound” beacon controllers shall be programmed to recognize a separate set of DTMF tones than “outbound” controllers. This will allow IDOT to send two distinct tones which can be used to independently operate each set of beacons.

Programming of the software used to transmit DTMF tones over the HAR antennas will be performed by IDOT. Programming of the DTMF decoders at each HAR flashing beacon sign is the responsibility of the Contractor.

Testing. Verify that the beacons can be turned on and off by using the manual activation toggle switch.

When the switch-ON command is transmitted from the HAR antennas verify that the beacons turn on. When the switch-OFF command is transmitted verify that the beacons turn off.

Method of Measurement. This work shall be measured for payment as the number of HAR Flashing Beacon Assemblies and be counted, each.

Basis of Payment. The item shall be paid at the Contract unit price each for HAR FLASHING BEACON ASSEMBLY, which shall be payment in full for the material and work described herein.

(CTE – 11/29/2004)

HIGHWAY ADVISORY RADIO CENTRAL SYSTEM UPGRADE

Description. The Highway Advisory Radio Central System Upgrade provides, installs, tests and integrates new equipment and software to translate information from the Advanced Traffic Management System (ATMS) into audio information that can be broadcast to travelers via the highway advisory radios (HARs) and highway advisory telephone (HAT).

Materials. The Contractor shall furnish two new PC servers as follows:

Mounting	Rack mounted in EIA 19-inch cabinet
Processor	Intel P4
Operating System	Windows XP Professional or Windows 2000
Speed	>2.8 GHz, Intel processor
Memory	1.0 Giga Bytes or greater
Hard Drive	120 Giga Bytes or greater, dual
Power Supply	120 VAC, 350 Watts or greater, dual

One of the servers will communicate with the Traffic Systems Center using IP over Ethernet or RS-232 over Ethernet. The other will provide speech processing and data distribution.

The Contractor shall upgrade or provide new system hardware to interface with the existing system. This shall include:

- The Contractor shall provide a rack-mounted keyboard and mouse. The Contractor shall supply a 17-inch monitor mounted in the rack (secured to the rack or placed on a shelf that is secured to the rack). The Contractor shall provide a KVM switch to alternate control of the two servers.
- The Contractor shall furnish four (4) Natural Microsystem AG-2000-8(PCI) voice boards; three shall be installed in the cabinet and one shall be supplied to the HAR Maintenance Contractor as a development spare.
- One equipment rack on wheels. This rack shall match existing racks and shall be approved by the engineer.

The Contractor shall supply two operator work stations. These PC work stations shall meet or exceed the following characteristics:

Processor	Intel P4
Operating System	Windows XP Professional
Speed	>3.2 GHz, Intel processor
Memory	1.0 Giga Bytes or greater
Hard Drive	120 Giga Bytes or greater
Power Supply	120 VAC, 350 Watts or greater
Installed Software	Microsoft Office Professional

The Contractor shall furnish two 17-inch flat monitors for the workstations.

The Contractor shall provide audio amplifiers and interface equipment to distribute the signal to the HAR feeds in the Communications Center.

The effort shall reuse existing C/O simulator and amplifier panel.

The Contractor shall furnish, install, and test an upgrade to the existing system software. The existing software is HAR'98 furnished by BiLine Computing Technologies, Inc., 648 E. Harbor Terrace, Bartlett, IL 60103, 630-830-3831. This software shall operate on the upgraded equipment using the Windows XP operating system. In addition to replicating all existing capabilities of the existing HAR'98 software, the new software shall:

- Assign a level of severity to system error reports.
- Consolidate entry of information to a single program module.
- Allow Communications Center operators to add messages to a HAR broadcast using text-to-voice entry from their workstations.
- Allow Communications Center operators to remove messages from the queue or broadcast sequence when they are no longer required.
- Alert operators in the communications center that there is a problem with the system and data. This software shall discriminate between critical alarms (those affecting system operation) and those associated with individual detectors or detector stations. The critical alarms shall provide an attention-getting notification to the operators such as a flashing light, flashing computer screen, or audio enunciator.
- Allow operators to record and play a voice message. This capability shall allow the operator to review a voice message and to alter its volume.

Installation.

General. The installation shall comply with the National Electrical Code. All interior 120-volt power wiring shall be in electrical metallic tubing, unless otherwise indicated. Except for permitted plug strips, receptacles shall be duplex receptacles, industrial specification grade, in metal boxes with metal covers.

The Contractor shall provide software development to modify the existing software for the updated and expanded capability. This software shall be developed off-line and demonstrated prior to installing it as the operational system.

- The software developer shall write the necessary code and demonstrate that it satisfies the requirements.
- The Contractor shall develop a operational test plan and submit for the approval of the Engineer. The tests shall demonstrate all functional capabilities of the software.
- The Contractor shall submit the plans a minimum of ten days prior to the start of any testing.
- The final cut-over to the new system shall be accomplished on a weekend between midnight on Friday and 4:00 AM on Monday morning.

The Contractor shall provide two 4-hour training sessions for eight students each. The training shall cover the operation of the system and proper procedures for entering new messages.

Interconnecting Wiring. The Contractor shall temporarily relocate the existing equipment and mount the new equipment in the rack locations shown in the plans.

All wiring, cabling, and other provisions necessary to connect the installed system package to power panelboards, audio patch panels, grounding systems, etc. shall be installed.

All wiring and cabling, shall be suitably labeled, using the designation scheme as developed by the Contractor and approved by the Engineer.

The Contractor shall demonstrate the functionality of the system prior to cut-over. Once the system capability of the new equipment has been demonstrated to the satisfaction of the Engineer, the Contractor shall cut over existing feeds to the new equipment.

Method of Measurement. The HIGHWAY ADVISORY RADIO CENTRAL SYSTEM UPGRADE, will be measured for payment on a lump-sum basis for the equipment and software installed, tested, and operating as an integrated whole.

Basis of Payment. This work will be paid for at the Contract unit price for the HIGHWAY ADVISORY RADIO CENTRAL SYSTEM UPGRADE which shall be payment in full for the material and work described
(EK – 10/16/2004)

TEMPORARY TELEPHONE SERVICE INSTALLATION

Description. This item shall provide temporary telephone service connections to each of the dynamic message signs, DMS-01 and DMS-02.

CONSTRUCTION REQUIREMENTS

Installation. Prior to the installation of the service cables the Contractor shall contact the Traffic Systems Center Engineer at (708)524-2145. The Engineer will contact SBC to confirm service location and request a hookup date.

A Siecior CAC 3000, or equal, plastic telephone network interface junction box shall be mounted within the sign controller cabinets. Telephone cable shall be installed from the network interface junction box to the telephone service. 1.5m (five feet) of excess cable shall be provided at each end of the installed cable. The TELCO Service Cable will be paid for under ELECTRICAL CABLE AERIAL SUSPENDED, COMMUNICATION, NO. 18 3 PAIR.

Basis Of Payment. This work shall not be paid for separately, but shall be considered included in the price for ELECTRICAL CABLE AERIAL SUSPENDED, COMMUNICATION, NO. 18 3 PAIR. After installation the Illinois Department of Transportation shall be responsible for SBC hookup and service charges.
(CTE – 10/08/2004)

RAMP METER FLASHER

Description. This item shall consist of furnishing and installing ramp meter advance flashing beacons which shall include 8-inch diameter colored lens, door, visor, terminal block and accessories, mounted on a 6-inch x 6-inch x 17-inch wood post, or 7-foot steel pole as shown on the Contract drawings or as directed by the Engineer. Ramp meter advance flashing beacons shall indicate to traffic approaching the beacons the existence of a ramp meter signal.

All ramp meter advance flashing beacons shall be new and shall be from one manufacturer and each type shall be the same model unless otherwise approved by the Engineer. Used or reconditioned equipment shall not be acceptable. The equipment shall be designed for continuous operation under temperature and humidity conditions encountered in the Midwestern United States.

Materials.

General. The standard ramp meter advance flashing beacon shall consist of two adjustable one section 8-inch beacon with amber lens mounted in separate complete housings giving indications to traffic approaching the beacon head from one direction only. The housing, door and visor shall be:

- A. Injection molded of ultraviolet stabilized, pre-colored opaque polycarbonate.
- B. Designed such that no light is visible in the profile view of the beacon face.
- C. Colored Federal Yellow with the exception of the interior (underside) of the visor that shall be painted flat black. The Federal Yellow coloring shall be molded in all the way through in the polycarbonate material, therefore, there shall be no peeling, no corrosion, and scratches shall not expose uncolored material.

Housing. The housing shall be a one-piece unit with provisions for securely mounting a terminal block. The housing shall be of such construction as to assure permanent alignment of the lens in the beacon faces to its traffic approach.

Door. The door shall be a one-piece unit with an approximate 8-inch diameter opening for the lens. The door shall be fastened to the housing with two stainless steel hinge pins, or by polycarbonate hinge pins that are an integrally molded part of the housing door. The door shall be securely gasketed to the beacon housing with a weatherproof gasket. A positive latching mechanism integrally molded into the housing and housing door shall be provided for opening and closing the door without the use of special tools.

Visor. Each door shall be equipped with a detachable tunnel visor that encloses 75 percent of the lens circumference. Visors shall be at least 7-inches long with a downward tilt of 2 to 8 degrees. The removable twist-on visor shall be rigidly attached to the door with stainless steel attaching screws and designed in a manner such that the encircled portion of the lens shall not be visible in the profile view of the beacon face. Visors shall be easily installed or removed from the beacon head without damage to the visor or beacon head.

Optical Unit. Each lens shall be provided with an optical unit consisting of a reflector assembly with leads to the terminal block together with all bolts, nuts, screw, clips, hinges, lugs, and incidentals necessary for mounting the various parts of the optical assembly. The optical unit shall consist of an amber lens with a nominal diameter of 8-inches as specified. Lenses shall be injection molded of a polycarbonate material, and shall be permanently marked in an inconspicuous manner, indicating the top of the lens and the name or trademark of the manufacturer. Lenses and optical unit shall be capable of withstanding continuous illumination of a 67-watt lamp in an 8-inch head. A precision molded neoprene gasket shall be provided between the lens and reflector to form a sealed weatherproof and dust-tight unit.

Each optical unit shall be wired complete to a terminal block. The terminal block shall be securely mounted in an accessible position and shall be of weatherproof molded construction, equipped with identified terminals for interior and field wires. Binding screws shall be provided for the field wires. Binding screws or solderless connectors shall be provided for the interior wires.

Reflectors. The reflector shall be parabolic in section, made of aluminum treated with an ALZAK finish. The reflecting surface shall be free of flaws, scratches, defacements, or mechanical distortion.

Lamp Receptacle. The lamp receptacle shall be of weatherproof molded construction capable of withstanding without deterioration the high temperatures within the optical unit during operation and shall be equipped with a lamp grip to render it impossible for the lamps to be loosened by vibration. The receptacle in the 8-inch signals furnished shall be set to place the filament of a standard 67-watt lamp in the proper focal position with respect to the reflector. The reflector holder and lamp receptacle holder shall be constructed of rust resisting material, shall be provided with hinges and/or lugs spaced to give clearance to the hinges or lugs for the door, and shall be designed to securely hold the reflector and lamp receptacle in place.

Wiring. All wiring and terminal blocks shall meet the requirements of Section 13.02 of the ITE Publication: Equipment and Material Standards, Chapter 2 (Vehicle Traffic Control Signal Heads). Each reflector assembly shall be provided with two flexible insulated color-coded leads not smaller than #18 AWG. These leads are to be securely fastened to the lamp socket and connected to the terminal block by means of solder less wire connectors or binding screws and spade lugs. Color-coding for the identification of the different leads shall be individual so that each lead can be identified separately by coding alone.

CONSTRUCTION REQUIREMENTS

General. The basic construction design shall provide minimum weight combined with the maximum rigidity and strength. Other parts of the optical unit, including the reflector, and reflector holder, shall be designed as a whole system to eliminate the return of outside light rays which enter the unit.

The electrical and optical system of the ramp meter advance flashing beacons shall be designed for operation from a power supply of 115 volt, single phase, 60 cycle alternating current and for 60 to 150 watt standard clear traffic light bulb.

All external signal hardware and fasteners of the signal shall be stainless steel, including hinge pins and latching mechanisms.

All ramp meter advance flashing beacon assemblies shall be rigid mounted utilizing a suitable assembly adjustable in both the horizontal and vertical planes of a design similar to that shown on the plans. Bracket assemblies shall be aluminum.

Each ramp meter advance flashing beacon shall be delivered completely wired, fully assembled, and ready for immediate installation.

Basis of Payment. This item shall be paid for at the Contract unit price per each for RAMP METER FLASHER. This price shall be payment in full for furnishing and installing the RAMP METER FLASHER as described herein and all connections, testing, and for all labor, tools, equipment, transportation, and incidentals necessary to mount the advance flashing beacons, realignments, optical adjustments, and to complete this item of work as described herein.
(EK – 10/15/2004)

NON-INVASIVE, MAGNETO-INDUCTIVE VEHICLE DETECTOR ASSEMBLY

This specification describes the minimum design, operational, functional and installation requirements for a non-invasive, magneto-inductive vehicle detector assembly.

Description. The non-invasive, magneto-inductive vehicle detector assembly consists of microloop detector probes, lead-in cables, carriers, and splicing kits. The non-invasive, magneto-inductive vehicle detector assembly is inserted into a three inch diameter plastic conduit placed below the road surface using open trenching techniques.

Materials. The Contractor shall furnish the following items:

Microloop Detector Probes. The Contractor shall furnish microloop detector probe assemblies, 3M Model 702 or Engineer approved equivalents.

Vehicle Data Collection Requirements. Each probe shall have an inductance change that will allow an appropriately designed, matched vehicle detector to detect all licensable vehicles that contain ferromagnetic material. The probe will detect these vehicles when they are within a travel distance less than one half ($\frac{1}{2}$) the height of the ferromagnetic material of the vehicle.

The single, double, or triple probe set shall consist of one, two, or three probes connected in series to a common lead-in wire.

Each single, double, or triple probe set shall be connected to an appropriately designed, matched vehicle detector.

Electrical and Magnetic Operating Requirements. The probe shall transduce changes in the ambient magnetic field to changes in its inductance.

An increase in the ambient magnetic field shall result in a decrease in the inductance of the probe.

The nominal magnitude of the vertical magnetic field over which the probe shall function to specified requirements shall be 200 millioerstads to 800 millioerstads.

The probe shall detect reliably and consistently changes in the ambient magnetic field of seven (7) millioerstad or greater when the earth's magnetic field is >200 millioerstad [HDC=200 mOe] and the peak-to-peak amplitude of the applied inductive current is 40mAmp[pp][IAC=40mAmp[pp]]. This requirement defines the sensitivity to be >2 nanohenries/millioerstad at HDC=200 mOe and IAC=40mAmp-p.

The inductance change of the probe shall be directly proportional to the changes in the earth's magnetic field.

The probe inductance shall be between 50 μ H to 80 μ H.

The nominal operating frequency of the probe shall be between 20 kHz and 60kHz.

The probe shall operate with drive currents of 2.5mAmp to 175 mAmp.

The specified electrical and operating requirements shall be maintained over temperatures ranging from -29.9 to 162.5 degrees Fahrenheit.

Physical Requirements. The probe shall have an outer diameter of 0.8125 inches and a height of 2.25 inches.

The probe shall snap into a carrier.

The carrier shall hold and maintain the probe position to ± 20 degrees of vertical.

The probe shall be suitably sealed for use in 100% humidity environments in the conduit.

Probe Lead-In Cable. The probes shall be equipped with lead-in cable, assembled to the probe by the manufacturer. The length of the lead-in cable shall be adequate to connect the probe to a splice in the handhole.

The lead-in cable shall meet or exceed CANOGA 40002 lead-in cable and have a resistance of 3.00 ohms per 100 feet and 16.5 μ H per 100 feet.

The microloop detector probes shall be furnished from factory with lead-in cable installed to the probes.

It shall be the Contractor's responsibility to order the probes with the correct lead-in cable lengths. Each probe/probe set shall be clearly identified by location/lane assignment. The lead-in cable length shall be such that there is sufficient lead-in to lift the splice to the homerun cable out of handhole, and be worked on by the maintenance staff above grade.

Contractor shall follow the splicing details in the plans.

Probe Carriers. Plastic mounting supports (carriers) shall be supplied to establish and maintain (lock) sensor spatial orientation and position within the conduit to within 20 degrees of vertical.

The carrier mechanism for holding and inserting the probes shall allow for placement of either single, double, or triple probes in the three inch diameter conduit meeting the installation requirements.

The carrier shall allow probes to be placed at six inch spacing increments.

The carrier shall allow for horizontal placement of the non-invasive sensors to be within three in. (75 mm) with respect to the specified location referenced at the road surface.

The carrier and the probe components shall be readily assembled on-site without special tools.

The carrier shall hold up to twelve (12) lead-in cables including the pull rope.

The carrier and interlinking mechanism shall have sufficient strength to allow insertion of up to twelve (12) probe sets into a 100 foot long conduit meeting the installation requirements.

The carrier system shall have a locking mechanism to maintain the orientation of all non-invasive sensors within ± 20 degrees of vertical.

The first carrier (end cap carrier) shall have a rope attached of sufficient strength to assist in the removal of the carriers from the conduit.

CONSTRUCTION REQUIREMENTS

The Contractor shall install microloop detector probes as shown in the Plans.

The Contractor shall test the microloop detector probes by measuring the loop resistance, loop inductance, and change of inductance for each array of probes. These results shall be recorded for each set of probes.

The installer of the vehicle detector assembly shall verify that the installation meets requirements by measuring the inductance of the probe assembly with an inductance meter.

The inductance shall be the sum of probe inductance and the inductance of lead-in cable ($16.5\mu\text{H}$ per 100 foot) and shall be within ± 20 percent of the calculated inductance.

The installer of the vehicle detector assembly shall verify that the installation meets requirements by measuring the DC resistance of the vehicle detector assembly with a properly calibrated ohmmeter.

The measured DC resistance shall be the sum of 1.5 ohms per probe and 3.0 ohms per 100 foot of lead-in wire and shall be within ± 20 percent of the calculated DC resistance.

The installer of the vehicle detector assembly shall measure the change in inductance of the installed vehicle detector assembly using a properly designed, matched vehicle detector when a standard, midsize vehicle is driven directly over the sensor.

The measured change in inductance for a standard midsize vehicle shall be in the range from 120nH to 1200nH.

The installer of the vehicle detector assembly shall provide a log of the measured inductance, DC resistance and the change in inductance for each installed vehicle detector assembly. This log shall be provided to the Engineer prior to splicing the lead-in cable to the homerun cable.

Documentation. Three copies of all operations and maintenance manuals for each detector assembly shall be delivered for each assembly furnished. The Department reserves the right to provide this documentation to other parties who may be Contracted with in order to provide overall integration or maintenance of this item.

Warranty. The Contractor shall warranty all materials and workmanship including labor for a period of two years after the completion and acceptance of the installation, unless other warranty requirements prevail. The warranty period shall begin when the Contractor completes all construction obligations related to this item and when the components for this item have been accepted, which shall be documented as the final completion date in the construction status report. This warranty shall include repair and/or replacement of all failed components via a factory authorized depot repair service. All items sent to the depot for repair shall be returned within two weeks of the date of receipt at the facility. The depot location shall be in the United States. Repairs shall not require more than two weeks from date of receipt and the provider of the warranty shall be responsible for all return shipping costs. The depot maintainer designated for each component shall be authorized by the original manufacturer to supply this service.

A warranty certificate shall be supplied for each component from the designated depot repair site indicating the start and end dates of the warranty. The certificate shall be supplied at the conclusion of the system acceptance test and shall be for a minimum of two years after that point. The certificate shall name the Department as the recipient of the service. The Department shall have the right to transfer this service to other private parties who may be Contracted to perform overall maintenance of the facility.

Basis of Payment. This work shall be paid for at the Contract unit price each for NON-INVASIVE MAGNETO-INDUCTIVE VEHICLE DETECTOR ASSEMBLY, which shall include probes, lead-in cable, carriers, labor, and miscellaneous materials required to make a complete and operational installation as specified herein and as directed by the Engineer.
(EK – 03/15/2004)

NON-INVASIVE, MAGNETO-INDUCTIVE VEHICLE DETECTOR

These specifications define the minimum design, operational and functional performance requirements for high performance, multiple channel inductive loop vehicle detector units and data acquisition software that can provide locally stored traffic data and real-time traffic measurements on a vehicle-by-vehicle basis. The system shall provide current measurements and vehicle detection information on the last vehicle for use in local control, incident detection and advanced traffic management systems.

Description. Under this item the Contractor shall furnish a 3M C800 Vehicle Detector or Engineer-approved equivalent and 3M C800 Interface and Data Acquisition Software (C800 IS) or Engineer-approved equivalent.

Materials.

General. The Contractor shall supply data acquisition and interface software and vehicle detectors that meet all the operational and functional performance requirements in accordance with the terms and conditions of this specification.

The Contractor shall be responsible for any testing, rework and/or retesting of equipment delivered under this Contract that may be required to meet these specifications, at no expense to the Illinois Department of Transportation (IDOT).

The Contractor's documentation shall indicate the manufacturer's name, address, model numbers, and include the shipping address for warranty work, as required in these specifications.

Serial numbers shall be clearly legible and permanently placed on each inductive loop detector unit.

Detectors shall be warranted against defects in workmanship or materials for five (5) years from date of purchase.

The Contractor shall prepare a shop drawing, which details all of the equipment to be supplied under this bid item.

Vehicle Detector Units.

General Hardware – Standards and Performance Requirements. The vehicle detector units shall be fully interchangeable, whether used for system counting, occupancy measurement, speed and length measurement, directional detection, locally stored data collection, and remote data acquisition.

Detector configuration data shall be entered using special interface and data acquisition software. A communication interface shall provide for remote connection and configuration of detectors, real-time activity monitoring and data acquisition via modem to remote devices.

Vehicle detector units shall meet the latest edition of the National Electrical Manufacturers Association (NEMA) Standard TS2-1992 for Type 2 controller and cabinet assemblies plus the functional and performance requirements of this specification. The detectors shall be configured as plug-in devices that meet the requirements for NEMA TS2-1992 section 3.2, actuated Type 2 A2 operation and Type 1 A1 operation in 44-pin input files.

Detectors shall comply with NEMA TS2-1992, Table 6.5.1 for four-channel rack mount type units, NEMA designation "D", except that Delay and Extension Timing shall be provided on all four channels in lieu of NEMA TS2-1992 section 6.5.2.24 requirements.

Detectors shall also be suitable for use in California/New York TYPE 170/179 and ATC cabinets with 22-pin input files.

Detectors shall detect and hold the presence of all licensable motor vehicles (including small motorcycles). This shall be accomplished, without detecting traffic in the adjacent lane on the single, double, and triple microloop probe sets configuration with 100 up to 1000 feet of homerun cable.

The detection performance described above shall be accomplished when using lead-in/homerun cable lengths of from 50 feet to over 1,000 feet of #18 AWG conductor homerun cable.

A pushwheel switch shall be provided to allow selection of the threshold/sensitivity setting which will detect and hold presence of all licensable motor vehicles (including motorcycles), without detecting vehicles, moving or stopped, in the adjacent lane.

Each channel shall automatically self tune with full sensitivity, to any loop and lead-in combination resulting in a total inductance of 20 to 2500 microhenries, with a Q factor of five or greater, within four seconds after application of power.

Detectors shall track changes in lead-in electrical characteristics that take place when environmental changes occur, to insure that units operate properly without producing a false indication, a loss of detection or a change in sensitivity due to weather changes.

Special Features and Functional Performance Requirements. Detectors shall be microprocessor controlled and shall be configurable with manual switch setting and via software settings in EEPROM memory.

Detectors shall include eight sensitivity settings (thresholds), in 2:1 steps. Threshold settings shall directly relate to nanohenries of inductance change (ΔL). Detection output shall be based on a response to a change in the inductance, which exceeds the ΔL threshold selected. It shall not be necessary to readjust the sensitivity setting to detect a specific vehicle type and/or to get consistent occupancy measurements using a range of lead-in or homerun cable lengths that vary from 100 feet up to 3500 feet.

Each detector shall have a single, switched oscillator system to sequentially excite and measure each channel to prevent crosstalk between channels within a unit.

Each detector shall have a three-position toggle switch to manually select one of three operating frequencies to reduce crosstalk between detector units. These three frequencies shall also be software selectable.

Each detector shall have two serial ports for local and remote communications, a front panel RS232 port and transmit/receive pins on the card edge connector.

Each serial port shall have a multi-drop mode and be capable of party line communication with up to eight detectors on the party line.

The detector unit shall be designed to accommodate the addition of a plug-in communication module to allow expansion of the multi-drop capability to 32 devices on a common serial port bus and convert the rear port into an independent port. With this module installed, communication with a PC through the front port shall not interfere with system communication on the rear serial port.

The Contractor shall supply installed with each detector unit, the plug-in communications module outlined herein.

Baud rates shall be selectable at 1200, 2400, 4800, 9600, or 19200 BPS using the interface software. With the communication module installed, the baud rates shall have independent settings for the front and rear serial ports.

The unit shall be designed to accommodate either plug-in communication module or a plug-in memory module to expand the memory used for on-board count and occupancy storage locally.

The front panel serial port shall have EIA-232 electrical characteristics and shall terminate with a front panel 6-pin circular Mini-DIN connector.

A communication with a DB-9 female connector (for a computer serial port connection) and a 6-pin Mini-DIN male connector (for the front panel serial port connection) shall be provided with the interface and data acquisition software. The communication cable shall enable direct communication with a remote reporting device or a PC running Windows™2000 or Windows™ NT 4.0.

Units shall have software settable addresses from 128 to 254. Address 255 shall be assigned as a “wildcard” to be used only when connected to the front panel port to establish connection and read the correct address from the device.

Units shall have 4-bit back panel hardwired addressing capability to allow selection of one of 16 hardwired addresses. Back panel addressing shall be enabled via the interface software.

An external 24VDC Green control input shall be provided to control the output timing. If True (ground level = 0 to +8VDC), the Green input shall disable Delay and enable Extension Timing, and if False (+16 to +30VDC or Open), the Green input shall disable Extension and enable Delay Timing. Software shall provide for an option to disable Green Gating so that Delay or Extension Timing is provided unconditionally.

Detector units shall have a Presence or Pulse mode output option. Selection shall be via front panel switches or software settable options.

Each channel shall have a pushwheel sensitivity switch to enable manual selection of the output mode and sensitivity (threshold) settings as follows:

- The pushwheel switch shall have an OFF mode position indicated by an “X” marking. This position shall disable each channel’s output and front panel Detect and Fault indicators.
- The pushwheel shall have seven Presence mode sensitivity settings.
- The pushwheel shall have eight Pulse mode sensitivity settings. Pulse mode settings shall use a square-wave marking over the channel sensitivity numeral to differentiate from Presence mode settings.

Each increase in Presence or Pulse mode settings shall double the sensitivity (reduce the threshold) from the previous setting. The highest sensitivity (smallest change) setting shall have an ΔL threshold value of eight nanohenries. The lowest sensitivity setting shall have an ΔL threshold of 1024 nanohenries.

Presence output shall hold vehicle detection for at least four minutes minimum for small licensed motor vehicles (100cc. Motorcycles) and for at least 60 minutes for automobiles before tuning-out vehicles (dropping recognition of vehicle presence). The presence output shall not tune out when vehicle motion exists (defined as vehicle entry and departures continue every few minutes and vehicles remain present in the sensing zone) for a least 60 minutes.

In Fast Recovery mode the channel shall recover to full sensitivity within 750 milliseconds after all vehicles leave the microloop sensing zone.

Pulse mode shall provide a single, 188 ± 5 millisecond, output pulse in response to an 18-foot long vehicle traveling over the microloop at eight miles per hour, and for successive vehicles traveling over the same loop at speeds ranging from ten to 100 miles per hour, with a one second headway. Pulse width shall be programmable from interface software.

Detector units shall have optically-isolated FET outputs to provide fail-safe solid-state operation (loss of power to the detector will provide a constant call to the controller—if it has power).

Loop detector channels shall continue to function with a single point to ground on the loop/lead-in system.

Each channel shall have loop measurement capability to continuously verify loop system integrity. The loop detector shall be capable of detecting and displaying current and historical faults (a short to ground, an open circuit or an inductance change $\geq 25\%$) in the microloop or lead-in system.

Each channel shall have two LED indicator lights on the front panel: a green “Detect” LED and a red “Fault” LED.

The green “Detect” indicator shall indicate detection output status and output timing in process.

It shall indicate an Extend flash while the call output is actuated following a directional detection.

The green “Detect” indicator shall flash during Delay and Extension timing to provide a visual indication of timed output. Delay and Extension flash rates shall differ by at least four times the other’s rate. Delay shall be four flashes per second and Extension shall be 16 flashes per second.

The green “Detect” indicator shall be ON continuously during a fault condition unless fail-safe for a particular condition is disabled using the interface software. During a fault condition on a channel, the channel shall display a continuous call indication on its green “Detect” LED and generate a continuous, fail-safe, output on the primary output, regardless of the Pulse or Presence operating mode selected.

A status output shall provide a serial coded message to external devices (controllers) that are capable of using the serial information in accordance with NEMA conventions described in TS2-1992.

A red “Fault” LED shall indicate current or historical channel fault condition (status) and type. The Fault indicator shall flash a coded message during an open loop condition, a shorted loop system condition and a $\pm 25\%$ change of inductance condition. The associated channel’s red “FAULT” LED shall provide visual indication of fault type and status as follows:

- OFF state indicates no faults (current or historical).
- ON for one second and one .25 second short pulse indicates a current open loop fault.

- A one second ON and two .25 second short pulses indicates a current shorted loop fault.
- ON for one second and three short pulses indicates a current greater than 25% change in inductance fault.
- A long pulse (six second) followed by a short pulse (.25 second) indicates an historical open.
- A long pulse followed by two short pulses indicates a historical shorted loop.
- A long pulse followed by three short pulses indicates a historical greater than 25% change in system inductance fault.

A fault indication shall be enabled for as long as the fault remains, except by turning the channel OFF in software or by selecting the "X" setting on the sensitivity switch.

If the fault heals or is corrected, the affected channel shall immediately retune and be capable of normal detection. The visual fault indication shall remain active until reset by a momentary change in the mode or sensitivity setting, a momentary interruption of power or by pressing a reset switch.

Call output for each detector channel shall provide detect durations in response to an automobile over a microloop to enable accurate speed, length and occupancy measurements by external devices. The detector with a 100 microhenry loop/lead-in attached to each channel shall, for any negative inductive change which exceeds its sensitivity threshold, generate a ground true logic level output response within 13 milliseconds for a sensitivity setting of 128 nanohenries. The detector with a 100 microhenry loop/lead-in attached to each channel shall, for any negative inductive change which exceeds its sensitivity threshold, generate a ground true logic level output response within 20 milliseconds for a sensitivity setting of 64 nanohenries.

The output shall become open within the same time limits when such an inductive change is removed.

Vehicle detectors shall have a multi-position switch to Reset all channels and to provide Normal and Fast Recovery modes of operation. The Fast Recovery setting shall cause the detector to adapt instantly to large changes of apparent inductance in the non-call direction. The Normal Recovery mode shall cause the detector to adapt, at a default rate of 0.5 thresholds per second, to apparent changes of inductance in both directions.

Vehicle detectors shall have a Remote Reset input pin on the card edge connector. The unit shall reset and establish a new reference for each loop that is turned ON, when voltage on Pin C is less than eight volts DC for a period of greater than 17 milliseconds.

Delay Timing shall be adjustable from zero to 31 seconds, minimum, in increments of 1.0 seconds in lieu of NEMA TS2-1992 section 6.5.2.24.1 increments. When Green Gating is enabled (using the interface software) delay timing shall only occur if the green input is false.

Extension Timing shall be adjustable from zero to 7.75 seconds, minimum, in increments of 0.25 seconds in lieu of NEMA TS2-1992 section 6.5.2.24.2 increments. When Green Gating is enabled (using the interface software) extension timing shall only occur if the green input is true.

Setting the Delay or Extend DIP switches on the PCB to OFF or selecting 0.0-seconds shall disable timing for that channel unless the override switch is off and Configuration Source is selected to be EEPROM using the interface software.

Each channel shall be capable of being assigned a Long-loop Count mode using the software. Each channel enabled for Long-loop Count mode shall count each individual vehicle moving onto or over a single microloop which has a length greater than 20 feet, regardless of previous vehicles being stationary on, moving over or leaving the detection zone. Each channel shall be configurable for long-loop Count mode via the serial communication ports. The Long-loop Count shall be readable via the serial ports. The call output in the Long-loop Count mode shall be a Presence output.

The vehicle detector unit shall be capable of collecting and storing counts and occupancy in time bins for each channel. The time bin interval of the vehicle detector shall be configurable from the serial port using the software. The memory of the vehicle detector shall be capable of storing count and occupancy data in 15-minute time bins for all four channels for 36 hours. The vehicle detector shall be designed to accommodate a plug-in memory module to expand the on-board memory used for storing the count and occupancy time bins. With optional memory module, the vehicle detector shall be capable of storing count and occupancy data in 15-minute time bins for all four channels for 335 hours. The count and occupancy stored in the time bins shall be retrievable remotely using the serial ports.

Connector Pinout Configuration. The following input-output connector pin terminations shall be provided on input file connectors as well as detector edge connector in accordance to NEMA TS2-1992 section 6.5.2.27.2, Table 6.5.8 requirements.

The detector's edge connector pinout is specified in the table below and is shown looking into the front of a detector card rack or input files. Pin-1 is at the top of the component side of the detector and Pin-A is at the top of the non-component side of the detector.

<u>FUNCTION/SIGNAL</u>	<u>PIN</u>	<u>PIN</u>	<u>FUNCTION/SIGNAL</u>
CH1 GREEN DC+	1	A	DC GND
CH2 GREEN DC+	2	B	POWER (+10.8 TO 37 VDC)
A=CH3 GREEN	3	C	REMOTE EXT RESET
B=DET ADDRESS 3			
LOOP IN CH 1	4	D	LOOP IN CH 1
LOOP IN CH 1	5	E	LOOP IN CH 1
DET ADDRESS 0	6	F	CH 1 OUT+
STATUS OUTPUT CH1	7	H	CH 1 OUT-
LOOP IN CH2	8	J	LOOP IN CH2
LOOP IN CH2	9	K	LOOP IN CH2
A=CH4 GREEN**	10	L	CHASSIS GND
B=DET ADDRESS 1			
NO CONNECTION	11	M	NO CONNECTION
NO CONNECTION	12	N	NO CONNECTION
LOOP IN CH 3**	13	P	LOOP IN CH 3
LOOP IN CH 3**	14	S	LOOP IN CH 3
DET ADDRESS 2	15	S	CH 3 OUT+
STATUS OUTPUT CH3**	16	T	CH 3 OUT-
LOOP IN CH 4**	17	U	LOOP IN CH 4
LOOP IN CH 4**	18	V	LOOP IN CH 4
DATA TRANSMIT	19	W	CH2OUT+
STATUS OUTPUT CH2	20	X	CH2OUT-
DATA RECEIVE	21	Y	CH4 OUT+
STATUS OUTPUT CH4**	22	Z	CH4 OUT-

**These signals are not used by two-channel detectors for Green Gating but they are required to establish backpanel (hardwired) addressing. Detector racks shall be wired so that a two-channel unit or a four-channel unit can be inserted into any slot for interchangeability in all slot positions.

Interface Software.

Interface Software Requirements. (for setting up communication and data collection, configuring, local data storage, logging, viewing diagnostics, fault monitoring and parameter setting features)

The vehicle detector unit shall be capable of remote configuration, system diagnostic measurements and real-time data collection. A communication link shall provide remote access to the detector, for reading its configuration, for fault identification and verification, for real-time monitoring and data collection on up to four channels. The link shall provide optional password protection to change unit configuration settings. Interface software shall display and report current loop inductance measurements, current or last (historical) fault information, and information specific to the last vehicle detected and vehicle counts. Vehicle information shall include vehicle change of inductance, speed, length and time over loop.

A Windows™ based interface and data acquisition software program shall be provided to perform these functions via a remote reporting device running under a Windows™ 2000 or Windows™ NT 4.0 operating system.

The software shall establish and maintain the communication link to a remote reporting device via a field modem or by direct connection to one of the serial ports on the detector.

The software shall be organized by application to simplify setup and monitoring of channel activity measurements, traffic counting, long-loop count, logging of vehicle speed and vehicle length, loop to loop travel time, detect durations, local storage of count and occupancy, and sensing of vehicle travel direction with directional detection and call duration.

The software shall allow selection of PC's communication port and baud rate, and allow selection of English or metric measurements. Baud rate options shall be 1200, 2400, 4800, 9600, or 19200 BPS. Direct communication shall be via PC's serial port or with telephone modem communications using one of the PC's COM ports.

The software shall include a phone book and dialing utility.

The interface and data acquisition software shall provide a Read from Device command on the File menu. It shall also provide for a unit address to be selected and allow the selection of a "wildcard" address to establish remote communication.

The initial screen shall open with a Settings icon, a Real-Time Vehicle Logging icon and a Traffic Data Storage icon. After communications have been established with a detector, the other icons shall appear. These shall include the Real-Time Activity Monitoring icon, Force ALL Outputs and LEDs icon, a Reset icon and the Scan-Time icon.

A Settings window shall be divided into nine tabs to organize the detector settings by functional application.

A General tab shall allow selection of the configuration source to be either from EEPROM or switches, the oscillator frequency for the unit, the vehicle count period and channel sensitivity and mode. When the interface software reads settings from a unit, whichever configuration source is currently active shall determine which settings are displayed in boldface type (EEPROM or switch settings).

A Communications tab shall provide for the setting of a field modem command string, transmit delay, selection of the communication baud rates on the front and rear ports, for setting a programmable address and to enable a backpanel address. There shall be provisions to establish, cancel and change a password. If password protection is set up in a vehicle detector, the unit shall not respond to any requests to perform a reset or change settings until the correct password has been issued. After a verified password has been issued, the vehicle detector shall respond to all requests for reset or settings changes for 60 minutes. After 60 minutes, the unit shall revert back to password protected mode until the password has been issued.

Reset shall cause immediate reinstatement of password protection. Most settings changes initiate a reset.

A Timing tab shall provide for setting the Delay or Extend Time options and the timing increments for each channel. There shall be an option to select "Enable" Green Gating to condition the timing functions to green inputs.

A Microloop tab shall provide for selecting microloop mode of operation and setting some of the parameters that are unique to the performance of microloop sensors in special applications.

A Long-loop tab shall provide for selecting the option to count vehicles over long loops set to operate in Presence mode. Setup options shall be included to allow for calibrating the algorithm to improve count accuracy on loops of from 20 feet long to 60 feet long. Vehicle counts shall be available over the serial communication ports.

A Directional tab shall provide the option of setting up travel direction sensing on channel pairs 1 & 2 and 3 & 4. With the paired channels connected to 6-foot by 6-foot loops that are overlapped by three feet, vehicles shall be counted in both directions. The directional detection call output shall be assigned to the last loop a vehicle crosses when traveling in the direction that is to be detected. Call Duration shall be selectable for the directional output on the trailing channel of the paired sets.

An Output tab shall provide for the option to enable the Status Output for NEMA TS2 Type controllers. Software provision shall also exist to disable the "fail-safe" Call Output for unique system sampling applications.

A Noise immunity tab shall provide for selecting several noise options including a power line filter, which can be enabled.

An Adapt tab shall provide for selecting the adaptation parameters for the detector unit, to modify default operation.

A Real-Time Vehicle Logging icon shall provide for setting up channels to perform vehicle speed and length measurements. Facilities shall be provided to insert a loop description (D label), a loop type (configuration) and a calibration utility to select effective magnetic field loop sizes to improve measurement accuracy. The utility shall also provide for setting up loop assignments and leading edge distances from loop to loop to calculate vehicle speeds. This information shall be saved in the detector's EEPROM. Facilities shall be included to activate and view the log with channel IDs, the loop descriptions, dates, times, speeds, lengths, durations, loop to loop times displayed in real-time. Provisions shall be made to save the log to a file and print the log.

A Traffic Data Storage icon shall open a window to setup and collect locally stored count and occupancy data from the vehicle detector. A tab shall provide for setting up the channels to be stored, the start date and time, the end date and time, and the storage intervals. The software shall inform the user when the detector will run out of memory based on the setup information provided. If continuous data collection is selected the data shall "wrap-around" so that the oldest data will be overwritten with the latest entries.

A Real-Time Activity window shall be provided to display all current detection information pertaining to each channel, including current measurements, last fault (or historical fault) information, plus information specific to the last vehicle detected and traffic counts. Measurements shall include: loop inductance, loop frequency, reference frequency, green input

state and loop status. Last Fault shall include fault type, time and date. Last Vehicle data shall include ΔL in nanohenries, detect duration, detect time, and detect date. Count shall display total count or directional count and the count period remaining.

The Activity window shall include a freeze capability to capture the current activity information and hold it for analysis while the software continues to display the most recent changes.

A utility window shall be included to verify the operation of a detector's outputs and LEDs and confirm the wiring of a control cabinet to issue the call output to a device or controller. This

utility shall allow selection of specific Detect LEDs, Call Outputs, Fault LEDs, and channel Status Outputs to be "forced" ON or OFF for testing the system.

A utility window shall be included to remotely reset a detector. It shall be possible to select specific channels, all channels or the entire unit.

A utility window shall be included to provide a real-time view of the detector's self-measured scan-time. This interactive utility shall continuously read and display the detector's scan-time and display the theoretical detection performance based on user-selectable parameters such as loop to loop spacing, effective field lengths, channel sensitivity settings, and the effects of any noise immunity options selected.

The software shall allow printing of settings, activity measurements, and binned and logged vehicle data.

A comprehensive ON-LINE Help utility shall be included with detailed descriptions of unit features and setup information. The Help text shall include hyperlinks to all subjects related to applications or setup sequences. Help screens shall include a print function to print the page.

CONSTRUCTION REQUIREMENTS

A communication link shall provide remote access to the detector for reading unit configuration settings, for fault identification and verification, for real-time system monitoring and data collection on up to four channels of detection. It shall include password security to the detector to change configuration settings. The communication link shall provide for party line communication on up to eight units using 4-bit hardwired addresses to the card edge connector and/or 127 software programmable addresses in EEPROM memory.

The interface and data acquisition software shall be organized by application and facilitate setup, real-time traffic monitoring and collection of binned count and occupancy data. A vehicle log shall provide a means for logging of vehicle speed, vehicle length, loop-to-loop travel time and detection duration. Optional modes of operation shall include a vehicle travel direction detection setup capability using a microloop mode selection when channels are connected to microloop probes.

The Department shall be provided with the communication protocols for integration of the data acquisition and interface software into its Advanced Traffic Management Systems (ATMS).

Documentation. Three copies of all operations and maintenance manuals for each detector unit shall be delivered for each assembly furnished. In addition, full documentation for all software and associated protocols shall be supplied to the Department on a 3.5-inch floppy disk(s) and a CD-ROM. The Department reserves the right to provide this documentation to other parties who may be Contracted with in order to provide overall integration or maintenance of this item.

Warranty. The Contractor shall warranty all materials and workmanship including labor for a period of two years after the completion and acceptance of the installation, unless other warranty requirements prevail. The warranty period shall begin when the Contractor completes all construction obligations related to this item and when the components for this item have been accepted, which shall be documented as the final completion date in the construction status report. This warranty shall include repair and/or replacement of all failed components via a factory authorized depot repair service. All items sent to the depot for repair shall be returned within two weeks of the date of receipt at the facility. The depot location shall be in the United States. Repairs shall not require more than two weeks from date of receipt and the provider of the warranty shall be responsible for all return shipping costs. The depot maintainer designated for each component shall be authorized by the original manufacturer to supply this service.

A warranty certificate shall be supplied for each component from the designated depot repair site indicating the start and end dates of the warranty. The certificate shall be supplied at the conclusion of the system acceptance test and shall be for a minimum of two years after that point. The certificate shall name the Department as the recipient of the service. The Department shall have the right to transfer this service to other private parties who may be Contracted to perform overall maintenance of the facility.

Basis of Payment. This work shall be paid for at the Contract unit price each for NON-INVASIVE, MAGNETO-INDUCTIVE VEHICLE DETECTOR which price shall include necessary connections and adjustments for proper operation. The detector shall be a four-channel unit.

The data acquisition and interface software shall not be paid for separately but shall be included in the Contract unit price for the non-invasive, magneto-inductive vehicle sensor. Software and/or hardware-related modifications or changes and/or for associated labor that is required to correct errors shall not be paid for separately but shall be included in the Contract unit price for the non-invasive, magneto-inductive vehicle sensor.

(EK – 03/19/2004)

NON-INVASIVE SENSOR HOMERUN CABLE

Description. Under these items, the Contractor shall furnish and install 4-conductor, non-invasive sensor, homerun cables specified as shown in the Plans and as directed by the Engineer.

Materials. The Contractor shall furnish 4-conductor, 3M Model 30003 Homerun Cable or Engineer-approved equivalent. The cable shall meet the following requirements:

Mutual Inductance: 23 μ H per 100 feet
Loop Resistance: 1.7 ohms per 100 feet

Dielectric Strength: 600 volts per UL83 Section 36
Conductor Size: 18 AWG, stranded, twisted 6 turns per foot
Color Code: black, red, white, and green
Insulation: polypropylene
Jacket Thickness: 0.032 inches
Outer Diameter 0.25 inches or less
Operating Temperature: -65 to +176 degrees Fahrenheit

The Contractor shall provide kits to splice the homerun cable to the probes' lead-in cable (3M Scotchcast 3832 Buried Service Wire Encapsulation Kit or equal). Sufficient sensor lead-in cable lengths shall be installed to allow splicing connections to shielded non-invasive sensor homerun cable where the conduit terminates in a handhole. Splices shall be soldered, insulated, and waterproofed using underground-rated splice kits with waterproof encapsulation compound.

CONSTRUCTION REQUIREMENTS

The non-invasive-sensor, homerun cable shall be installed as shown in the Plans and as directed by the Engineer.

The non-invasive sensor homerun cable shall be installed from handhole to the control cabinet as shown in the Plans. In the handhole, the homerun cable shall be spliced to the sensor lead-in cable. In the cabinet, the homerun cable shall be terminated on the terminal blocks.

Each non-invasive sensor homerun cable shall be labeled in each handhole and cabinet that it passes through and where it terminates. The label shall be a Panduit tag #MP250W175-C or Engineer approved equal. Each non-invasive sensor homerun cable tag shall identify it by location/lane assignment/cabinet number. Prior to splicing the homerun cables to the lead-in cable, the Contractor shall use a megger to measure the insulation resistance. This value shall not be less than 100 Megohms.

The Contractor shall measure the loop resistance and total inductance of the spliced lead-in cable from the sensor and the homerun cable to the cabinet. This measurement shall be made from the cabinet. The total inductance shall not exceed the sum of the inductance of the probes and product of the length of the cable and mutual inductance of the cable, 23Mh per 100 feet. The loop resistance shall not exceed the product of length of the installed cable and the linear resistance of 1.7 ohms per 100 feet plus the resistance of the probes.

Method of Measurement. This item shall be measured for payment in feet in place for non-invasive sensor homerun cable. The length of measurement shall be the distance horizontally and vertically measured between the changes in direction including cable slack. Other ancillary components, required to complete the splicing of the non-invasive sensor homerun cables, including but not limited to, heat source, shrink tubing, cable stripping tool, etc., shall be supplied under these items for non-invasive sensor homerun cable and will not be paid for separately.

Basis of Payment. This work shall be paid for at the Contract unit price per foot for ELECTRICAL CABLE IN CONDUIT NO. 18 4/C, TWISTED, SHIELDED that shall be payment in full for the work complete, as specified herein and as directed by the Engineer.

(EK – 03/19/2004)

SIGNAL HEAD, POLYCARBONATE, LED, 1-FACE, 2-SECTION; BRACKET MOUNTED, POST MOUNTED, OR WALL MOUNTED

Description. This item shall consist of furnishing and installing the Ramp Meter LED Signal Head on a post, bracket, or wall. The signal head shall include all light emitting diode (LED) displays including LED signal modules, 8-inch diameter lenses, housing, door frame, gaskets, visor, reflector, wiring, and accessories, mounted on a signal pole or attached to retaining wall as shown on the Contract drawings or as directed by the Engineer. All components of the ramp meter signal heads furnished under this specification shall comply with the latest version of the Institute of Transportation Engineers Standard(s) for Adjustable Face Vehicle Traffic Control Signal Heads (VTCSH). All signals at each ramp shall be new and shall be from one manufacturer and each type shall be the same model unless otherwise approved by the Engineer. Used or reconditioned equipment shall not be acceptable. The Equipment shall be designed for operation under temperature and humidity conditions encountered in the

Midwestern United States. The mounting assembly shall include gaskets, bolts, hub plate, and all accessories required to allow the signal head to be attached to the mounting location and securely mount the signal head as shown on the Contract drawings or as directed by the Engineer.

Materials.

Assembly. The retaining wall signal mounting bracket assembly, cast and extruded parts shall be fabricated from aluminum alloy and shall be free of voids, pits, dents, molding sand and excessive foundry grinding marks. All design radii shall be smooth and intact. Exterior and interior surface finish shall be smooth and cosmetically acceptable, free of molding fins, cracks and other exterior blemishes. Certification shall be available upon request. The bracket assembly shall be adjustable to allow the signal face to be oriented to its traffic approach and locked in place.

The wall mounted signal assembly shall be constructed of galvanized steel.

Signal.

General. All ramp meter signal heads shall be constructed with 8-inch diameter lens openings. The housing, door and visor shall be injection molded of ultraviolet stabilized, pre-colored opaque polycarbonate. All sections shall be interchangeable and fit so they can be combined in a tier. The body, doors, and interior and exterior surfaces of visors, of all the polycarbonate signals heads and all mounting accessories shall be colored flat black in their entirety. Coloring shall be molded in all the way through in the polycarbonate material, therefore, there shall be no peeling, no corrosion, and scratches shall not expose uncolored material.

Housing. The housing shall be a one-piece unit with serrations in 5 degree increments at each end. Each housing shall have provisions for mounting two terminal blocks and attaching backplates. All wiring and terminal blocks shall meet the requirements of Section 13.02 of the ITE Publication: Equipment and Material Standards, Chapter 2 (Vehicle Traffic Control Signal Heads). Housings shall be capable of being fastened together to make multi-section signals. Each signal face shall be oriented to its traffic approach and locked in place by the serrated locking ring.

Door. The door shall be one-piece and shall be grooved to accommodate a one-piece gasket. The door shall be fastened with two stainless steel captive eyebolts and secured against the gasket with wing nut clamps to permit easy access to the inside of the housing. Hinge pins shall be stainless steel.

Visor. Each signal lens shall have a visor of a type normally described as a tunnel visor (bottom open) that encloses 75 percent of the lens circumference for the entire length of the visor. Visors shall be at least seven inches long with a downward tilt of 3½ inches. The removable twist-on visor shall be secured to the door with stainless steel attaching screws and designed in a manner such that the visor may be easily installed or removed from the signal head.

Gaskets. A molded one-piece weather-resistant mildew-proof gasket shall be provided between the housing and door assembly and between the lens and reflector, which shall make the signal weatherproof and dust-tight.

LED Ramp Meter Signal Module. Ramp meter signal head assemblies furnished and installed shall utilize LED signal modules as the light source. All LED signal modules shall conform to the ITE Specification for Vehicle Traffic Control Signal Heads, Part 2: Light Emitting Diode (LED) Vehicle Traffic Signal Modules. The modules shall be operationally compatible with the 2070 controller assembly. Circular LED signal modules shall not require a specific mounting orientation and shall not vary in light output, pattern or visibility for any mounting orientation. The LED signal module shall be protected against dust and moisture intrusion per the requirements of NEMA Standard 250-1991 for Type 4 enclosures to protect all internal components.

The LED signal module shall be designed to fit in the doorframe of a standard 8-inch traffic signal section without modification to the housing, and shall be designed to be installed and removed without special tools. LEDs used in signal modules shall be of Aluminum Indium Gallium Phosphide (AlInGaP) technology for red indications and of Gallium Nitride (GaN) technology for green indications, and shall be the ultra bright type rated for 100,000 hours of continuous operation from -40 to +165 degrees Fahrenheit. The modules shall be rated for a minimum useful life of 48 months. All modules shall meet all parameters of this specification during this period. The minimum requirements for the LED signal modules are indicated in the Table below.

DESCRIPTION	RED	GREEN
Nominal Applied Voltage	120 VAC/60 Hz	
Typical Wattage at 77°F	7.0	11.0
Dominant Wavelength (nm)	626	505
Minimum Luminous Intensity (cd)	133	266
Total Harmonic Distortion	<20%	<20%

The LED signal module lens shall be integral to the unit with a nominal diameter of eight inches as indicated in the plans and shall be tinted or shall use transparent film or materials with similar characteristics. The LED signal module lens shall be UV stabilized and shall be capable of withstanding ultraviolet (direct sunlight) exposure for a minimum period of 60 months without

exhibiting evidence of deterioration. If a polymeric lens is used, a surface coating or chemical surface treatment shall be used to provide front surface abrasion resistance. Glass lenses shall not be acceptable. The lenses shall have an optimal curvature to allow maximization of heat dissipation within the signal and reduce the possibility of lens burning. All lenses shall meet the light transitivity and chromaticity standards established by ITE Standard, Equipment and Materials Standards, "Vehicle Traffic Control Signal Heads" Sections 8.00 and 9.00.

The individual LEDs shall be wired such that the total failure of one LED will not result in the loss of more than 5 percent of the signal module light output. Failure of an individual LED in a string shall not result in the loss of the entire string or any other indication.

Each module shall be a sealed unit with two conductors for connecting to power, a printed circuit board, power supply, lens and gasket, and shall be weatherproof after installation and connection.

Within each signal head section, the two-conductor pigtail from the LED module shall be connected to the signal-wiring conductors, such that power may be disconnected and the module removed without accessing other sections of the signal head. Wiring terminations shall be made using insulated quick disconnect type connectors.

The modules shall operate from a 60 HZ \pm 3 HZ AC line over a voltage ranging from 95 volts to 135 volts. The fluctuations of line voltage shall have no visible effect on the luminous intensity of the indications. Operating voltage of the modules shall be 120 VAC. All parameters shall be measured at this voltage.

The LED signal module shall have a power factor of 0.90 or greater.

For warranty purposes, each LED signal module shall be permanently marked with the manufacturers name, trademark, model number, serial number, date of manufacture (month-year), and lot number as identification on the back of the module.

LED signal modules and associated on-board circuitry shall conform to the requirements in Federal Communications Commission (FCC) Title 47, SubPart B, Section 15 regulations concerning the emission of electronic noise.

CONSTRUCTION REQUIREMENTS

Assembly. The Retaining Wall Signal Bracket Assembly shall be assembled as shown on the Contract drawings. The upper and lower arm shall consist of a serrated ell, 5-inch nipple, gasket, and cast nipple:

- The serrated ell shall be die cast from Alloy 380 and have a serrated 72-tooth boss on one end. The outside diameter of the serration shall not exceed 2-3/8 inch. The non-serrated end of the ell shall be notched to accept a separate serrated locking ring. The ell shall be threaded 1½ to 1½ NPS on both ends. The ell shall have a minimum 3/8-inch width boss that extends the entire length of both sides. On one side of the boss at each end of the ell shall be a ¼-inch 20 threaded opening for a setscrew.
- A 60-70 durometer neoprene gasket shall be provided for both arms.

- A die cast nipple shall be assembled into the ell. The cast nipple shall be 1½-inch NPS with thread length of ½-inch. The head of the cast nipple shall be hex and 2½-inches across the flats. An indention shall be on each corner to accommodate a spanner wrench for tightening.
- A 1½-inch x 6-inch extruded nipple shall have 1½-inch NPS threads on both ends. The nipple shall have a "brushed" finish. The rough surface texture shall add to the appearance and provide for greater paint adhesion.

The universal hub plate with 1½-inch opening shall be cast from aluminum alloy 319 or equivalent and shall be supplied with dimensions and design characteristics as shown on the Contract drawings. The universal hub plate shall have two 3/8-inch x ¾-inch slotted mounting holes 4-1/8 inch center to center. The front opening shall be tapped for 1½-inch to 11½-inch NPS thread and shall have at least one ¼ inch-20 x ½ inch square head setscrew 3/8-inch in from the end.

The Wall Signal Mounting Assembly shall be assembled as shown on the Contract drawings.

The die-castings shall be cleaned in an alkaline cleaning compound (i.e. potassium hydroxide solution) prior to painting in order to remove oils, grease, dirt, etc. Extruded parts shall have an alodine conversion coating to provide a proper base for paint adhesion. The assembly shall be painted federal yellow or other color as specified and baked in a drying oven after painting.

All electrical wiring shall be completely concealed within the mounting assembly.

Signal.

General. The basic construction design shall provide minimum weight combined with the maximum rigidity and strength. Other parts of the optical system, including the reflector, and reflector holder, shall be designed as a whole system so as to eliminate the return of outside light rays which enter the unit.

All external signal hardware and fasteners of the signal shall be stainless steel, including hinge pins and latching mechanisms.

All signal head assemblies shall be rigid mounted utilizing a suitable assembly consisting of both top and bottom brackets and easily adjustable in both the horizontal and vertical planes. Bracket assemblies shall be of a design similar to that shown on the plans. Bracket assemblies shall be aluminum.

LED. A sample of the LED module to be used, the manufacturer's specifications, and a Manufacturer's Certificate of Compliance to the specifications shall be provided to the Engineer for approval. If approved, the sample will then be held for comparison to the remainder of the units to be installed. Written approval by the Engineer will be required prior to installation

The LED signal module shall be a single, self-contained device, not requiring on-site assembly for installation into traffic signal housings. The power supply for the LED signal modules shall be integral to the unit.

Enclosures containing either the power supply or electronic components of the signal module shall be made of UL94VO flame retardant materials. The lens of the signal module is excluded from this requirement.

The circuit board and power supply shall be contained inside the module.

The assembly and manufacturing process for the LED signal assembly shall be designed to assure all internal components are adequately supported to withstand mechanical shock and vibration from high winds and other sources.

Materials used for lenses and LED signal modules shall conform to the requirements in ASTM Specifications for the materials.

Basis of Payment. This item shall be paid for at the Contract unit price per each for SIGNAL HEAD, POLYCARBONATE, LED, 1-FACE, 2-SECTION, BRACKET MOUNTED, SIGNAL HEAD, POLYCARBONATE, LED, 1-FACE, 2-SECTION, POST MOUNTED, and SIGNAL HEAD, POLYCARBONATE, LED, 1-FACE, 2-SECTION, WALL MOUNTED. This price shall be payment in full for furnishing and installing the SIGNAL HEAD, POLYCARBONATE, LED, 1-FACE, 2-SECTION, BRACKET MOUNTED, SIGNAL HEAD, POLYCARBONATE, LED, 1-FACE, 2-SECTION, POST MOUNTED, and SIGNAL HEAD, POLYCARBONATE, LED, 1-FACE, 2-SECTION, WALL MOUNTED as described herein and all connections, testing, and for all labor, tools, equipment, transportation, and incidentals necessary to mount the signals, and to complete this item of work as described herein.

(EK – 03/19/2004)

TRAFFIC SIGNAL POST, PAINTED STEEL

Description. This work shall consist of furnishing a metal traffic signal post of length specified and installing it as shown in the Plans.

Materials. The traffic signal post shall be designed to support the traffic signal loading shown on the plans. The design and fabrication shall be according to the Standard Specifications for Structural Supports for Highway Signs, Luminaries, and Traffic Signals, as published by AASHTO and the requirements of applicable sections of Articles 875 and 1077.01 of the Standard Specifications for Road and Bridge Construction.

The post shall be fabricated from Schedule 40 steel and have an outside diameter of 4½ in. The post shall be threaded for assembly to the base. The top of the post shall be enclosed with a removable Pole Cap. The cap shall be secured in place with three each, 1/8 in. diameter, 300 series stainless steel screws coated with anti-seize compound. The design of the cap shall be such that it shall not permit entry of water into the post.

The post shall be attached to either a post base, saddle mounting, or base plate mounting as shown in the Plans.

Post Base. The base of a post shall be cast iron. The base shall be threaded for the attachment to the threaded post. The base shall be approximately 15 in. high and 13½ in. square at the bottom. The bottom of the base shall be designed to accept four 5/8 in. diameter anchor rods evenly spaced in a 12½ in. to 13 in. diameter circle. The base shall be true to pattern, with sharp clean cutting ornamentation, and equipped with access doors for cable handling. The door shall be fastened to the base with stainless steel screws. A grounding lug shall be provided inside the base.

The anchor rods shall be a minimum of 5/8 in. in diameter and 16 in. long and shall be according to Article 1006.09 of the Standard Specifications for Road and Bridge Construction. The anchor rods shall be threaded approximately 3 in. at one end and have a bend at the other end. The first 5 in. at the threaded end shall be galvanized. One each galvanized nut and washer shall be furnished with each anchor rod.

The steel post and the cast iron base shall be shop painted with one coat of primer and two coats of yellow enamel according to Article 851 of the Standard Specifications for Road and Bridge Construction.

Saddle Mounting. The saddle mounting shall be threaded for the attachment to the threaded post. The saddle mounting and attachment shall be as shown in the Plans.

The saddle mounting anchor rods shall be a minimum of 5/8 in. in diameter and 5 in. long and shall be according to Article 1006.09 of the Standard Specifications for Road and Bridge Construction. The anchor rods shall be galvanized. One each galvanized nut and washer shall be furnished with each anchor rod.

The steel post and the saddle mounting shall be shop painted with one coat of primer and two coats of yellow enamel according to Article 851 of the Standard Specifications for Road and Bridge Construction.

Base Plate Mounting. The base plate mounting shall be threaded for the attachment to the threaded post. The base plate mounting and attachment shall be as shown in the Plans.

The base plate mounting anchor rods shall be a minimum of 5/8 in. in diameter and 6 in. long and shall be according to Article 1006.09 of the Standard Specifications for Road and Bridge Construction. The anchor rods shall be galvanized. One each galvanized nut and washer shall be furnished with each anchor rod.

The steel post and the base plate mounting shall be shop painted with one coat of primer and two coats of yellow enamel according to Article 851 of the Standard Specifications for Road and Bridge Construction.

Method of Measurement. This item shall be measured in units of each for TRAFFIC SIGNAL POST, PAINTED STEEL installed, including the pole cap and base complete.

Basis of Payment. This work will be paid for at the contract unit price each for TRAFFIC SIGNAL POST, PAINTED STEEL, of the type and length specified.

(EK – 11/29/2004)

COMMUNICATION SHELTERS, 10 X 12 AND 10 X 20

Description. Provide fabrication, delivery, installation and testing of Equipment Shelter to support Intelligent Transportation System (ITS) communication equipment. The shelter shall be used to house electronic communication equipment, power supplies, and related components necessary for the proper operating conditions of the equipment to be installed within a controlled environment.

Technical Abbreviations and Definitions. The abbreviations, acronyms and their definitions listed below may be used throughout this section:

AWG	American Wire Gauge
BCH	Bose-Chaudhuri-Hocquenghem (type of cyclic redundancy code)
CMOS	Complimentary Metal-Oxide Semiconductor
FSK	Frequency Shift Keying
IEEE	Institute of Electrical and Electronic Engineers
mA	Milliamperes
MTBF	Mean Time Between Failure
NEC	National Electrical Code
RTU	Remote Terminal Unit
TIA	Telecommunications Industry Association
UPS	Uninterruptible Power Supply

Applicable Publications. The publications listed below form a part of these Specifications to the extent referenced. The publications are referred to in the test by basic designation only. Conform to reference standards by date of issue in effect on date of Contract Advertisement.

ANSI/TIA/EIA-606 Administration Standard for the Telecommunications Infrastructure of Commercial Buildings,

ANSI/TIA/EIA-607 Commercial Building Grounding and Bonding Requirements for Telecommunications.

National Electrical Code (NEC), Article 800.

IEEE Surge Withstand Capability Test C37-90-1.

Materials.

Prefabricated Equipment Shelter. The equipment shelter shall be pre-assembled, and of reinforced solid concrete construction. The shelter shall be a standard item provided by any of several manufacturers. The shelter shall come complete with a secure door; power distribution panels; a heating, ventilation, and air conditioning (HVAC) system; lightning protection; a grounding system; and any other necessary appurtenances to provide for an integrated communication shelter. The shelter shall be built and constructed to wind loads as required by local building codes. The shelter's exterior shall be provided with a concrete aggregate finish. The shelter shall have a bullet-resistant surface as required by UL 752. The shelter's exterior color shall be earth tone to blend into surroundings. The shelter's heat transfer coefficient shall not exceed 0.07 British Thermal Unit (BTU) per hour per square foot (h/ft) per degree Fahrenheit (OF) [0.3 kilocalorie (kcal) per hour per square meter (hr/M²) per degree Celsius ('Q)].

Shelter floor and foundations. The equipment shelter's supporting floor shall be concrete or a concrete composite material. The communication shelter's foundation shall be a monolithic slab with a footing foundation. The foundation for the communication shelter as shown on the contract drawings shall be evaluated for the specific requirements of the site, in consideration of local soil conditions, and local building restrictions. Shelter anchor locations shall be coordinated

with shelter manufacturer. The top of the foundation shall be a minimum of 1 foot [0.3 meter] above grade. Sufficient cross bracing shall be provided to prevent the equipment shelter's structure from bending or breaking during moving, towing, or hoisting, and to ensure minimum warping after the shelter has been placed on the foundation with the interior equipment installed. The equipment room's finished floor covering shall be industrial-grade vinyl flooring fastened to the sub floor with waterproof glue. The sub floor shall be 6 inch (15cm) precast reinforced concrete, insulated, and equipped with integral lifting points, and shall contain a recessed step-joint, to prevent water intrusion into the shelter. The floor shall be designed and constructed to support a minimum live load of 150 pounds per square foot (lbs/f) [7.2 kilopascals (kPa)] while on foundation.

Door. The door shall be an exterior pre-hung, fully insulated, bullet-resistant, galvanized steel door with continuous hinge, and shall be provided with baked enamel finish, and a door check and doorstop. The exterior door shall be 36 inches [0.91 meter] in width by 84 inches [2.1 meters] in length with a mortised deadbolt security common-keyed lock, consistent with other Illinois Department of Transportation (IDOT) sites. The keys to the door's lock shall be provided to the Department. Doors shall have a hydraulic door closer, and a passage style lever handle on both the inside and outside for opening and closing.

Walls. The walls shall be constructed of 4 inch (0.1cm) thick reinforced concrete, with a two-step keyway joint, to prevent water intrusion into the shelter. The walls shall be insulated using a minimum insulating factor of R11. Interior surfaces shall be sheathed with 1.5 inches (4cm) of high performance hard board insulation. The interior of the walls shall be finished with an aesthetically pleasing 0.5 inch (1.3cm) wood panel with a white laminate coating, and molding on all corners. Total wall system shall have a thermal insulation rating of R19. All floor/wall intersections shall have 4-inch [0.1 -meter] vinyl baseboards installed using waterproof glue.

The ceiling structure shall be designed and constructed to support all of the proposed fixtures, cable trays, etc., or a minimum live load of 30 lbs/SF. (1.4 kPa).

Roof. The roof sections shall be designed and constructed of 4 inch thick reinforced concrete, with a minimum 0.25-inch per foot [3.2 millimeters per 304.8 millimeters] pitch from the center for drainage. All voided areas between the roof and the ceiling shall be sheathed with 1.5 inches (4 cm) of high performance hard board insulation with a thermal performance of R11, covered with a layer of an aesthetically pleasing 0.5 inch (1.3 cm) white laminate wood panel with a vapor shield. The exterior of the roof shall be covered with an ultraviolet resistant, reflective elastomeric coating to prevent water intrusion. The roof shall be designed and constructed to support a minimum live load of 100 lbs/f' (4.8 kPa).

Entrance Stoop. The shelter's entrance shall have a 3 foot by 5 foot reinforced concrete slab, installed so that the top of the slab matches the top of the foundation slab. The distance from the final grade to the shelter floor shall not exceed 12 inches [0.2 meter], and the entrance slab shall be separated from the foundation wall by a continuous 0.5 inch (1.3cm) pre-moulded joint filler.

Lighting. The equipment shelter shall utilize dual-bulb 40-watt fluorescent surface-mounted fixtures. The Contractor shall supply a sufficient quantity of light fixtures to provide a uniform light level of 150 footcandles, or lumens per ft² [1614.6 metercandles] or lumens per M² at 4 feet [1.2 meters] above the floor to void shadows throughout the building. An interior light switch shall be mounted adjacent to the entry door. The Contractor shall furnish and install one 35-watt

high pressure sodium vandal-resistant floodlight mounted on the outside near the entrance door with a photocell and interior light switch. The Contractor shall also furnish and install an interior two-headed emergency light with rechargeable batteries, a charger pilot, and test light that are wired unswitched to the interior lighting circuit.

Heating, Ventilation, and Air Conditioning System. The Contractor shall provide exterior vertical wall-mounted air conditioners for the communication shelter. The heating, ventilation, and air conditioning (HVAC) system shall provide an alarm that indicates failure (i.e., a dry contact closure alarm point). The unit shall have an adjustable time delay initially set to five minutes to prevent compressor damage or generator stall if utility power service is prematurely restored following a power failure. The unit shall also have a hard start device installed to reduce the starting current required during a cold start or under high-head pressure conditions. The unit shall be capable of safely operating when the outside temperature falls below 60 'F [15.5 'C], allowing continuous interior equipment cooling and dehumidification in cold weather. The unit shall have sufficient capacity to cool from a 95 'F [35 'C] ambient temperature to 75 '17 [23.9 'C], including the equipment heat load.

Cable Tray. The Contractor shall provide cable trays that are 1 foot [0.3 meter] wide and of sufficient strength to support the control wires, and alarm wires associated with the communication equipment. The cable tray construction shall be galvanized steel, aluminum, or painted steel. The cable trays shall be suspended from the ceiling. All cable trays shall be fabricated in an open ladder type arrangement to permit easy cable routing. In addition, all rack and cabling tray units shall be electrically bonded together. Flat washers shall be used to facilitate rack bonding on non-painted surface areas. After bonding, these areas shall be covered with an antioxidant compound. The Contractor shall ground the cable tray assemblies to the shelter interior ground.

Wall Mounted Fiber Optic Termination Frame. The Contractor shall provide a wall mounted fiber optic termination frame used to terminate outside plant fiber optic cables inside the communication shelter as shown on the Plans. Each termination frame shall terminate a minimum of 480 single-mode fibers. The termination frame shall store excess fiber and splice individual pigtails. The pigtails are mounted on bulkhead sleeves using type SC connectors. These connectors shall be accessible to a technician standing in front of the frame. Each SC connector on the panel shall not cause in excess of 0.3dB optical signal loss when tested at 1310nm. The single mode fiber used in the pigtails shall meet the optical characteristics of the outside plant fiber optic cable used, including mode field diameter.

The termination frame shall route fiber optic patch cables between any two connectors without reaching the patch cables' minimum bending radius.

The termination frame shall include standard anchor bolts for securing to a wall and the floor. The termination frame shall include ground bar which shall be used to ground the frame to the shelter's central ground point.

Fire Smoke Detection and Suppression. The equipment shelter shall include one ionization and one photoelectric smoke detector operating on alternating current (AC). The smoke detector shall be mounted on the ceiling and shall include a dry contact closure that will activate during smoke detection conditions. A hand-held carbon dioxide fire extinguisher suitable for use on electrical fires shall be mounted on the wall near the door. The extinguisher shall have a valid inspection tag and be refillable.

Electrical. The standard electrical configuration for the shelter site shall be single-phase 120/240 volts of alternating current (VAQ per 60 hertz (Hz) with a 150-amp minimum service. The Contractor shall provide the necessary power service drop and site-specific power needs on to site. Provide one 225 Amp, 42-circuit distribution panel, and two 100 Amp, 24-circuit distribution panels.

AC-Powered Transient Voltage Surge Suppression Device. The shelter shall have a primary AC transient voltage surge suppression (TVSS) device that has been pre-approved in writing by the engineer. The TVSS device shall use field-replaceable modular technology and shall include a set of Normally Opened (NO) Normally Closed (NC) Form C contacts for remote alarm monitoring as detailed below.

The Contractor shall ground the TVSS device using a minimum #12 American Wire Gauge (AWG) copper wire that is exothermically welded to the interior perimeter ground. The device shall consist of primary modules using silicon avalanche diode (SAD) technology and a secondary module using the metal oxide varistor (MOV) technology. The shelter shall have a spare MOV and SAD module with each primary AC TVSS device. For substitute product approval, the Contractor shall submit a certified, signed, and sealed statement that the device meets or exceeds all requirements as detailed herein, within the plan set, and/or in the Contract from an engineer registered in the State of Illinois.

In addition, the Contractor shall submit unpotted samples of each module to the engineer for inspection. The modules shall be bolted in the TVSS device. No plug-in modules shall be permitted. The equivalent of a minimum of two SAD modules and one MOV module shall be installed from each phase conductor to the neutral conductor. One or more separate MOV modules capable of handling at least 75 kiloamperes (kA) of surge current shall be installed between the neutral and ground.

A 200-kA ampere interrupting capacity (AIC) fused disconnect shall be installed in the TVSS device. The TVSS device shall have a surge counter that counts the number of surge current transients that are being suppressed over 150 amps. Surges in any mode and phase shall be counted. The TVSS device shall have a UL 1283 listed electromagnetic interference (EMI)/radio frequency interference (RFI) filter with a maximum attenuation of 75 decibels (dB) from 100 kilohertz (kHz) to 100 megahertz (MHz). Enclosure ratings shall be a minimum of NEMA 1, 2, 3, 3S, 4, 4X, 12, and 13, and shall be compliant with the UL 95 standard's Test 5V. The TVSS device shall be listed in the second edition of the UL 1449 standard.

The TVSS device shall comply with the specifications detailed herein, within the plan set, and/or in the Contract, including:

- A maximum surge current (8x20uS) for a SAD module that is greater than or equal to (~:) 24 kA;
- minimum energy absorption for a SAD module of 0.9 BTU [1,000 joules];
- maximum surge current (8x20uS) for a MOV module that is ~: 50 kA;
- minimum energy absorption for a MOV module of 4.7 BTUs [5,000 joules];
- maximum continuous operating voltage of 150 volts; and
- let-through voltage of 339 volts as required in the second edition of the UL 1449 standard.

Conduit Entry. The shelter shall have a rectangular floor opening to accommodate the entry of communication related conduits as shown on the contract drawings. Gaps in floor remaining between the conduit stub ups and the floor opening are to be filled solid with self-expanding sealant caulk.

Serial Device Server. The Contractor shall furnish industrially-hardened, Ethernet serial device servers. The device server shall be a multi-port serial-to-Ethernet server, specifically designed to operate in harsh environments. The Ethernet server shall operate within specifications over the temperature range of -40° to 85° C. The server shall operate with relative humidity of 95%, non-condensing.

The Ethernet server shall have four RS-232 ports, two 100BaseT ports, and two 100BaseFX ports. The optical ports shall satisfy the following:

- Shall be designed to operate into single mode cable with physical core of 8-9 microns
- Shall provide a nominal output power of -16 dBm, receive sensitivity of -32 dBm, and link power budget of 16 dB.
- Shall operate at 1310 nm (nominal)

The Ethernet ports shall be full duplex. The Ethernet switch management shall include:

- Enhanced Rapid Spanning Tree (IEEE 802.1w) for fault tolerance with rapid recovery times
- Quality of Service (IEEE 802.1p) for real-time traffic
- Port rate limiting: 128 kbps, 256 kbps, 512 kbps, 4 Mbps, and 8 Mbps
- VLAN (IEEE 802.1q) for traffic segregation with double tagging
- IGMP Snooping for multicast filtering
- Port configuration, status, statistics, mirroring, and security
- Loss of link management for link pulse control on fiber ports
- Web-based, Telnet, CLI management interfaces
- SNMP v2 and RMON
- Diagnostics with logging and alarm

The serial device server shall include a power supply compatible with 120 VAC. The power supply shall be compatible with the environment specified for the device server.

The device server shall be DIN rail or panel mounted.

The server shall comply with the following IEEE standards:

- 802.3—10BaseT
- 802.3u—100BaseTX, 100BaseFX
- 802.3x—Flow Control
- 802.3d—MAC Bridges
- 802.1d—Spanning Tree Protocol
- 802.1p—Class of Service
- 802.1q—VLAN Tagging
- 802.1w—Rapid Spanning Tree Protocol

The server shall comply 47 CFR, Part 15, Type A and be UL listed.

SCADA System. The remote terminal unit(s) (RTU) shall be fully compatible with the IDOT DISTRICT 1 existing Supervisory Control and Data Acquisition (SCADA) system. The Contractor shall expand the existing District 1 Headquarters SCADA equipment by integrating additional remote terminal units (RTUs) specified under this contract. The remote terminal units shall collect device status data. The flow of alarm data to the District 1 Headquarters shall be initiated by equipment on/off sensors installed in equipment to be monitored.

The Contractor shall include all required programming and updating of the SCADA database at communication shelters as part of this contract. In addition, all communications equipment and components necessary for a complete and operational system at the District 1 Headquarters, if required.

In each communication shelter the Contractor shall furnish and install a SCADA cabinet consisting of line surge protection and ground fault detection, power supply, central processor, and digital input modules, and digital output modules.

The SCADA RTU inputs shall be communication shelter alarm inputs. The Contractor shall provide one 16 port digital output card under this contract for the SCADA Alarm System identified as SCADA Main and a second 16 port digital output card identified as SCADA Backup, both individually transported via 4 TW pair Ethernet cable to an Serial Device Server as specified herein.

Remote Terminal Units (RTUs) shall be furnished and installed in the Communication Shelters, and shall include the auxiliary equipment necessary for the interface functions associated with equipment at these locations.

REMOTE TERMINAL UNITS (RTUs)

Functional Requirements. The RTUs shall be microprocessor controlled such that changes in their operation may be made by merely changing memory elements. System input/output boards shall be cable connected to logic boards and arranged such that future expansion of the RTU may be made with minimum effort and not require specialized tools or knowledge.

All remote terminal units shall communicate with the IDOT District 1 Headquarters over the IDOT District 1 Fiber Optic backbone.

CAT-5 Ethernet cable shall be used to connect the RTU to a Serial Device Server as specified herein.

The inputs to the RTU shall be on/off sensors such as dry contacts, limit switches, etc. The RTU shall be furnished with an MODBUS RTU protocol and external modem to permit polling over telephone lines using DF-1 Protocol.

All Contractor furnished equipment shall function and communicate with existing IDOT District 1 Headquarters SCADA equipment, located at the Headquarters communication center.

Operational Requirements. The remote station RTU enclosures shall be fused to protect the lines and equipment in the event of accidental contact with 120VAC.

The RTU shall support programmable calculation and control algorithms. These shall be written on a portable laptop computer using a script editor. These shall be compiled and loaded into non-volatile memory in the RTU. The RTU shall have the capability to upload the script to the Master Station. In the event of a failure of the RTU or corruption of the script file, the Master Station shall download the file into the RTU. This file format and communication protocol shall be compatible with the existing District 1 Headquarters SCADA System.

As a minimum, the calculation and control routines shall support the following mathematical and logical functions: add, subtract, multiply, divide, assign, log, exponential, sine, cosine, tan, arcsine, arccosine, arctan, equal to, not equal to, greater than or equal to, less

The available database for the above shall include: local status values, local accumulator values, set-point values from Master Station, date and time variables, and communications failure.

Functions shall include: set status value, set accumulator value, and start local timer. The RTU shall have a built-in circuit to detect and isolate a grounded SCADA communication line from the RTU so a "ground" at only one point on the data transmission line wire shall not cause a LINE SUPERVISION alarm or impair operation of the system. (LINE SUPERVISION is defined as loss of communication between the Master Station and the RTU).

The RTU shall have an adjustable ground detection system capable of sensing a resistance to ground with an adjustable range between 5,000 Ohms and 50,000 Ohms on the RTU station DC power (both positive and negative). 2 outputs of ground detector circuits shall be dry contacts with configuration "energized in Normal Condition".

The negative supply potential of the ground detectors shall be connected to ground or Shelter Structure as appropriate. The ground detector system shall be energized from an independent DC power supply, rectified and filtered from an isolated 120 VAC -60 Hz source

Input and Output Points.

Status Points. The RTU shall be capable of accepting SCADA inputs from 64 sources. These shall be monitored by the remote station. All status points associated with an RTU shall be interrogated by the RTU at least once every 10 milliseconds.

The RTU shall be equipped such that if a device change of state occurs, but disappears before that remote is polled by the Master Station, the change is not lost. Storage for up to 7 changes of state per status point must be available.

All RTU inputs shall be protected against voltage surges and shall meet the IEEE surge withstand test.

A separated industrial barrier type interposing terminal blocks shall be provided for all interface connections between other, contractor furnished equipment and the SCADA RTU inputs. These terminal blocks shall accommodate up to No. 10 AWG wire, and shall be General Electric type EB-5 or approved equal.

Local LED indicators shall be provided to display the state of all status points.

Circulating current to dry contacts shall be supplied by the RTU at a 12 VDC level. Non-shielded wires shall be used and the input point shall not be affected by electromagnetic and electrostatic interferences. The input points shall be capable of operating from contact devices up to 400 feet from the RTU over No. 14 AWG non-shielded wires.

The initial configuration shall contain the following inputs:

Source

Alarm Description

i.	AC Normal Power	Normal Power Failure
ii.	AC Reliable Power	Reliable Power Failure
iii.	Communication Shelter Door Intrusion	Comm. Shelter Key Switch
iv.	Fire Alarm Panel	General Alarm – Fire
v.	Fire Alarm Panel	Panel Alarm – Trouble
vi.	Comm. Shelter Temp.	Comm Shelter Alarm – Low Temp.
vii.		Comm. Shelter Temp. Comm. Shelter High -- High Temp Alarm
viii.	HVAC #1	HVAC #1 -- Malfunction
ix.	HVAC #2	HVAC #2 -- Malfunction
x.	Generator Alarm	Low Fuel
xi.	Generator Alarm	Generator Malfunction
xii.	Generator Alarm	Emergency Generator Running
xiii.		AC Transfer Switch Automatic Transfer Switch "Bypassed"
xiv.	AC Transfer Switch	AC Normal Power Failure
xv.		AC Transfer Switch Automatic Transfer Switch "EM Generator Position"
xvi.		AC Transfer Switch Automatic Transfer Switch "Normal Power"
xvii.		AC Transfer Switch Automatic Transfer Switch – Malfunction

Communication Path Security. The RTU's encoding/decoding of information shall guard against false commands being executed and prevent false data from being transmitted to the Master Station. As a minimum the following security features are required:

BCH error detection coding or equivalent cross-hatch parity, error detection encoding shall be used. The RTU shall re-encode and retransmit (to the Master Station) part or all information control messages according to existing master handshake procedures.

Internal Operation and Construction Security. As a minimum, the following features are required:

High stability clocks for internal timing. The time base of all RTUs shall be periodically synchronized by the Master Station to ensure Sequence of Event accuracy and a time base for calculate and control programs.

The following conditions shall not produce false control operations by the Master Station. In addition, these conditions shall not produce false or continuous transmission to the Master Station. These conditions are: Power up of the RTU; Switching from the primary power source to the back-up source; Communication circuit failure; Any component failure in the RTU; A logic card left out of the RTU.

The RTU design shall be modular for ease of maintenance and expansion. Failure of one card containing a group of input or output points shall not disable the entire RTU. The RTU reliability shall be high, with a mean time between failures (MTBF) of at least 10,000 hours.

The Manufacturer shall provide details of all data security features for the review/approval of the Engineer prior to the start of the manufacturing process.

Integrated circuits using circuit types other than CMOS logic shall require the approval of the Engineer prior to the start of the manufacturing process.

RTU Hardware.

Control Panel. The RTU shall be an Allen Bradley ControlLogix 1756. It shall acquire data from two separate communication systems. The first and the primary system is an IDOT fiber optic communications backbone network. The second is a dial up phone system operating at the slow speed of 2400 baud to accommodate the existing RTU's.

The RTU shall be microprocessor controlled such that changes in their operation may be made by merely changing memory elements. The controller shall be modular and multiple controllers may be placed in any slot of the backplane. The Controller shall be able to communicate with or other processors across RS-232 (DFI/DH-485 protocol), DeviceNet, DH+, ControlNet, Ethernet/IP networks. The contractor shall select the appropriate communications interface module.

RTU Supervision. The supervision of all devices shall be accomplished via the monitoring of dedicated auxiliary contact(s) on each device.

The auxiliary contact(s) will open or close depending on the status of the device (open, closed, running, etc.). The RTU shall monitor the position of the contacts and report the status of the device to the Master Station. The status of 2 auxiliary contacts shall indicate a maximum of 4 possible positions of the device.

The RTU shall be equipped with local indicators that will display the state of each and every contact.

Visual Basic code in the RSView application software requests data from Kepware, at which point Kepware communicates with the modem for dialing and data transfer.

Terminal Blocks. Within the RTU cabinet, all external wiring interfacing with the RTU cabinet shall terminate on easily accessible interposing terminal blocks. This wiring shall include, but not be limited to: emergency power supply wiring, supervision contacts, interposing relay contacts, telemetering points and line wires. Terminal blocks shall be General Electric type EB-5 or approved equal. Self-extinguishing white vinyl marking strips shall be included on all interposing terminal blocks. All terminals to which battery or other high voltages are to be connected, shall be provided with protective covers. All terminal blocks shall be labeled and have corresponding identification on unit schematic prints.

Wiring. All wiring shall be stranded and of suitable gauge and insulation to meet the intended use. Extra flexible stranded control wires shall be used for wiring between hinged and stationary portions of panels. All internal wiring to interposing terminal blocks shall be a minimum of No. 14 AWG stranded wire.

Input and output wiring shall be kept physically separate where possible. AC and low voltage DC wiring shall be kept physically separate where possible.

All wiring shall be clearly identified with designation at each end using white plastic slip-on markers with black lettering. The marker diameter shall be consistent with the wire diameter to insure a snug fit, but yet be able to be rotated for identification.

All wiring shall be secured into harnesses. All wiring including harnesses shall be routed in such a manner as to not obstruct the installation or removal of RTU components, and shall be secured to the cabinet where appropriate for neatness and to reduce strain on components.

All terminations to terminal strips within all RTUs shall be made with crimp-on insulated ring type terminals.

Input/Output Isolation and Protection. All inputs and outputs including power supply and circuit ports shall be capable of withstanding the IEEE SWC standard test without damage.

Components. Proper mounting shall be employed for all components on printed circuit boards to prevent damage from shipping and vibration encountered in the IDOT "right-of-way" environments.

Circuit boards and their components shall be suitably protected from dampness and corrosion common to the exterior environments.

Construction/Packaging/Labeling. In addition to general quality workmanship the following shall be implemented:

All plug-in printed circuit cards shall be keyed to prevent damage to the RTU or devices connected to the RTU through improper connection.

Gold plated contacts shall be used on all printed circuit board and other multi-pin connectors.

All printed circuit boards shall be made of glass-epoxy material.

Each printed circuit board and all subassemblies shall be serial numbered to uniquely identify them for warranty.

All nameplates for cabinets, panels, components, relays, fuse blocks, switches and terminal blocks (except terminal block numbering strips) shall be plastic, utilize white printing on a black background, and shall match those on existing IDOT District 1 SCADA equipment. All nameplates shall meet the approval of the Engineer.

All terminal blocks, rows and/or columns shall be suitably and clearly labeled by the contractor using standard methods.

All plug-in devices/cards shall employ a positive locking design to prevent loosening from vibration.

All internal components shall be labeled and referenced to the internal schematic diagram.

Remote Terminal Unit Enclosure. Cabinets shall be rigid, weatherproof and constructed from fiberglass reinforced polyester resins for use in highly corrosive atmospheres. Design shall conform to NEMA Type 4X construction.

The main box portion of the cabinet shall be of one-piece construction, with smooth, rounded comers and a mounting flange around the entire perimeter (attached back plate is unacceptable). All fabrication seams must be sealed and no unused holes are permitted. There shall be no gasketed joints except for the neoprene door gasket. Gasket material shall be approved by IDOT.

Cabinet shall have automatic, corrosion-proof condensation drain plugs installed in the bottom. Plugs shall be of tamper-proof design with stainless steel screening. Cabinet design shall incorporate an integral fiberglass drip shield to protect the door hardware from water, ice/snow buildups and settling dust.

The cabinet shall be arranged for top or bottom cable entry and shall have overlapping double doors. Each door shall be fastened to the main box with a continuous stainless steel hinge (16 gauge minimum) for the full length of the door. All hinges, latches, etc. shall be fastened to the cabinet using stainless steel rivets with stainless steel backup washers. All rivets shall be sealed with RTV or similar material. All doors shall be capable of opening a minimum of 180 degrees and shall be of tamperproof design and construction.

The door surfaces shall incorporate fiberglass bracing to prevent door buckling or warpage. No RTU electronic components or modules shall be mounted on the doors. The doors shall be equipped with holdopens for the 180 degree position. All cabinet doors shall be furnished with suitable handles and 3-point latching mechanisms. All door locks shall be keyed to match existing SCADA RTU cabinet locks. Doors shall be provided with hasps suitable for a IDOT supplied 5/8 inch padlock. All cabinets shall have a print pocket attached to the inside of the cabinet door for the storage of prints and point assignment charts.

Cabinets shall be provided with a 3/8 inch fiberglass laminate interior mounting panel of NEMA GPO-2 construction with a UL 94V-0 rating for high flame resistance. The panel shall be attached to the inside of the cabinet by stainless steel collar studs embedded in the main cabinet interior. All RTU components shall be installed on this mounting board using bolted connections. All mounting holes must be tapped (nuts behind panels are not permitted).

Cabinet shall be designed so that removal of the cabinet from its mounts or the removal of any internal components from the RTU shall not require the removal of any interior mounting panel. Maximum dimensions of the RTU cabinet shall be 48" high by 23" wide by 15" deep.

All cabinets shall be designed to incorporate necessary bracing to assure the rigidity of the cabinet structure including an optional door(s). The cabinets shall be of sufficient strength that no external supports are required if the cabinets are securely fastened to the wall.

Each cabinet shall have mounted on it a large, easily readable identification label corresponding to the location where the RTU will be installed. These shall match labels on existing IDOT District 1 RTUs or shall be approved by the Engineer.

A ground lug capable of accommodating up to a No. 8 AWG stranded grounding cable shall be provided in each cabinet.

Other. All RTUs shall have a switchable interior AC light and dual duplex AC receptacle mounted inside the RTU cabinet.

Two rack-mounted, plug-in type modems are to be provided for installation in the Communication Line Termination Cabinet in the Control Center. These modems will be installed and setup by IDOT personnel. The modems shall be hot-plugable. Modems shall be US model V.3225 or approved equal.

CONSTRUCTION REQUIREMENTS

All materials shall be furnished with the most recently developed product versions that meet or exceed these specifications. It is the Contractor's responsibility to ensure that all components comply with the performance requirements specified herein, within the plan set, and/or in the Contract. In case of conflict between the requirements of the American National Standards Institute (ANSI), the American Society for Testing and Materials (ASTM), the National Electrical Manufacturers Association (NEMA), the Underwriters Laboratories (UL) Incorporated, and local codes, permitting requirements, and requirements contained herein, within the plan set, and/or in the Contract, the most stringent specifications shall apply. All materials and practices shall comply with the applicable requirements of the United States Department of Labor's (USDOL) Occupational Safety and Health Standards.

Contractor Requirements. The Contractor is solely responsible for all designs, equipment, materials, and services proposed. The Contractor is responsible for verifying the completeness of the materials required and the suitability of devices used to meet these specifications. The Contractor shall provide and install, without claim, any additional equipment required for operation as required herein, within the plan set, and/or in the Contract.

The Contractor shall possess the qualifications, skills, and experience necessary to accomplish the work required herein, within the plan set, and/or in the Contract to construct, furnish, and install equipment shelter. The Contractor who performs the lightning protection system installation shall document experience and competency in the proper design and installation of lightning protection systems, and be certified by the Lightning Protection Institute (LPI). This requirement is in addition to the normal contractor licensing requirements of the State of Illinois.

General Installation. Equipment shelter installation shall meet or exceed the design requirements contained herein, within the plan set, and/or in the Contract. The Contractor shall be responsible for identifying local facilities for the delivery, storage, and legal disposition of post-installation materials. The Contractor shall also be responsible for locating and protecting any existing underground utilities at the work site. The Contractor shall repair any damage to existing installations at no additional cost to the Department.

The Contractor shall submit detailed drawings of the proposed installation to the engineer for approval. All concrete work shall be performed according with IDOT's Standard Specifications for Road and Bridge Construction.

The Contractor shall supply a concrete mix design to the engineer for approval. The concrete mix design shall be signed and sealed by a professional engineer registered in the State of Illinois. When the concrete is delivered on site, the Contractor shall provide the actual mix design to the engineer for approval. If the concrete mix design does not meet the requirements of the signed and sealed concrete mix design, the Contractor shall not be permitted to use the concrete. At a minimum, the Contractor shall take five samples (i.e., cylinders) of concrete from each truckload. The Contractor is responsible for performing concrete break tests on the samples at 3-, 7-, 14-, and 28-day intervals. The Contractor shall use a fifth sample as a spare in the event one of the other samples becomes damaged. The Contractor shall submit all concrete break tests in writing to the engineer. No construction or installation may begin on a concrete foundation until the concrete break tests indicate that the concrete has reached its design strength.

The Contractor shall also perform slump and temperature tests for each truckload. If the concrete is beyond the limits of the design or IDOT requirements, the Contractor shall not be permitted to use concrete. Some sites may be located in environmentally sensitive areas and require special treatment of the waste products associated with drilled shaft excavations.

Electrical Installation. The Contractor shall be responsible for providing and connecting electrical power to the shelter. Routing of wires and cables shall be neat and orderly. Electrical connectors and all costs associated with providing power shall be the Contractor's responsibility. The Contractor shall install the power service as required by IDOT's Standard Specifications for Road and Bridge Construction. Unless otherwise specified, the Contractor shall provide underground power service.

The Contractor shall provide all electrical connections from the service drop to the shelter's receptacles. The receptacles, switches, and light fixtures shall be wired using a minimum of # 12 AWG copper wires. All wire shall be run in a minimum 0.50-inch [1.27 -centimeter] electrical metallic tubing (EMT). The electrical loads shall be divided among as many load centers as necessary to contain the quantity of circuit breakers required to protect the communication shelter facility. The load centers shall contain separate, appropriately sized circuit breakers for the HVAC units as required for each major branch, receptacle, and remaining location in the 42-circuit panel. Power outlets consisting of quad receptacles shall be mounted on unistruts fastened to the overhead cable tray, above the equipment cabinet racks. In addition, a total of five duplex outlets shall be mounted in the equipment shelter walls as shown on the contract drawings. A separate 20-amp single-pole circuit breaker shall be provided to protect the lighting circuits.

All electrical conduits shall be installed in a neat and orderly fashion. Symmetry shall be employed wherever possible. The main power shall enter the equipment shelter at a primary power switch to allow for the disconnection of commercial power and shall then be routed to an automatic transfer panel that will switch to emergency generator power in the event commercial power is lost. Emergency generator power shall also enter the equipment shelter through a power switch prior to connection to the automatic transfer panel. The main power from the automatic transfer switch shall be routed to a manual transfer switch with the mobile emergency generator connection installed on the outside of the shelter. The emergency generator connection shall allow IDOT personnel to power the site from a portable generator in the event that both the commercial power and emergency power is lost. The resulting main power shall then be routed to a 42-circuit distribution panel and through the associated AC TVSS devices as described herein, within the plan set, and/or in the Contract.

Grounding. The purpose for installing a grounding system is to provide personnel safety and equipment lightning protection and to minimize the induced noise and static in the system. The grounding system shall comply with the specifications detailed herein, within the plan set, and/or in the Contract, and with National Electrical Code (NEC) requirements and National Fire Protection Agency (NFPA) standards detailed in NFPA-70, as well as all local grounding-related building codes.

The equipment shelter's exterior grounding system shall function as the primary ground sink. All grounds for the shelter shall be installed on the side of the shelter that the utilities, communication cables, and fiber enter. The grounding system for the surge protection devices shall be installed according to the manufacturer's recommendations and shall be connected to the existing grounding system with no less than the minimum wire size specified herein, within the plan set, and/or in the Contract, or the manufacturer's recommended wire size, whichever is larger, typically a #2 AWG stranded copper wire. The grounding system shall be bonded at a single point so that the communication cables, AC power, generator, signaling equipment, and equipment frames are connected by the shortest practical route to the grounding system. Lead lengths from each device to the device shall be protected and grounding shall be minimized for all devices according to installation requirements. The TVSS device's lead lengths shall not exceed 10 inches [0.3 meter]. Any variance from the IDOT requirements shall be submitted in writing and pre-approved by the engineer for acceptance.

All belowground connections shall use an exothermic bonding process. The Contractor shall not backfill the openings where the underground exothermic bonds are made until the engineer has inspected and approved the grounding system.

All aboveground exterior connections shall use an exothermic bonding process to bond ground conductors to the exterior of the equipment shelter. Grounding connections to interior ground bus shall be mechanical connections using two bolts on a double lug connector. After a firm connection has been made to the connectors, an application of an anti-oxidant compound shall be required.

All connections to fence posts shall be exothermic bonds. Connections to top rails and fabric shall be mechanical connections. After a firm connection has been made to the connectors, an application of an anti-oxidant compound shall be required. See IDOT Fence Grounding Specifications for additional details.

Connection of conductors to interior equipment, such as panels and cable trays, shall use tow bolts on a double lug connector, or clamps appropriate to the size and type of wire, and the requirements of the equipment being grounded. Wires connected to lugs or clamps shall be crimped and soldered for reliable electrical contact. All non-conducting surface coatings shall be removed before each connection is made. Application of an anti-oxidant compound shall be required. Star washers, or another means that accommodates the fasteners used, shall be installed to ensure reliable electrical connections. The objective is to provide reliable, low-maintenance electrical and mechanical connections that will not deteriorate.

Ground Conductor Bending. Ground conductors shall be downward coursing and vertical and shall be as short and straight as possible. The minimum bending radius for interior shelter grounds shall be 8 inches [0.2 meter]. Sharp bends and multiple bends in conductors shall be avoided in all cases. Any deviation shall be submitted in writing and pre-approved in writing by the engineer.

Interior Grounding. One "halo" ground system consisting of an interior copper ground bus bar .25 inch x 2 inch (.64cm x 5cm), approximately 6 inches (15.24cm) below the ceiling, with a vertical #2 AWG stranded copper drop through the floor at each corner, with a sufficient length of coiled wire slack at the drop to allow attachment to an exterior ring ground system.

The cable trays shall be mechanically connected to the upper interior perimeter ground using #2 AWG stranded copper wires with bolted terminal connectors at the cable tray ends. All points where cable tray sections meet shall be made electrically continuous by use of a short jumper wire with terminals attached at each end. All other metallic objects, such as door frames and doors, air conditioners, alarm systems, wall-mounted communication equipment, etc., shall be directly bonded to the closest interior upper or lower perimeter ground with the shortest possible #2 AWG stranded copper wire. The door shall be bonded to the doorframe using flexible welding cable. A bond shall be made between the lower and upper internal perimeter grounds using #2 AWG stranded copper wires at each corner of the room, and shall continue to provide a bond between the internal and external grounding systems.

Exterior Grounding. The shelter's exterior grounding system shall consist of a ground ring consisting of four ground rods placed a minimum of approximately 2 feet from the building foundation corners and enclosed within a pre-fabricated 10 inch ground inspection well. The ground rods shall be bonded together using #2 AWG stranded copper wires and an exothermic bonding process. The bonding wires shall be buried a minimum of 2 feet [0.6 meter] below the finished grade. The following items shall also be bonded to the shelter's external grounding system using #2 AWG stranded copper wires:

- Ground rods provided by power or telephone utilities for grounding of AC power or surge protection devices, as permitted by local codes; and any metal object greater than 4 ft² [0.4 m²].

Punch Block Transient Voltage Surge Suppression Grounding. All Type 66 punch blocks shall have #2 AWG stranded copper wires installed to ground external line surge protection devices. The #2 AWG stranded copper wires shall be installed as required by the TVSS manufacturer's recommendations and shall be mechanically connected to the shelter's interior perimeter ground.

Site Preparation. IDOT shall provide site space for shelter installations. The Contractor shall install the shelter and other necessary facilities and equipment in the provided space and make all necessary electrical and mechanical connections. General site preparation, specific building tie-downs, and landscaping shall be the Contractor's responsibility. The Contractor shall comply with all environmental protection requirements and shall contact the engineer for specific information regarding shelter site preparation. The Contractor shall provide a weed barrier mat and gravel ground cover in the fenced-in compound.

Land Clearing. The Contractor shall be responsible for the clearing of brush, trees, or any other obstructions, including the removal of asphalt or concrete. The Contractor shall coordinate with the engineer as to the extent and schedule for all land clearing activities to ensure that there is no interference with concurrent operations at the site. Any tree stumps resulting from clearing shall be grubbed. The Contractor shall comply with all environmental protection requirements. The engineer shall pre-approve in writing any site clearing and tree trimming.

Debris Removal. After installation, inspection, and approval by the engineer as specified herein, within the plan set, and/or in the Contract, the Contractor shall remove all onsite debris, backfill, and compact all excavations, and return the grounds to their original condition. The Contractor shall comply with all environmental protection requirements.

Sanitary Provision. The Contractor shall provide and maintain neat and sanitary accommodations for the use of its employees as required for compliance with the Illinois Department of Health and all applicable county regulations. No nuisances shall be permitted.

Excess Garbage and Clutter Removal. The trash generated from the installation, including lunch bags and drinks, shall be stored in a neat manner until disposed of properly. The Contractor shall be responsible for removing and legally disposing of trash in a timely manner. Trash shall not be allowed to blow around or away from any construction site.

Fencing. The Contractor shall include and install metal fencing to provide complete perimeter security at the shelter site. The fence shall form a rectangle or square shape, unless otherwise specified herein, within the plan set, and/or in the Contract, and allow for 5 feet [1.5 meters] of space between the fence and any enclosed item whenever possible. The fence shall be a chainlink as per IDOT Standard Detail 664001-01 "Chain Link Fence", and as modified per details on the contract drawings. The basic fence shall be a height of 6 feet [1.8 meters] and shall be topped with three strands of barbed wire. The barbed wire shall be held outward from the fence at a 45-degree angle with galvanized hardware. In addition, the fence fabric shall be fastened to a top rail and installed on top of the fence. The fence shall include a double-gate made of the same material as the fence material. The gate shall have a width of 12 feet [3.6 meters] and include a gate closing arrangement consisting of a female pipe receptacle anchored in the ground with concrete. A hardened, four-digit combination gate lock shall be provided by the Contractor, and the combination shall be set to the IDOT specifications.

Weed Prevention. The fenced compound area at all sites shall be treated with an IDOT-approved herbicide and covered with weed prevention material. The Contractor shall apply gravel or crushed rock to the area to a depth of 6 inches [0.2 meter] so that mowing and other requirements are minimized, unless otherwise specified herein, within the plan set, and/or in the Contract. A woven plastic weed barrier shall be placed on the ground before gravel installation. The barrier shall be installed according to the manufacturer's recommendations.

The manufacturer's recommendations shall describe the minimum 10 percent overlap for each section and the method of securing the edges of the mat with stakes. See gravel section detail on contract drawings.

Compound Gravel Finish. The Contractor shall install gravel or crushed rock covering all unimproved areas inside the new fenced area to a depth of 6 inches [152.4 millimeters]. The gravel or crushed rock shall be obtained locally and the size shall not exceed 3 inches [76.2 millimeters] in diameter so that foot traffic is not difficult.

Fence Grounding. The fence shall be electrically grounded to prevent shock hazards from lightning or other electrical sources. One metal fence or gate post located adjacent to the exterior ground triad shall be grounded to one of three ground rods with #2 AWG stranded copper wire. The ground wire shall be buried 2.0 feet [0.6 meter] below finished grade. The gate and gatepost shall be bonded together with a flexible ground, such as welding cable wires. All connections to the ground wire shall be exothermically bonded. The fence's top rail shall be connected to the post.

Grounding Lead. Ground leads shall be #2 AWG stranded copper wires and shall be required for all above and belowground grounding wire installations.

Wall Mounted Fiber Optic Termination Frame. The fiber optic termination frame shall be installed in the communication shelter as specified on the Plans. The frames shall come with cable strain relief hardware and pull out label for administrative documentation. All work shall be neat and in a workmanlike manner. Particular care shall be taken as to not crush or kink the fiber optic cable.

Cutover Work. The Contractor shall relocate and re-terminate existing fiber optic cables as shown on the plans. This effort shall be considered a component of the installation of termination panels in the 10 X 20 SHELTER.

In relocating and re-terminating these cables, the Contractor shall recognize that they are being used for operations. The Contractor shall maintain operations during this operation, with a minimum impact. The process of moving these cables or relocating termination equipment from the cabinets to the shelter shall be done during specific times identified by the Department. Typically the timeframes available to make these changes will be on non-holiday weekends. The Contractor shall assume that the work will be accomplished during this timeframe and provide the necessary resources to accomplish the work without causing an operational impact to the systems.

When splicing into existing fiber optic cables that are supporting operations, the Contractor shall take additional precautions to avoid disrupting Communications Center and Traffic System Center operations. The specific timeframes for performing the work shall be dictated by the Engineer. The Contractor shall commit adequate resources to finish the work during the authorized periods. In addition, the Contractor shall exercise additional precautions to ensure that only the fibers, conductors, or equipment that are assigned to this project, are accessed by the Contractor's technicians.

Prior to splicing or re-terminating any existing cables or fibers, the Contractor shall provide specific details of the work to be done to the Engineer with an anticipated timeframe to complete the work. This must be done a minimum of seven calendar days prior to commencing the work. The Engineer will grant approval for any operations 72 hours in advance of their commencement.

Prior to commencing any operations, the Contractor shall document the existing attenuation of any fibers using an OTDR and source/power meter. Subsequent to relocating and re-terminating the cable, the Contractor shall measure the attenuation of all fibers affected by the move. Any difference in attenuation greater than 0.5 dB shall be addressed and if necessary, the Contractor shall re-splice the fibers.

REMOTE TERMINAL UNITS (RTUs)

Installation. Install the Remote Terminal Unit at the location indicated in the Contract Drawings and connect to the assigned terminals of the telephone terminal cabinet. Installation of the RTUs may necessitate the purchase of communications components from the RTU manufacturer to be installed at the control center. In addition, some field programming may be required.

Mounting. Mount enclosures as shown on the Contract Drawings, so that all equipment at the location is of uniform height. A grounding cable shall be attached mechanically to the enclosure such that it can be easily removed if necessary.

Verification. Following completion of the installation of all SCADA equipment at a site, the Contractor shall inspect all equipment wiring to verify that all mechanical connections are made and properly secured, all hardware is installed in its proper location, and all wiring is properly terminated. This inspection shall include conductor and shield continuity and isolation verification of all installation wiring. Data sheets containing evidence of such inspection, certified as correct by the Contractor's Quality Control Engineer for the project, shall be delivered to the Engineer for approval. The Contractor shall receive approval of such inspection certification before applying power to the SCADA equipment covered by such certification.

Grounding. Grounding of all of the equipment shall be provided as required by the Manufacturer's specifications and Electrical Grounding Section of this Specification, and shall be approved by the Engineer.

LOCAL FIELD ACCEPTANCE TESTS

Perform local field acceptance test in accordance with the approved test procedures and furnish a report of each test.

Test SCADA system's rack equipment under power following approval of the Contractor's installation inspection by the Engineer. Installation testing shall demonstrate the full functional capability of the equipment.

INTEGRATION TESTING

Integration testing of the complete SCADA system for the project shall follow completion of all work regarding the SCADA system under the Contract, including system testing at all stations and at the Control Center. Integration testing shall consist of exercising the overall SCADA system from the Control Center and locally to verify all is operational, and shall be done in accordance with the equipment Manufacturer's recommended System Testing.

DOCUMENTATION

The system shall include thorough documentation of all hardware and software to be supplied. Documentation for all procured Master Station equipment shall consist of the original manufacturer's manuals (one per unit supplied). Documentation delivered for hardware and software manufactured by the RTU vendor shall be subject to approval.

HARDWARE DOCUMENTATION

System Manual. A System Manual shall be provided which includes a complete summary list of deliverable items: remote stations, spares, test equipment, consumables, and all documentation manuals and drawings.

Remote Station Manuals. The remote station manual shall include as a minimum the following items:

- Installation and startup instructions
- Instructions for expansion of the RTU module
- Theory of operation
- Maintenance and trouble shooting guidelines
- Functional block diagrams
- Layout drawings and interconnect drawings
- Schematics of each RTU module
- Replacement parts list.

Warranty. The equipment shelter shall carry a manufacturer's warranty of one year from the date of final IDOT acceptance. Said warranty shall be transferable from the Contractor to the IDOT upon the anniversary of the Contractor's one-year warranty period.

Training. The training for this section shall be in accordance with Specification – General Provisions.

Inspection and Verification. The inspection shall be performed by the Contractor and witnessed by the engineer or a designated representative. The Contractor shall notify the engineer at least 10 calendar days prior to completion of the installation. Following shelter equipment installation, the Contractor, in conjunction with the engineer or designated personnel, shall verify that all equipment is correctly installed and functional.

For ground system inspections, the Contractor shall notify the engineer at least 2 calendar days prior to completion of the installation. Below-grade ground installations and ground connections shall not be backfilled until inspected and approved by the engineer. All test results shall be recorded in a standardized format to be determined by the Contractor and approved by the engineer prior to testing. All recorded test report data shall be dated, witnessed, and signed by at least one representative of IDOT and the Contractor. The Contractor, at no cost to IDOT shall remedy all deficiencies.

Mechanical Inspection. Equipment that is to be mounted to the shelter walls shall be inspected to ensure adequate support has been provided. The HVAC system shall be tested for adequate heating, cooling, and dehumidification. The building shall be inspected for the proper sealing of conduit ports, telephone/signal cables, and ground wire penetrations. The Contractor shall be responsible for correcting any deficiencies.

Electrical Inspection. The shelter lights and smoke detectors shall be verified for proper operation. The Contractor shall verify proper power load balances and provide a report to the engineer prior to acceptance of the site. The Contractor shall be responsible for correcting any deficiencies.

Grounding Inspections. The grounding system shall be inspected for proper connection types, tightness, workmanship, as well as conformance to the approved design. Any exothermic bonds that are deemed unsatisfactory shall be repaired with new bonds. Any mechanical connections that are deemed unsatisfactory shall be repaired or replaced.

Site Inspection. The site shall be inspected and shown to be free of debris, and proof that excavations are backfilled and restored shall be provided.

Performance Testing. Following the completion of all acceptance testing and inspections, the installed site(s) shall be subjected to a minimum 20-day performance period. For the purpose of a successful performance period, failure of operation is defined as the failure of a major site component (i.e., HVAC systems, etc.). Degradation of performance is not a failure if function and proper operation is maintained. The performance verification shall be accomplished with the engineer or his designee present. Upon acceptance of the test criteria by the engineer, the 20-day performance period shall begin.

This requirement shall be accomplished during a period of time not to exceed 45 consecutive calendar days after equipment installation, testing, and inspection. If a successful performance period cannot be accomplished within 45 consecutive calendar days after the equipment testing and inspection, IDOT reserves the right to deem the Contractor in default and enforce the provisions set forth in the contract.

Method of Measurement. The communication shelter shall be measured for payment as each is furnished, installed, configured, warranted, made fully operational, and tested according to the specifications detailed herein, within the plan set, and/or in the Contract.

Basis of Payment. The unit price for each communication shelter shall consist of the furnishing and installation of a shelter to house electronic communication equipment, power supplies, and any related components necessary for the proper operating conditions of the equipment to be installed. The shelter shall include all mounting hardware, technical specifications, warranties, equipment, and any and all material to complete installation of the unit.

AUTOMATED TRAFFIC RECORDING CABINET EQUIPMENT

Description. This item shall consist of furnishing and installing the AUTOMATED TRAFFIC RECORDING (ATR) EQUIPMENT.

Materials. The Contractor shall provide the following equipment:

AUTOMATED TRAFFIC RECORDING CONTROLLER
DATA MODEM

The equipment shall meet the following requirements:

AUTOMATED TRAFFIC RECORDING CONTROLLER

The Contractor provide an AUTOMATED TRAFFIC RECORDING CONTROLLER meeting or exceeding the following criteria:

General. The counters supplied must be production models and have been in production for over three years. Upon apparent award of bid the vendor shall supply a complete to specification working unit.

Housing, Cabinet Rack Mount. The counters shall be housed in a 10" or 19" rack. The counter shall also be capable of being installed in a shelf mounted type scenario. The following circuit boards must be rack mount; CPU board, 8 input Loop Board, 8 input Piezo Board, Piezo WIM Board, Data Card Board, Contact Closure Input Board, Fiber Optic Sensor Board. These boards are interchangeable and can be added to the unit at anytime. These boards also must be interchangeable with the portable unit. The rear of the unit must have easy access for repair. Both the 19" rack and the 10" rack must have a fully operational 4 line LCD display and 16 key, keypad. The keypad and display must allow for programming the unit and viewing live traffic by axle, time, vehicle type, speed, lane number, axle spacing and axle weights (if WIM board is installed).

Electronics & Battery. The counter shall be designed to insure low power consumption. AC adaptor/charger for all units must be capable of operation with no effects on accuracy in temperatures of -40 degree F to +158 degrees F. The unit must work with AC. All electronic parts and circuit cards must be easily removed with simple plug in connectors.

Memory Storage. The counter shall have a minimum of 256K memory expandable to 64Meg. The counter shall collect 16 lanes of volume counting and 8 lanes of the following: FHWA Scheme F axle classification data, 15 bin speed data, 15 bin gap, 15 bin headway, 15 bin length or per vehicle data with time stamps. Data storage shall be in a EEPROM such that a loss of power does not cause loss of data. Battery backed up memory is not acceptable due to possible loss of battery power and the need to replace the battery. The unit must contain or be up gradable for use with an external data card, which can be chosen as the main memory. This Data card must be a minimum of 4 Meg and maximum 64meg and be formatted to MSDOS disk drive. This data card is PCMCIA compatible and must be readable through Windows 95/98/NT/2000/ME/XP with no special software.

Input Capabilities & Air Switches. The counters must have the capabilities to accept up to 16 inductive loops, 8 piezo sensors and 4 road tubes with a sensor configuration of loop-piezo-loop, piezo-loop-piezo, or piezo-piezo. The unit must be upgradeable to 4 lanes of piezo weigh in motion by installing only one piezo WIM Board.

Keyboard & Display. The counter shall have a keypad with 16 keys and an easy to read four-line low power LCD display. An On/off switch shall be located on the top of the front panel so as to cut power to the unit when not in use. A solar/charging port socket shall be accessible on the front panel and through a connector on the side of the unit to allow for recharging of the batteries via an AC adaptor/charger or solar panel.

Programming Functions. The counter must be menu driven and easy to program. Step by step consecutive programming is not allowed. The user must be able to choose from the following study types: 8 lanes of volume, FHWA 13 channel Axle Classification, 14 bin (preset) hi speed, 14 bin (preset) lo speed, user definable speeds, TMG (preset) speed, Gap, Headway, 15 categories of vehicle length, per vehicle and simultaneous class & speed. The user must be able to enter 16 characters of alpha/numeric site id, site reference, site location1 and site location2. These for different data entries will be stored with each count file. The Axle classification scheme must use a special tail gating algorithms for high accuracy classification data collection. Each lane of travel must be programmable through the LCD display & keypad to designate the direction of travel.

A count period shall be started by simply pressing the start function for immediate data recording. This is important so as to allow for minimal roadside programming when desired. The unit shall have a real time display mode to view the current interval count, class, speeds and axle spacing of passing vehicles and their associated lanes of travel. The counter must have a diagnostic mode to show sensor inputs, test the LCD display, keyboard and internal and external data card memory.

Special Accuracy Features. The unit must have built in tailgating algorithms to improve vehicle count, axle classification and over all vehicle detection. With the tailgating algorithm the counter will not combine tailgating vehicle or incorrectly classify trucks or vehicles following too close together. The result is less type 15 unclassified vehicles and more correctly classified vehicles. The algorithm must work on an infinite amount of vehicles.

Data Collection & Retrieval. The data must have six modes of collection: **One**, the data shall be collected electronically by connecting the counters RS232 port to a notebook or desktop computer. The cable must have a 9-pin D type connector on both ends and be a standard 9 pin straight through cable available at a local computer store. **Two**, a data module shall be plugged into the counters RS232 port and the counters data uploaded to the module. The module must be capable of containing multiple files. The data module, if used, must have on board EEPROM memory and require no batteries for power. The power for the module must be drawn from the counter or computer when connected, this allows for a fail-safe operation. **Three**, a PCMCIA data card option for downloading data maybe used. This card must be 1meg to 64meg (defined by the user). Upon insertion of the data card, the operator must be notified of the following options: Card to be used as main memory, card to be used to preprogrammed the unit, collect the units recorded data, or format a data card to a MSDOS disk drive. This data card must work with Windows 95/98/NT/2000/ME/XP with no special software. **Four** a Palm (PDA). **Five** over dial up, voice grade line (modem). **Six** a Dell handheld PDA with a Microsoft operating system.

Data Collection Software and Data Transfer. The counter and the counters data modules must plug in directly to a COM port on the main computer through a serial cable. No other interface or special cable shall be supplied. All data must be transferred by this cable. The computer

software must run properly under Windows 3.11, Windows 95/98/NT/ME/2000/XP. DOS based programs are unacceptable. The software shall allow for full editing features such as editing the file header, start date & time, directions and all site information. The counter download software must show previews of stored count files so as to find files before opening a file. The software must allow for adding files together and adding specific directions of one file to another. File format options must exist for transferring of TAS files, .PRN files and TMG files. 15-minute files must be able to be easily converted to hourly files. Also 15-minute files must be able to be reported in hourly formats, with peak intervals. The Windows software must interface with the counter, data module and turning movement counters (if needed), along with StreeterAmet TraffiComp III, 241's and GK5000's and GK modules. The software shall printout summary reports and graphs for daily, weekly, monthly and annual data. Specific times shall be selectable. The software must allow for adding of files together and adding lanes from other count files. In addition, the software must be upgradeable via an Internet website.

DATA MODEM

The data modem furnished by the Contractor shall meet or exceed the following requirements.

Serial Data Interface

Protocol – RS-232, 10 or 11 bit asynchronous

Throughput – 300, 600, 1200 Baud

Flow Control – RTS Control or DSCC (Data Sense Carrier Control)

Carrier Interface

Protocol – Bell 202, CCITT V.23 (Bell 202 Default)

Carrier Connector – Removable Terminal Block

Operation Modes

Point-to-Point, point-to-multipoint

Two wire/four wire

Simplex, half-duplex and full-duplex (Full-duplex requires four wire and point-to-point mode.)

Power

Supply Voltage – 11 – 24 VDC; 12 VDC wall mount transformer supplied with modem

Current – 60 mA @ 12 VDC

Power Connector – Center Positive Barrel Jack or Removable Terminal Block

Operating Environment

Temperature – -34.6 F to 165 degrees Fahrenheit

Humidity – 0 to 95% non-condensing humidity

Enclosure

Standard – NEMA 1; 18-gauge steel; 1.54" X 4.90" X 7.75" including mounting flanges

INSTALLATION.

AUTOMATED TRAFFIC RECORDER CONTROLLER

The ATR controller unit shall be installed and connected inside the Type IV Cabinet at the locations as shown on the Plans and according to the manufacturer's instructions. The Contractor shall install all cables and ancillary equipment, connecting the ATR controller to the appropriate inductive loop detectors.

Surge and over-voltage protection shall be installed on all loop lead-in cables and all power conductors.

All cables shall be neatly dressed and labeled with their function and physical connection.

Testing. The Contractor shall power up the ATR controller and self-test the unit using available software. Applications software shall be uploaded, configured, and validated. This testing shall be accomplished prior to installing the unit in the field cabinet. After the unit is installed in the cabinet, the Contractor shall apply power and verify the unit is operating correctly. Tests previously used for bench checking shall be repeated and documented.

The Contractor shall test the operation of the ATR controller, using CCTV video as ground truth for vehicle detection, and a calibrated radar gun for speed. Traffic data produced by the ATR controller shall be within 5% of ground truth (actual traffic counts and speeds). A written copy of the test, with supporting videotape, shall be submitted to the Engineer at the end of the test for approval.

Documentation. One copy of all operations and maintenance manuals for each component shall be delivered for each assembly installed. In addition, full documentation for all software and associated protocols shall be supplied to the Department on a 3.5-inch floppy disk(s) and a CD-ROM. The Department reserves the right to provide this documentation to other parties who may be Contracted with in order to provide overall integration or maintenance of this item.

Warranty. The Contractor shall warranty all materials and workmanship including labor for a period of two years after the completion and acceptance of the installation, unless other warranty requirements prevail. The warranty period shall begin when the Contractor completes all construction obligations related to this item and when the components for this item have been accepted, which shall be documented as the final completion date in the construction status report. This warranty shall include repair or replace all failed components via a factory authorized depot repair service. All items sent to the depot for repair shall be returned within two weeks of the date of receipt at the facility. The provider of the warranty shall be responsible for all return shipping costs.

The depot maintainer designated for each component shall be authorized by the original manufacturer to supply this service. A warranty certificate shall be supplied for each component from the designated depot repair site indicating the start and end dates of the warranty. The certificate shall be supplied at the conclusion of the system acceptance test and shall be for a minimum of two years after that point. The certificate shall name the Department as the recipient of the service. The Department shall have the right to transfer this service to other private parties who may be Contracted to perform overall maintenance of the facility.

DATA MODEM

The ATR controller unit shall be installed and connected inside the Type IV Cabinet at the locations as shown on the Plans and according to the manufacturer's instructions. The Contractor shall install all cables and ancillary equipment, connecting the ATR controller to the appropriate controller ports.

All cables shall be neatly dressed and labeled with their function and physical connection.

The Contractor shall be responsible for the coordination of telephone service installation in accordance with these specifications. The Contractor will NOT be compensated for the coordination of telephone service installation as this is considered incidental to the installation of the ATR cabinet.

Basis of Payment. This item shall be paid for at the Contract unit price each for AUTOMATED TRAFFIC RECORDER CABINET EQUIPMENT. This shall be payment in full for all work and incidental items to install all equipment in the cabinet.

CABINET HOUSING EQUIPMENT, MOUNTING AND SIZE AS SPECIFIED

Effective Date: June 1, 1994

Revised Date: June 12, 2003

Description. This item shall consist of furnishing and installing cabinets of the type and size specified in place including anchor bolts, bases, pedestals, posts, fans, cable harnesses, ground rods, terminal boards, shelves, mounting hardware, and all miscellaneous items at locations as directed by the Engineer.

Materials. Cabinets shall be of fabricated aluminum supplied in sizes with minimum inside dimensions as listed below.

<u>TYPE</u>	<u>HEIGHT</u>	<u>WIDTH</u>	<u>DEPTH</u>	<u>THICKNESS</u>	<u>OPENING</u>
E.S.P. 1	571.5mm	362mm	248mm	4.7mm	457mm x 279mm
E.S.P. 2	914.4mm	508mm	381mm	4.7mm	711mm x 444.5mm
E.S.P. 3	1257.3mm	762mm	432mm	4.7mm	965mm x 698.5mm
E.S.P. 4	1397mm	1117.6mm	660.4mm	4.7mm	1079.5mm x 1054.1mm
E.S.P. 1	22-1/2"	14-1/4"	9-3/4"	3/16"	18" x 11"
E.S.P. 2	36"	20"	15"	3/16"	28" x 17-1/2"
E.S.P. 3	49-1/2"	30"	17"	3/16"	38" x 27-11/2"
E.S.P. 4	55"	44"	26"	3/16"	2-1/2" x 41-1/2"

Cabinets shall be watertight. Doors shall be gasketed to provide a waterproof seal. Bases shall be caulked to obtain a moisture-proof bond. All cabinet types shall have a minimum of two (2) shelves for setting detectors and other equipment on, and Type 2 Corbin brass locks or equal.

E.S.P. Type 3 and Type 4 cabinets shall be fitted with a thermostatically controlled fan. It shall be mounted at the top of the cabinet for a forced air fan system that has a screened air exhaust opening under roof overhang and no opening in top of cabinetry. The fan shall be capable of operating at 3.68m³/min (130C.F.M.) at 4.1mm (.160") of water static pressure.

Where the E.S.P. Type 3 cabinet is used to house equipment controlling ramp metering signals, the E.S.P. Type 3 cabinet shall have a signal load relay installed. The signal load relay shall consist of two components, a base which is mounted on the E.S.P. Type 3 cabinet wall and a locking screw. The coil of this relay shall be connected to the mark output of the signal change tone receiver. The one set contacts of the load relay shall be used to change the ramp signals and one set of contacts shall be used to key the mark input to the signal change transmitter. This relay shall be incidental to the cost of the cabinet when used.

Materials shall conform to controller cabinets as listed in the Standard Specifications 1074.03 except that the door shall not have any outside designation nor shall the cabinet door be equipped with a police door or louvers. Post top mounted cabinets, shall have a 6.4mm (1/4") bottom of cabinet welded.

CONSTRUCTION REQUIREMENTS

Installation shall conform to applicable portions of Section 863 of the Standard Specifications.

Cabinets, cabinet posts, and cabinet pedestals shall be primed and painted in accordance with TSC Specification T712#1. The final coat color shall be specified by the T.S.C. at the time of the pre-construction meeting. Interior of all cabinets shall be painted high gloss white.

CMS/DMS Type 4 cabinets shall be serviced by 117 volts AC power with a 60 amp circuit breaker minimum.

All cabinets shall be serviced by 117 volts AC power and a telecommunication system. Each cabinet shall be equipped with a 10 ampere circuit breaker, ground rod, 115 VAC RFI filtering surge protector (ACD-340 surrestor), 130 volt, 70 joules, 10 amp varistor, lightning protection for each loop (SRA-6LC surrestor), data line protection for each leg of the four (4) wire telecommunication system (SRA 64C surrestor), a pull chain porcelain base light fixture with a 3 prong 110 volt outlet. The porcelain fixture shall be mounted on metal plate, that shall be mounted on the cabinet ceiling. No holes shall be drilled thru the cabinet exterior for internal equipment mounting.

Each wire entering a cabinet shall be trained in a workmanlike manner and lugged at each terminal strip or switch. If more than one wire has a common terminal on a terminal strip, the adjacent strip shall be used and an appropriate jumpered connection shall be made.

All cables and wiring entering a cabinet shall be dressed, harnessed, tied, laced, and clamped to produce a workmanlike wiring installation.

All cables (loop wires, power, phone) shall be labeled with a panduit type cable tag. The tag will identify the type of cable and the cable destination.

A copper grounding bus shall be mounted on the rear wall of the cabinets.

Each cabinet shall contain a wiring diagram of the installation in addition to the diagrams which are to be submitted to the Engineer.

Prior to the wiring of the cabinet, the Contractor shall submit box print for approval before cabinet wiring shall begin.

The Contractor shall furnish three (3) diagrams of the internal and external connections of the equipment in each Traffic Systems Center cabinet. He shall also furnish the operating and maintenance instructions for all equipment supplied. One copy of the wiring diagrams for each cabinet shall be retained in each field cabinet. Wiring diagram shall be contained in a plastic pouch that shall be permanently mounted to the door of each cabinet. Contractor shall permanently mark the cabinet for each termination and each terminal connection as to loop, tone, closure, phone, and lane function of each termination in the cabinet.

Incidental to the cost of each cabinet, the Contractor shall construct 127mm (5") P.C.C. sidewalk of a rectangular area 1 meter by 1.2m (3' x 4') immediately adjacent to the cabinet foundation on the same side of the foundation as the cabinet door, with the 1.2m (4') dimension of the rectangle parallel to the cabinet door when closed. If the width of the required cabinet foundation is greater than the 1 meter (3 feet) width of the standard concrete foundation. Type D, the 1.2m (4') dimension of the sidewalk area shall be increased to equal the width of the foundation plus 30 cm (1ft), the area to extend 15 cm (6") beyond each side of the foundation. This paragraph shall be applicable at all cabinet locations included in this Section. The only situations where this paragraph shall not apply are as follows: When the foundation is immediately adjacent to or within a paved sidewalk or shoulder area and no further surfacing is required. The Engineer shall be the sole judge as to the applicability of this paragraph in all questions arising therefrom.

No raceways shall be allowed to enter cabinet through the sides, top or back walls.

Anchor bolts shall be installed for pedestal and base mounted cabinets. These shall be considered as incidental to the cost of the cabinets.

Cable harnesses, terminal boards, and mounting hardware shall be installed as needed. These items shall be considered as incidental to the cost of the Contract.

Terminal blocks provided in field cabinets shall be the heavy duty barrier type. The terminal block shall be a minimum of 50.8mm (2") wide and 30.2mm (1-3/16") deep. Center to center of the terminal screws or studs shall be a minimum of 16 mm (21/32") with barriers in-between. Terminal blocks shall be rated at 45 amps 600 volts breakdown RMS line to line 11,000 V. and breakdown RMS line to ground 13,800 V. A marking strip shall be provided with each terminal block.

Method of Measurement. Cabinets will be accepted as concrete foundation mounted, pole mounted, pedestal mounted, or attached to structure. Each cabinet installed complete and in place will be counted as a single unit.

Basis of Payment. This work will be paid for at the Contract price each for CABINET HOUSING EQUIPMENT, mounting and size specified, installed complete and in place.

PREFORMED INDUCTION LOOP EMBEDDED IN NEW CONCRETE PAVEMENT

Effective Date: February 11, 1997

Revised Date: June 11, 2003

Description. This item shall consist of furnishing, installing and testing an induction loop, of the dimensions shown on the plans or of the dimensions from Table 1, at the locations shown. The induction loop shall be installed in accordance with all details shown on the plans and applicable portions of Section Art.886 of the Standard Specifications for Road and Bridge Construction. All cable installation, lead-ins and testing necessary to complete the installation shall conform with the following requirements.

Materials. The cable used for induction loop shall be #14-7 strand XHHW XLP-600V, encased in a 9.5mm (3/8") synthetic cord reinforced hydraulic hose with a 17576.75 Grams/sq cm (250 psi) internal pressure rating as manufactured by Goodyear Tire & Rubber or comparable. All loop wire shall be UL listed. Lead-ins shall be Conoga 30003 or equal cable. The jacket of high density polyethylene shall be rated to 600 volts in accordance with UL 83 Section 36.

Preformed detector loops shall be factory assembled. Hose for the loop assembly shall be one continuous piece. No joints or splices shall be allowed in the hose except where necessary to connect homeruns or interconnects to loops. This will provide maximum wire protection and loop system strength. Hose tee connections shall be high temperature synthetic rubber. The tee shall be of proper size to attach directly to the hose, minimizing glue joints. The tee shall have the same flexible properties as the hose to insure that the whole assembly can conform to pavement movement and shifting without cracking or breaking.

The wire used shall be #14 XHHW stranded copper. The number of turns in the loop shall be application specific. No wire splices will be allowed in the preformed loop assembly.

The loops shall be filled and sealed with a flexible sealant to insure complete moisture blockage and further protect the wire.

Loops and wire will be custom marked as necessary for the job.

CONSTRUCTION REQUIREMENTS

These preformed induction loops shall be installed in new concrete pavement at the location shown on the plans or as directed by the Engineer. The loops shall be installed at such a time that the loop can be secured to the reinforcement bars to prevent movement during concrete pour. The induction loop shall have a minimum of 50mm (2 inches) of concrete cover at all points.

The reinforced hose shall be fed through a 50mm (2 in) galvanized steel conduit to a heavy duty handhole (See TY-1TSC-418#10). The hose shall extend a minimum of 1.8 meters (6 feet) into the HDHH.

For loops in bridge decks, the reinforced hose shall extend a minimum of 1.8 meters (6 feet) beyond the forms for the bridge deck pour. Extra care shall be taken when the forms are stripped to insure that no damage is done to the loop. A 254mm x 203.2mm x 101.6mm (10" x 8" x 4") stainless steel junction box, minimum, shall be used to house the splice for the induction loop. This stainless steel junction box shall be attached where the loop hose passes out of the bridge deck. The stainless steel junction box shall not be considered incidental but shall be paid for separately as 254mm x 203.2mm x 101.6mm (10" x 8" x 4") Stainless Steel Junction Box Attached to Structure. Enough loop wire and lead-in shall be coiled in the SS Junction Box to permit the splice to be removed, worked on, and replaced.

Where there are continuous count stations in the new concrete pavement, the loops from inside lane to outside lane shall be wrapped and alternate clockwise, counter-clockwise, etc...as per Loop Table #2 shown below:

Mainline Loop Table # 2

Lane 1	Lane 2	Lane 3	Lane 4
Clockwise	Counter-clockwise	Clockwise	Counter-clockwise

The induction loops shall follow this method to reduce crosstalk between adjacent loops. The synthetic cord reinforced hose outside jacket shall be stamped hose size, hose rating, clockwise or counter-clockwise, loop dimension, # of turns, and wire type every 1.8 meters (6 feet) or as directed by the Engineer.

Induction loops on exit and entrance ramps shall be square or rectangular with edges perpendicular or parallel to traffic flow. All mainline loops shall be round loops, 1.8 m (6 feet) in diameter. Induction loops shall be centered on all ramps and in traffic lanes unless designated otherwise on the plans or by the Engineer. Traffic lanes shall be referred to by number and loop wire shall be color-coded and labeled accordingly. Lane one shall be the lane adjacent to the median, or that lane on the extreme left in the direction of the traffic flow; subsequent lanes are to be coded sequentially towards the outside shoulder. A chart which shows the coding for each installation shall be included in each cabinet.

All induction loops shall contain four (4) turns of No. 14 wire min. Each induction loop shall have its own Canoga 30003 or equal home run or lead-in to the cabinet. Induction loops shall not be connected in series with other loops. This wire shall be free from kinks or any insulation abrasions. The loop lead-in shall be barrel sleeved, crimped, soldered and protected by heat shrinkable tubing to the loop #14 wire. Lead-ins shall be twisted in such a manner so as to prevent mechanical movement between the individual cables. Lead-ins shall be brought into a cabinet or handhole at the time the induction loop is placed in the pavement. Loops located over 300 m (1000 feet) from cabinet shall require five (5) turns of No. 14 wire.

Loop lead-ins placed in handholes shall be coiled, taped and hung from the side of the handhole to protect against water damage. Any other method of installation will require prior written approval of the Engineer. Each loop lead-in shall be color coded and tagged in each handhole through which it passes. The loop lead-in shall be color coded and tagged at the core hole, in each junction box it passes through, and at the termination point in the cabinet.

RAMP LOOP TABLE #1

W (M)	S (M)
4.0m (13 ft)	2.8m (9 ft)
4.3m (14 ft)	3.1m (10 ft)
4.6m (15 ft)	3.4m (11 ft)
4.9m (16 ft)	3.7m (12 ft)
5.2m (17 ft)	4.0m (13 ft)
5.5m (18 ft)	4.3 m (14 ft)
5.8m (19 ft)	4.6m (15 ft)
6.1m (20 ft)	4.9m (16 ft)
6.4m (21 ft)	5.2m (17 ft)
6.7m (22 ft)	5.5m (18 ft)
7.0m (23 ft)	5.8m (19 ft)
7.3m (24 ft)	6.1m (20 ft)
7.6m (25 ft)	6.4m (21 ft)

The loop shall be spliced to the lead-in wire with a barrel sleeve crimped and soldered. An epoxy filled heat shrink tubing shall be used to protect the splice. The soldered connection shall be made with a soldering iron or soldering gun. No other method will be acceptable, i.e. the use of a torch to solder will not be acceptable. The heat shrink tube shall be shrunk with a heat gun. Any other method will not be acceptable, i.e. the use of a torch will not be acceptable. No burrs shall be left on the wire when done soldering. Cold solder joints will not be acceptable. Refer to TSC typical(s) TY-1TSC-418 #2 & #3 for proper loop to loop lead-in splice detail.

The new concrete pavement slab in which the loop is installed shall be stamped near the right shoulder to indicate an induction loop.

Traffic Systems Center Loop Splicing Requirement Color Code

Mainline Loops				Metering Loops	
Lane 1	Blue	Lane 4	Violet	Loop 1	Green
Lane 2	Brown	Exit	Black	Loop 2	Yellow
Lane 3	Orange	Entrance	White	Loop 3	Red

When 2 or 3 loops are installed on an exit or entrance ramp the loop color code shall conform to the mainline loop color code and shall be marked as entrance or exit ramp loops.

In addition to color codes each loop shall be identified with a written label attached to the loop wire, or lead-in wire. The tags shall be Panduit #MP250W175-C or equivalent. All wires and cables shall be identified in each handhole or cabinet the cable passes through, or terminates in. The labels shall be attached to the cable by use of two cable ties.

Prosecution of Surveillance Work. Should damage occur to any Traffic Systems Center cabinets, housing telemetry equipment and/or vehicle detection equipment, the Contractor shall install and replace all damaged equipment at his own expense. The Traffic Systems Center staff shall determine what equipment shall be reusable and what shall be replaced. Replaced equipment shall be of equal or better quality and type.

Connections to Existing Installations. Where new work connects to existing installations, the Contractor shall do all necessary cutting, fitting and foundation drilling to the existing installation and shall remove all existing work, as required, to make satisfactory connections, with the work to be performed under these Provisions, so as to leave the entire work in a finished and workmanlike manner, as approved by the Engineer. No raceways shall be allowed to enter cabinet through the sides or backwalls.

Protection of Work. Electrical work, equipment and appurtenances shall be protected from damage during construction until final acceptance. Electrical raceway or duct openings, shall be capped or sealed from the entrance of water and dirt. Wiring shall be protected from mechanical injury.

Standards of Installation. Electrical work shall be installed in a neat and workmanlike manner in accordance with the best practices of the trade. Unless otherwise indicated, materials and equipment shall be new and installed in accordance with the manufacturer's recommendations.

Except as specified elsewhere herein, materials and equipment shall be in conformance with the requirements of Section 106 of the Standard Specifications.

Testing. Before final acceptance, the induction loops shall be tested. Tests will not be made progressively, as parts of the work are completed. They shall be all made at one time. Items which fail to test satisfactorily shall be repaired or replaced.

An electronic test instrument capable of measuring large values of electrical resistance, such as major megger, shall be used to measure the resistance of the induction loop and its lead-in. The resistance of the loop and its lead-in shall be a minimum of 100 megohms above ground under any conditions of weather or moisture. The resistance tests and all electronic tests shall be performed in the presence of the Engineer any number of times specified by the Engineer. The loop and loop lead-in shall have an inductance between 100 microhenries and 700 microhenries. The continuity test of the loop and loop lead-in shall not have a resistance greater than two (2) ohms. The Contractor shall do all testing in the presence of the Engineer and all readings will be recorded by the Engineer. Testing shall be done with an approved loop tester.

Final Acceptance Inspection. When the work is complete, tested and fully operational, the Contractor shall schedule a Final Acceptance Inspection with the Engineer. Final acceptance will be made as a total system, not as parts.

The Contractor shall furnish the necessary manpower and equipment to make the Final Acceptance Inspection. The Engineer will designate the type of equipment required for the inspection tests.

Method of Measurement. The induction loop measurement shall be the length of rubber reinforced hose in the pavement which contain loop wire. The actual length of wire used in the rubber reinforced hose shall not be considered in any measurement.

Basis of Payment. This item will be paid at the Contract unit price per lineal meter (foot) as DETECTOR LOOP, TYPE III. The price will be payment in full for furnishing and installing all materials listed complete and operating in place.

UNDERGROUND TELEPHONE SERVICE INSTALLATION

Description. This item shall provide galvanized steel conduit, size as shown on the plans from a traffic surveillance cabinet or a communication shelter, through the foundation, and underground to the nearest telephone service

Prior to the installation of the service conduit to a surveillance cabinet, the Contractor shall contact the Traffic Systems Center Engineer at (708)524-2145. Prior to the installation of the service conduit to a communication shelter, the Contractor shall contact the Bureau of Electrical Operations Engineer at (847) 705-4356. The Engineer will contact SBC to confirm service location and request a hookup date.

If the service is pole mounted, the conduit shall be mounted a minimum of 3 m (10 feet) in height above the ground line and securely fastened in the same manner as the electrical service. A weatherhead shall be provided at the top of the pole mounted service.

If the service is ground mounted, the conduit shall be extended into the service box to a height which will not affect the operation of the telephone equipment and each end of the conduit shall be plugged with approved conduit putty.

A Siecior CAC 3000, or equal, plastic telephone network interface junction box shall be mounted within the controller cabinet/shelter. Telephone cable shall be installed from the network interface junction box to the telephone service. 1.5m (five feet) of excess cable shall be provided within the cabinet/shelter and at the service. The TELCO service cable will be as described in Special Provision, ELECTRIC CABLE IN CONDUIT, NO. 19 12/C.

Basis of Payment. This work shall not be paid for separately, but shall be considered incidental to the price for Galvanized Steel Conduit in Trench, 50 mm (2 inch), which shall include all labor and materials necessary to install this service conduit complete. After installation the Illinois Department of Transportation shall be responsible for IBT/Ameritech hookup and service charges.

(EK – 10/28/2004)

ELECTRIC CABLE NO. 19 – 12 CONDUCTORS

Effective Date: June 1, 1994

Revised Date: January 22, 1997

Description. This item shall consist of furnishing and installing telephone cable intended for direct burial in P-duct or G.S. conduit. The number of conductors shall be twisted into pairs stranded into a cable core and enclosed in two polyethylene jackets, with a copper shield

between the inner and outer jackets. All No. 19 electric cable shall conform with these specifications and the current addition of the Rural Electrification Specification for fully color-coded, polyethylene or crystalline propylene/ethylene copolymer-insulated, double polyethylene copolymer-insulated, double polyethylene-jacketed telephone cables for direct burial PE 54. The No. 19 cables shall be installed in complete spans.

Material and Testing. No. 19 electric cable shall meet the requirement set forth in the REA Specification PE 54.

Conductors. Each conductor shall be a solid round wire of commercially pure annealed copper. Conductors shall meet the requirements of ASTM Designation B-3, latest issue, except that the requirements for dimensions and permissible variations are waived.

Conductor Insulation. Each conductor shall be insulated with colored insulating grade high density polyethylene or crystalline propylene/ethylene copolymer. The manufacturer shall have the option of using either of the above materials.

Identification of Pairs. The polyethylene or propylene copolymer compounds used for conductor insulation shall be colored so as to identify (1) the "tip" and "ring" conductor of each pair, and (2) each pair in the completed cable.

Standards of Color. The colors of insulated conductors supplied in accordance with this specification shall fall within the limits of standards of color as defined by the Munsell Color Notations specified in paragraph 4.031.

Twisting of Pairs. The insulated conductors shall be twisted into pairs.

In order to provide sufficiently high crosstalk losses at voice and carrier frequencies, the pair twists shall be designed to enable the cable to meet the pair-to-pair capacitance unbalance requirements and the crosstalk requirements.

Core Covering. The core shall consist of an inner jacket of polyethylene applied over the completed core, a metal shield, and an outer jacket of polyethylene.

Shield. A gopher-resistant corrugated shield of fully annealed copper shall be applied longitudinally over the inner jacket. The shield shall completely cover the inner jacket and shall be so constructed that the completed cable shall meet the bending requirements given in paragraph 9 of Rural Electrification Specification PE-54. The shield shall provide 100% electrical shielding plus resistance to gopher attack or other severe service conditions.

Mutual Capacitance. The average mutual capacitance of all pairs in any reel shall be in accordance with the following table:

<u>Number of Cable Pairs</u>	<u>Average Mutual Capacitance mf/mile (mf/km)</u>
3	0.083 plus or minus 0.010 (0.052 plus or minus 0.006)
6, 12	0.083 plus or minus 0.007 (0.052 plus or minus 0.004)
18 or more	0.083 plus or minus 0.004 (0.052 plus or minus 0.002)

Mutual capacitance is the effective capacitance between the two wires of a pair.

Capacitance Unbalance. (Pair to Pair): Pair-to-pair capacitance unbalances as measured on the completed cable at a frequency of 1000 plus or minus 100 Hz shall not exceed the following values:

	Pair-to-Pair Capacitance Unbalance (Max)
Number of	mmf/kf (mmf/km)
<u>Cable Pairs</u>	<u>Max. Individual</u>
Less than 12	100 (181.1)

Capacitance Unbalance. - (Crosstalk Loss): The r.m.s. output-to-output far-end crosstalk loss as measured on the completed cable at a frequency of 150 kHz shall be not less than 73 db per 1,000 feet (67.8 db per kilometer) for cable sizes of 6 pairs and larger. The r.m.s. calculation shall be based on the combined total of all adjacent and alternate pair combinations within the same layer and center to first layer pair combinations.

Capacitance Unbalance. - (Pair to Shield): Pair-to-shield direct capacitance unbalances as measured on the completed cable at a frequency of 1000 plus or minus 100 Hz shall not exceed the following values:

	Pair-to-Shield Capacitance Unbalance (Max)
Number of	mmf/kf (mmf/km)
<u>Cable Pairs</u>	<u>Max. Individual</u>
Less than 12	250 (820)

Conductor Resistance. The d.c. resistance of any conductor as measured on the completed cable shall not exceed the following values when measured at or corrected to 20° C.

	Maximum Resistance
<u>AWG</u>	<u>ohms/kf (ohms/km)</u>
19	8.7 (28.5)

Basis Of Payment. This work will be paid for at the contract price per lineal meter (foot) for ELECTRIC CABLE IN CONDUIT, NO. 19 of the number of conductors specified, which price or prices shall be payment in full for furnishing all materials, making all electrical connection and installing the cable in place.

FIBER OPTIC CABLE

Description Under these items, the Contractor shall furnish and install loose-tube, single-mode, fiber optic cable of the number of fibers specified as shown in the plans and as directed by the Engineer.

Other ancillary components, required to complete the fiber optic cable plant, including but not limited to, moisture and water sealants, cable caps, fan-out kits, etc., shall be supplied under these items for fiber optic cable and will not be paid for separately.

Materials The single-mode, fiber optic cable shall incorporate a loose, buffer-tube design. The cable shall be qualified to the requirements of RUS 7 CFR1755.900 (PE-90) for a single sheathed, non-armored cable, and shall be new, unused and of current design and manufacture.

The cables shall use dispersion unshifted fibers. The optical and physical characteristics of the un-cabled fibers shall include:

- Core Diameter 8.3 μm (nominal)
- Numerical Aperture 0.14
- Zero Dispersion Wavelength 1300-1322 nm
- Zero Dispersion Slope 0.092 ps/(nm²*km) (maximum)
- Cladding Diameter 125.0 \pm 0.7 μm
- Core-Clad Concentricity 0.05 μm maximum
- Cladding Non-Circularity 1% maximum
- Coating Diameter 245 \pm 10 μm
- Coating-Cladding Concentricity 12 μm maximum
- Mode Field Diameter 9.2 μm \pm 0.4 μm at 1310nm
- Mode Field Diameter 10.4 μm \pm 0.5 μm at 1550nm
- Dispersion 18.0 ps/(nm*km) maximum at 1550nm

The number of fibers in each cable shall be as specified on the plans.

For cables with more than 12 fibers, the core construction shall consist of individual buffer tubes, each containing 12 fibers. These buffer tubes shall be stranded around a dielectric central strength member using a reverse oscillation process. For cables containing 12 fibers or less, the core shall use a unitube construction with either 6 or 12 fibers in a single tube.

The maximum attenuation of any cabled fiber shall not exceed 0.4 dB/km at 1310 nm and shall not exceed 0.3 dB/km at 1550 nm.

The cable shall be capable of withstanding a minimum-bending radius of 20 times its outer diameter during installation and 10 times its outer diameter during operation without changing the characteristics of the optical fibers.

The cable shall meet all of specified requirements under the following conditions:

- Shipping/storage temperature: -58° F to +158° F (-50° C to +70° C)
- Installation temperature: -22° F to +158° F (-30° C to +70° C)
- Operating temperature: -40° F to +158° F (-40° C to +70° C)
- Relative humidity from 0% to 95%, non-condensing

Optical Patch Cords and Pigtails

The optical patch cords and pigtails shall comply with the following:

- The optical patch cords furnished under this contract shall consist of a section of single fiber, jacketed cable equipped with optical connectors at both ends.

- The factory installed connector furnished as part of the optical patch cords and pigtails shall meet or exceed the requirements for approved 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 twelve fiber single-mode fiber optic cable shall be installed as a pigtail with factory installed ST compatible connectors.
- The patch cords shall comply with Telcordia GR-326-CORE

Connectors

The optical connectors shall comply with the following:

- All connectors will be factory installed ST compatible connectors. Field installed connectors shall not be allowed.
- Maximum attenuation 0.4dB, typical 0.2dB.
- No more than 0.2dB increase in attenuation after 1000 insertions.
- Attenuation of all connectors will be checked and recorded at the time of installation with an insertion test minimum 5 times checked with an OTDR.
- All fibers shall be connectorized at each end.
- All fibers shall terminate at a fiber patch panel
- Unused fibers will be protected with a plastic cap to eliminate dust and moisture.
- Termination shall be facilitated by splicing factory OEM pigtails on the end of the bare fiber utilizing the fusion splicing method. Pigtails shall be one meter in length.

CONSTRUCTION REQUIREMENTS

Experience Requirements.

Personnel involved in the installation, splicing and testing of the fiber optic cables shall meet the following requirements:

- A minimum of three (3) years experience in the installation of fiber optic cables, including fusion splicing, terminating and testing single mode fibers.
- Install two systems where fiber optic cables are outdoors in conduit and where the systems have been in continuous satisfactory operation for at least two years. The Contractor shall submit as proof, photographs or other supporting documents, and the names, addresses and telephone numbers of the operating personnel who can be contacted regarding the installed fiber optic systems.
- One fiber optic cable system (which may be one of the two in the preceding paragraph), which the Contractor can arrange for demonstration to the Department representatives and the Engineer.

Installers shall be familiar with the cable manufacturer's recommended procedures for installing the cable. This shall include knowledge of splicing procedures for the fusion splicer being used on this project and knowledge of all hardware such as breakout (furcation) kits and splice closures. The Contractor shall submit documented procedures to the Engineer for approval and to be used by Construction inspectors.

Personnel involved in testing shall have been trained by the manufacturer of the fiber optic cable test equipment to be used, in fiber optic cable testing procedures. Proof of this training shall be submitted to the Engineer for approval. In addition, the Contractor shall submit documentation of the testing procedures for approval by the Engineer.

Installation in Conduit.

The Contractor shall provide a cable-pulling plan, identifying where the cable will enter the underground system and the direction of pull. This plan will address locations where the cable is pulled out of a handhole, coiled in a figure eight, and pulled back into the hand hole. The plan shall address the physical protection of the cable during installation and during periods of downtime. The cable-pulling plan shall be provided to the Engineer for approval a minimum of 10 working days prior to the start of installation. The Engineer's approval shall be for the operation on the freeway and does not include an endorsement of the proposed procedures. The Contractor is responsible for the technical adequacy of the proposed procedures.

During cable pulling operations, the Contractor shall ensure that the minimum bending of the cable is maintained during the unreeling and pulling operations. Entry guide chutes shall be used to guide the cable into the handhole conduit ports. Lubricating compound shall be used to minimize friction. Corner rollers (wheels), if used, shall not have radii less than the minimum installation-bending radius of the cable. A series array of smaller wheels can be used for accomplishing the bend if the cable manufacturers specifically approve the array.

The pulling tension shall be continuously measured and shall not be allowed to exceed the maximum tension specified by the manufacturer of the cable. Fuse links and breaks can be used to ensure that the cable tensile strength is not exceeded. The pulling system shall have an audible alarm that sounds whenever a pre-selected tension level is reached. Tension levels shall be recorded continuously and shall be given to the Engineer upon request.

The number of handholes and their locations shall be as shown on the Plans.

The cable shall be pulled into the conduit as a single component, absorbing the pulling force in all tension elements. The central strength member and Aramid yarn shall be attached directly to the pulling eye during cable pulling. "Basket grip" or "Chinese-finger type" attachments, which only attach to the cable's outer jacket, shall not be permitted. A breakaway swivel, rated at 95% of the cable manufacturer's approved maximum tensile loading, shall be used on all pulls. When simultaneously pulling fiber optic cable with other cables, separate grooved rollers shall be used for each cable.

To minimize the exposure of the backbone cable and to facilitate the longer lengths of fiber optic cable, the Contractor shall use a "blown cable" (pneumatically assisted) technique to place the fiber optic cable.

Construction Documentation Requirements

Installation Practices for Outdoor Fiber Optic Cable Systems

The Contractor shall examine the proposed cable plant design. At least one month prior to starting installation of the fiber optic cable plant, the Contractor shall prepare and submit to the Engineer for review and approval, ten (10) copies of the Contractor's "Installation Practices for Outdoor Fiber Optic Cable Systems" manual. This manual shall address the Contractor's proposed practices covering all aspects of the fiber optic cable plant. This submittal shall include all proposed procedures, list of installation equipment, and splicing and test equipment. Test and quality control procedures shall be detailed as well as procedures for corrective action.

Operation and Maintenance Documentation

After the fiber optic cable plant has been installed, ten (10) complete sets of Operation and Maintenance Documentation shall be provided. The documentation shall, as a minimum, include the following:

- Complete and accurate as-built diagrams showing the entire fiber optic cable plant including locations of all splices.
- Final copies of all approved test procedures
- Complete performance data of the cable plant showing the losses at each splice location and each terminal connector.
- Complete parts list including names of vendors.

Testing Requirements

The Contractor shall submit detailed test procedures for approval by the Engineer. All fibers shall be tested bi-directionally at both 1310 nm and 1550 nm with both an Optical Time Domain Reflectometer (OTDR) and a power meter and optical source. For testing, intermediate breakout fibers may be concatenated and tested end-to-end. Any discrepancies between the measured results and these specifications will be resolved to the satisfaction of the Engineer.

The Contractor shall provide the date, time and location of any tests required by this specification to the Engineer at least 5 days before performing the test. Upon completion of the cable installation, splicing, and termination, the Contractor shall test all fibers for continuity, events above 0.1 dB, and total attenuation of the cable. The test procedure shall be as follows:

A Certified Technician utilizing an Optical Time Domain Reflectometer (OTDR) and Optical Source/Power Meter shall conduct the installation test. The Technician is directed to conduct the test using the standard operating procedures defined by the manufacturer of the test equipment. All fibers installed shall be tested in both directions.

The method of connectivity between the OTDR and the cable shall be a factory patch cord of a length equal to the "dead zone" of the OTDR. Optionally, the Technician can use a factory "fiber box" of 328 ft (100 m) minimum with no splices within the box. The tests shall be conducted at 1310 and 1550 nm for all fibers.

At the completion of the test, the Contractor shall provide two copies of documentation of the test results to the Project Engineer. The test documentation shall be submitted as both a bound copy and a CDROM and shall include the following:

Cable & Fiber Identification:

- Cable ID
- Cable Location - beginning and end point
- Fiber ID, including tube and fiber color
- Operator Name
- Date & Time
- Setup Parameters
- Wavelength
- Pulse width (OTDR)
- Refractory index (OTDR)
- Range (OTDR)
- Scale (OTDR)
- Setup Option chosen to pass OTDR "dead zone"

Test Results:

- A. OTDR Test
 - Total Fiber Trace
 - Splice Loss/Gain
 - Events > 0.10 dB
 - Measured Length (Cable Marking)
 - Total Length (OTDR)

The OTDR test results file format must be Bellcore/Telcordia compliant according to GR-196-CORE Issue 2, OTDR Data Standard.

- GR 196, Revision 1.0
- GR 196, Revision 1.1
- GR 196, Revision 2.0 (SR-4731)

- B. Optical Source/Power Meter
 - Total Attenuation
 - Attenuation (dB/km)

These results shall be provided in tabular form. The following shall be the criteria for the acceptance of the cable:

The test results shall show that the dB/km loss does not exceed +3% of the factory test or 1% of the cable's published production loss. However, no event shall exceed 0.10 dB. If any event is detected above 0.10 dB, the Contractor shall replace or repair the fiber including that event point.

The total loss of the cable (dB), less events, shall not exceed the manufacturer's production specifications as follows: 0.5 dB/km at both 1310 and 1550 nm.

If the total loss exceeds these specifications, the Contractor shall replace or repair that cable run at the Contractor's expense, both labor and materials. Elevated attenuation due to exceeding the pulling tension during installation shall require the replacement of the cable run at the Contractor's expense, including labor and materials.

Label the destination of each trunk cable onto the cable in each handhole, vault or cable termination panel.

Splicing Requirements

Splices shall be made at locations shown on the Plans. Any other splices shall be permitted only with the approval of the Engineer.

All optical fibers shall be spliced as indicated on the Plans. If no information is provided, mainline splices will concatenate the fibers from the two cable segments, that is, the colors of the buffer tubes and fibers shall be the same across the splice. For splices that breakout the individual fibers, the fibers shall be spliced in accordance with the Plans.

Slack Storage of Fiber Optic Cables.

As part of these items, slack fiber shall be supplied as necessary to allow splicing the fiber optic cables in a controlled environment, such as a splicing van or tent. After splicing has been completed, the slack fiber shall be stored underground in handholes or in the raised base adapters of ground mounted traffic controller cabinets.

Where identified on the plans, or as directed by the Engineer, additional lengths of fiber shall be stored, as maintenance coils. The aggregate lengths of the maintenance coils and the slack fiber will be used to repair and maintain the fiber optic cable.

Fiber optic cable shall be tagged inside handholes with yellow tape containing the text: "CAUTION - FIBER OPTIC CABLE." In addition, permanent tags, as approved by the engineer, shall be attached to all cable in a hand hole or other break-out environment. These tags shall be stainless steel, nominally 0.75" by 1.72", and permanently embossed. These tags shall be attached with stainless steel straps, and shall identify the cable number, the number of fibers, and the specific fiber count. Tags and straps shall be Panduit or approved equal.

Method of Measurement The fiber optic cable of the number of fibers specified will be measured for payment as the number of linear feet (meters) of cable, including lengths stored as splicing slack and maintenance coils, actually furnished installed and tested.

Basis of Payment FIBER OPTIC CABLE of the number of fibers specified shall be paid for at the contract unit price per foot, which cost shall include the cost of furnishing all labor, material, documentation, tools and equipment to install and test the fiber optic cable.

Fiber optic termination panels, splice closures, connectors, splice vaults and handholes will be supplied and paid for under other contract items.

(EK – 11/29/2004)

FIBER OPTIC TERMINATION PANEL, 12F

Description. Work under this item shall consist of furnishing and installing a fiber optic termination panel, type and size as specified on the plans and described herein. This equipment will be used to link field equipment using single-mode fiber optic cable.

Materials. The fiber optic termination panel shall comply with the following requirements:

- The fiber optic termination panel shall be rack mountable.
- The fiber patch panel shall terminate twelve (12) pigtail fibers as called out on the Plans.
- The fiber optic termination panel shall allow termination of a fiber patch cord to interconnect outside plant fibers to fiber optic communication equipment.
- 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 fibers with the optical connectors on the pigtail cable shall be routed through and secured in the fiber optic termination panel as directed by and to the satisfaction of the Engineer.
- The bulkheads or single-mode adapter types shall be single-mode ST compatible, ceramic, unless a substitute is approved by the Engineer.

CONSTRUCTION REQUIREMENTS

The Fiber Optic Termination Panel shall be installed in the surveillance cabinets as specified on the Plans. The panels shall come with cable strain relief hardware and pull out label for administrative documentation. All work shall be neat and in a workmanlike manner. Particular care shall be taken as to not crush or kink the fiber optic cable. If in the opinion of the Engineer the cable has been crushed or kinked, the entire cable span shall be removed and replaced at the Contractor's expense.

The approved type of single-mode connectors on the end of each pigtail must screw into a sleeve securely mounted to the termination panel within the fiber termination panel enclosure. The panel must be provided with pre-connectorized and pre-wired port modules.

Basis of Payment. FIBER OPTIC TERMINATION PANEL, 12F will be paid for at the Contract unit price each. This price shall be payment for furnishing and installing the FIBER OPTIC TERMINATION PANEL, 12F along with any necessary fiber optic patch cords and any other materials, hardware, and labor necessary to complete the installation.

FIBER OPTIC SPLICE

Description. The Contractor will splice optical fibers from different cable sheaths and protect them with a splice closure at the locations shown on the Plans. Fiber splicing consists of in-line fusion splices for all fibers described in the cable plan at the particular location.

Two splices are identified. A mainline splice includes all fibers in the cable sheath. In a lateral splice, the buffer tubes in the mainline cable are dressed out and those fibers identified on the plans are accessed in and spliced to lateral cables.

Materials.

Splice Closures. Splice Closures shall be designed for use under the most severe conditions such as moisture, vibration, impact, cable stress and flex temperature extremes as demonstrated by successfully passing the factory test procedures and minimum specifications listed below:

Physical Requirements. The closures shall provide ingress for up to four cables in a butt configuration. The closure shall prevent the intrusion of water without the use of encapsulates.

The closure shall be capable of accommodating splice organizer trays that accept mechanical, or fusion splices. The splice closure shall have provisions for storing fiber splices in an orderly manner, mountings for splice organizer assemblies, and space for excess or un-spliced fiber. Splice organizers shall be re-enterable. The splice case shall be UL rated.

Closure re-entry and subsequent reassembly shall not require specialized tools or equipment. Further, these operations shall not require the use of additional parts.

The splice closure shall have provisions for controlling the bend radius of individual fibers to a minimum of 38 mm (1.5 in.).

Factory Testing.

Compression Test. The closure shall not deform more than 10% in its largest cross-sectional dimension when subjected to a uniformly distributed load of 1335 N at temperatures of –18 and 38 degrees Celsius (0 and 100 degrees Fahrenheit). The test shall be performed after stabilizing at the required temperature for a minimum of two hours. It shall consist of placing an assembled closure between two flat parallel surfaces, with the longest closure dimension parallel to the surfaces. The weight shall be placed on the upper surface for a minimum of 15 minutes. The measurement shall then be taken with weight in place.

Impact Test. The assembled closure shall be capable of withstanding an impact of 28 N-M at temperatures of –18 and 38 degrees Celsius (0 and 100 degrees Fahrenheit). The test shall be performed after stabilizing the closure at the required temperature for a minimum of 2 hours. The test fixture shall consist of 9 kg (20 lb) cylindrical steel impacting head with a 50 mm (2 in.) spherical radius at the point where it contacts the closure. It shall be dropped from a height of 305 mm (12 in.). The closure shall not exhibit any cracks or fractures to the housing that would preclude it from passing the water immersion test. There shall be no permanent deformation to the original diameter or characteristic vertical dimension by more than 5%.

Cable Gripping and Sealing Testing. The cable gripping and sealing hardware shall not cause an increase in fiber attenuation in excess of 0.05 dB/fiber @ 1550 nm when attached to the cables and the closure assembly. The test shall consist of measurements from six fibers, one from each buffer tube or channel, or randomly selected in the case of a single fiber bundle. The measurements shall be taken from the test fibers before and after assembly to determine the effects of the cable gripping and sealing hardware on the optical transmission of the fibers.

Vibration Test. The splice organizers shall securely hold the fiber splices and store the excess fiber. The fiber splice organizers and splice retaining hardware shall be tested per EIA Standard FOTP-II, Test Condition 1. The individual fibers shall not show an increase in attenuation in excess of 0.1 dB/fiber.

Water Immersion Test. The closure shall be capable of preventing a 3 m (10 ft) water head from intruding into the splice compartment for a period of 7 days. Testing of the splice closure is to be accomplished by the placing of the closure into a pressure vessel and filling the vessel with tap water to cover the closure. Apply continuous pressure to the vessel to maintain a hydrostatic head equivalent 3 m (10 ft) on the closure and cable. This process shall be continued for 30 days. Remove the closure and open to check for the presence of water. Any intrusion of water in the compartment containing the splices constitutes a failure.

Certification. It is the responsibility of the Contractor to insure that either the manufacturer, or an independent testing laboratory has performed all of the above tests, and the appropriate documentation has been submitted to the Department. Manufacturer certification is required for the model(s) of closure supplied. It is not necessary to subject each supplied closure to the actual tests described herein.

CONSTRUCTION REQUIREMENTS

The closure shall be installed according to the manufacturer's recommended guidelines. For mainline splices, the cables shall be fusion spliced. 45 days prior to start of the fiber optic cabling installation, the Contractor shall submit the proposed locations of the mainline splice points for review by the Department.

The Contractor shall prepare the cables and fibers in accordance with the closure and cable manufacturers' installation practices. A copy of these practices shall be provided to the Engineer 21 days prior to splicing operations.

Using a fusion splicer, the Contractor shall optimize the alignment of the fibers and fuse them together. The Contractor shall recoat the fused fibers and install mechanical protection over them.

Upon completing all splicing operations for a cable span, the Contractor shall measure the mean bi-directional loss at each splice using an Optical Time Domain Reflectometer. This loss shall not exceed 0.1 dB.

The Contractor shall measure the end-to-end attenuation of each fiber, from connector to connector, using an optical power meter and source. This loss shall be measured at from both directions and shall not exceed 0.5 dB per installed kilometer of single mode cable. Measurements shall be made at both 1300 and 1550 nm for single mode cable. For multimode cable, power meter measurements shall be made at 850 and 1300 nm. The end-to-end attenuation shall not exceed 3.8 dB/installed kilometers at 850nm or 1.8 dB per installed kilometer at 1300nm for multimode fibers.

As directed by the Engineer, the Contractor at no additional cost to the Department shall replace any cable splice not satisfying the required objectives.

The Contractor shall secure the Splice Closure to the side of the splice facility using cable support brackets. All cables shall be properly dressed and secured to rails or racks within the manhole. No cables or enclosures will be permitted to lie on the floor of the splice facility. Cables that are spliced inside a building will be secured to the equipment racks or walls as appropriate and indicated on the Plans.

Method of Measurement. Fiber optic splice of the type specified will be measured as a unit, completely installed and tested with all necessary splices completed within the closure, and the closure secured to the wall of the splice facility.

Basis of Payment. FIBER OPTIC SPLICE, LATERAL and FIBER OPTIC SPLICE, MAINLINE of the type specified, measured as provided above, will be paid for at the Contract unit price each, which price shall be payment in full for furnishing and installing the splices and enclosures, including all labor, tools, equipment, and incidentals necessary to complete the work.
(EK – 08/30/2004)

PULLING PEDESTAL

Effective Date: December 18, 2003

Description. This work shall consist of furnishing and installing a pulling pedestal as specified.

Materials. Materials shall be in accordance with Articles 1020 and 1075.02 of the Standard Specifications for Road and Bridge Construction.

The pulling pedestal shall be a 12 gauge Type 304 or Type 316L stainless steel two-door single-access NEMA Type 4X enclosure with nominal outside dimensions of 62 inches high x 48 inches wide x 12 inches deep. The pulling pedestal shall consist of the a back panel with nominal dimensions of 56 inches high x 44 inches high which shall be drilled and tapped for front mounting of the equipment as shown on the plans. The panel shall be easily installed and removed from the front of the cabinet. The door shall be constructed from the same material and thickness as the enclosure. The door shall be equipped with a three point latching mechanism with nylon rollers at the top and bottom. The door shall have a hasp and staple for padlocking. The door shall be sealed with an oil-resistant gasket attached with oil-resistant adhesive and held in place with stainless steel retaining strips. The door hinge shall be a heavy gauge stainless steel continuous hinge. The hinge shall be secured with stainless steel carriage bolts and stainless steel nuts and locknuts. The pulling pedestal shall be equipped with ground studs in the body of the enclosure suitable for installation of a 2/0 ground wire. Twelve-inch base stands shall be welded to the bottom of enclosure. All external hardware shall be manufactured of Type 316 stainless steel. The pulling pedestal shall provide protection against corrosion, windblown dust and rain, splashing water, and shall be undamaged by the formation of ice on the enclosure.

The pulling pedestal shall be prepared inside and outside before painting, or as otherwise recommended by the paint manufacturer and approved by the Engineer. The cabinet shall then receive two sprayed coats of white polyamide epoxy primer with a corrosion inhibitor applied inside and outside to all surfaces. The primer shall have a solid content by volume of not less than 65 percent \pm 3 percent and each coat shall be applied to a thickness of 75-125 μ m (3-5 mil). The interior and exterior, (all surfaces), shall then receive one final coat of silicone alkyd

enamel paint. The finish paint shall be applied to a thickness of 40-60 μm (1.5-2.5 mils). The color of the finish paint shall meet ANSI standards No. 70 Sky Gray. The finish shall be applied according to the paint manufacturer's recommendations. The manufacturer shall certify, in writing that the finish has been applied properly.

CONSTRUCTION REQUIREMENTS

Concrete shall be cast in place. The pulling pedestal assembly shall be anchored to the concrete foundation using 12-inch base stands welded to the bottom of enclosure as shown on the plans.

Two stainless steel sleeves shall enter the base of the pulling pedestal at a 45° angle as shown on the plans.

The pulling pedestal shall be grounded according to Article 1087.02 of the Standard Specifications for Road and Bridge Construction.

Method of Measurement. This item shall be measured in units of each for PULLING PEDESTAL installed.

Basis of Payment. This work will be paid for at the Contract unit price each for PULLING PEDESTAL. The cost of the ground rod will be included in the cost of the pulling pedestal.

(EK – 10/16/2004)

CONCRETE FOUNDATION, TYPE 2

Description. Concrete foundations shall be constructed to support pulling pedestals (Type 2 foundations) at locations as indicated on the Plans. This work shall include installing any necessary hardware (entering conduits, bolts, anchor rods, grounding, etc.) as shown on the Plans. This work shall also include any topsoil, fertilizing, seeding, and mulching of the distributed areas in accordance with Sections 211, 250, and 251 of the Standard Specifications.

Materials. Type 2 concrete foundations shall be according to materials defined in Article 836.02 of Section 836 of the Standard Specifications. All anchor bolts shall be in accordance with Section 1006.09 of the Standard Specifications except that all anchor bolts shall be hot dipped galvanized the full length of the anchor bolt including the hooks. Anchor bolts shall provide bolt spacing as shown in the Plans and as required by the cabinet manufacturer.

The Type 2 concrete foundations shall also be fabricated in accordance with Section 1070 of the Standard Specifications. These concrete foundations shall be fabricated from material new and unused in any previous application. The manufacturer shall provide a Certificate of Compliance that the materials are new and meet the specified requirements in accordance with the Standard Specifications and as shown on the Plans.

CONSTRUCTION REQUIREMENTS

The Engineer will determine the final placement of the Type 2 concrete foundations. Type 2 concrete foundation dimensions shall be in accordance with those dimensions shown in the Plans on the detail sheet "Pulling Pedestal Detail". The foundation shall be located as required in order to avoid existing and relocated utilities.

Anchor rods and ground rod shall be set in place before the concrete is deposited by means of a template constructed to space the anchor rods according to the pattern of the bolt holes in the base of the appurtenance to be attached. The appurtenance shall not be erected on the foundation until the bases have cured for at least (7) days. The Concrete shall cure according to Article 1020.13 of the Standard Specifications.

Method of Measurement. Concrete foundations shall be measured for payment in feet of the concrete foundation in-place installed in accordance with the total length of concrete foundation required for Type 2 foundations as indicated on the Plans and as directed by the Engineer. Extra foundation depth, beyond the directive of the Engineer, will not be measured for payment.

Basis of Payment. Payment will be paid for at the Contract unit price per feet (meter) of CONCRETE FOUNDATION, TYPE 2, of the diameter and length indicated. The price shall include payment in full for all necessary excavation, backfilling, disposal of unsuitable material, form work, furnishing, installing, and testing all materials (entering conduits, bolts, anchor rods, grounding, etc.) within the limits of the foundation. Any topsoil, fertilizing, seeding, and mulching of the distributed areas as well as all associated labor is to be included in this Contract unit price.

(EK - 03/19/2004)

CHAIN LINK FENCE TO BE REMOVED AND RE-ERECTED

Description. This item consists of removing, salvaging, safeguarding and re-erecting the same fence at the new location as shown on the plans, or as directed by the Engineer. Any new hardware fasteners, fence post foundations, anchors and incidentals necessary to re-erect the fence shall be included in the work.

Method of Measurement. This work will be measured in feet of existing fence, as it is installed in its new location.

Basis of Payment. This work will be paid for at the Contract unit price per foot for CHAIN LINK FENCE TO BE REMOVED AND RE-ERECTED, which price shall be payment in full for all materials, labor, tools, equipment and incidentals necessary to construct the work as specified.

CHAIN LINK FENCE REMOVAL

Description. This work consists of the removal and satisfactory disposal of existing chain link fence at the locations shown on the plans or as directed by the Engineer. This work shall be performed in accordance with the applicable portions of Section 201 of the Standard Specifications and as herein specified.

General. The chain link fence to be removed is approximately 4 feet in height with the posts set in concrete. Removal shall include posts, fence fabric, fittings, appurtenances, attachments and concrete foundation. Any holes created by removal of the foundation shall be filled with suitable material to eliminate any hazard to the public.

Any signs mounted on the fence shall be removed, stored and re-erected in accordance with Article 107.25.

Disposal of removed materials shall be in accordance with Article 202.03.

Method of Measurement. Chain link fence removal shall be measured in linear feet along the top of the fence.

Basis of Payment. This work will be paid for at the Contract unit price per foot for CHAIN LINK FENCE REMOVAL, which price shall be payment in full for all labor, tools, equipment and materials necessary to remove and dispose of existing chain link fence as herein specified. (TYLIN – 08/27/2004)

SEDIMENT CONTROL, DRAINAGE STRUCTURE INLET FILTER CLEANING

Description. This work shall consist of cleaning sediment out of a drainage structure inlet filter when directed by the Engineer. This cleaning work is to be periodically performed as directed by the Engineer, for the duration of the use of each drainage structure inlet filter assembly. The Engineer will be sole judge of the need for cleaning, based on the rate that debris and silt is collected at each inlet filter location.

Cleaning of the inlet filter shall consist of inspecting, cleaning (includes removal and proper disposal of debris and silt that has accumulated in the filter bag), by vactoring, removing and dumping or any other method approved by the Engineer.

Method of Measurement. Cleaning of the drainage structure inlet filter shall be measured for payment each time that the cleaning work is performed at each of the drainage structure inlet filter locations.

Basis of Payment. The work will be paid for at the Contract unit price per each for SEDIMENT CONTROL, DRAINAGE STRUCTURE INLET FILTER CLEANING, which price shall include all costs for labor, materials, equipment, and incidentals necessary to perform the work. (TYLIN – 08/27/2004)

TEMPORARY CHAIN LINK FENCE

Description. This item consists of constructing a chain link fence 6 feet high and any gates as necessary, as shown on the plans or as directed by the Engineer. This work shall be performed in accordance with Section 664 of the Standard Specifications, except as herein modified.

Upon completion of the project or as directed by the Engineer, the fence, gates, posts, and all other fence hardware shall be removed from the job site and become the property of the Contractor. The salvage value of the fence shall be reflected in the Contract unit price. All postholes shall be filled and compacted with a material similar to the surrounding material, or as directed by the Engineer.

This item shall also include any work necessary to remove and relocate fencing as shown on the plans or as directed by the Engineer for the purposes of staged construction at multiple, different work site locations. Upon completion of the work at a particular location and when

directed by the Engineer to be removed, the temporary fencing shall be relocated to a new location as directed by the Engineer. Any new hardware fasteners, fence post foundations, anchors and incidentals necessary to re-erect the fence shall be included in the work. Relocation of temporary chain link fence shall not be paid for separately, but shall be included in the Contract unit price of this item.

Method of Measurement. Temporary chain link fence shall be measured per foot along the top of the fence, from end post to end post. Any gates within the fence shall be measured as a length of fence. Gates shall not be paid for separately.

Basis of Payment. This work will be paid for at the Contract unit price per foot for TEMPORARY CHAIN LINK FENCE, which price shall be payment in full for all materials, labor, tools, equipment and incidentals necessary to construct the work as specified, including furnishing, placing, maintaining, relocating and removing the fence during staged construction.
(TYLIN – 08/27/2004)

FURNISH TEMPORARY CONCRETE BARRIER

Description. This work shall consist of furnishing and placing temporary concrete barrier at locations shown on the plans or as directed by the Engineer. This work shall be performed, measured and paid for in accordance with Section 704 of the Standard Specifications with the following revisions:

“704.03 General. The temporary concrete barrier will remain after the Contract is complete, at the locations shown on the plans.”

Basis of Payment. Temporary concrete barrier as specified herein will be paid for at the Contract unit price per foot for FURNISH TEMPORARY CONCRETE BARRIER.
(TYLIN – 06/08/2004)

CONCRETE BARRIER REMOVAL

Description. This work consists of the removal and satisfactory disposal of portions of the existing concrete barrier at the locations shown on the plans or as directed by the Engineer. This work shall be performed in accordance with the applicable portions of Sections 202 and 501 of the Standard Specifications, the details in the plans and as herein specified.

CONSTRUCTION REQUIREMENTS

Concrete barrier removal shall be in accordance with the applicable portions of Article 501.03. A typical detail of the existing single face barrier wall is provided in the plans.

The portion to be removed shall be disposed of in accordance with Article 202.03.

Method of Measurement. Concrete barrier removal shall be measured in linear feet along the top of the barrier.

Basis of Payment. This work shall be paid for at the Contract unit price per foot, for CONCRETE BARRIER REMOVAL, which price shall be payment in full for all labor, tools, equipment and materials necessary to remove and dispose of the concrete barrier as specified herein.

RUSTICATION FINISH FOR RETAINING WALLS

Effective Date: May 1, 1990

Revised Date: February 19, 2004

Description. This work consists of providing the forms, materials and rusticated finish on retaining walls, in accordance with the details shown in the plans and the Special Provisions.

Materials. Materials shall conform to Article 503.02; of the Standard Specification and includes the following:

The coarse aggregate to be used in the concrete for the rustication finish shall conform to the requirements for coarse aggregate in concrete superstructure.

CONSTRUCTION REQUIREMENTS

Forms shall be constructed so that the completed concrete structures conform to the shape, lines and dimensions of the members as shown on the plans. Forms shall be properly braced or tied together to maintain position and shape. Forms shall be made sufficiently tight to prevent leakage of mortar.

Formliners shall be used to obtain the rustication finish on the retaining walls. Formwork shall have the strength and stability to ensure finished concrete dimensions within the tolerances specified herein. The quality of the formwork shall be maintained throughout the entire project.

Variations in dimensions for the wall sections with a rustication finish shall be within the following tolerances: the width and depth of rustication joints shall be within 3 mm (1/8 inch) + , the location of the rustication joints shall be within 13 mm (1/2 inch)+, the maximum variation of a joint from a straight line shall be 6 mm (1/4 inch)+ in 3 meters (10 feet).

The Contractor shall submit proposed construction procedures for the rustication finish on the outside face of retaining walls. The Contractor's method of obtaining the surface texture specified on the plans shall be subject to approval by the Engineer.

Upon approval of the construction procedures by the Engineer, the Contractor shall pour a 9 m (30 feet) long test section of retaining wall at a location directed by the Engineer. After removal of the formwork, the Engineer will examine the test section of the wall and instruct the Contractor if the rustication finish is acceptable or if future wall sections need further modifications. If necessary, the Contractor shall pour additional test sections of wall at locations designated by the Engineer until a wall section meets with the Engineer's approval. The rustication finish of all subsequently installed wall sections shall match the approved test section. The Contractor shall repair all deviations from the approved rustication finish to the satisfaction of the Engineer at no additional cost to the Contract.

The Contractor shall notify the Engineer at least 40 hours prior to placing concrete. Concrete shall not be placed until the Engineer has inspected the formwork and the placement of reinforcing bars for compliance with the plans.

Method of Measurement. Rustication finish will be measured in place and the area computed in square meters (square feet). The dimensions used to compute the area of rustication will be the dimensions indicated on the plans or directed by the Engineer of the outline of the plane area. Measurement will not be made on the actual surface area of rustication finish.

Basis of Payment. This work will be paid for at the Contract unit price per square meter (square foot) for RUSTICATION FINISH, which price includes all work as specified herein.

COMBINATION CONCRETE CURB AND GUTTER

Description. This work shall be constructed in accordance with Section 606 of the Standard Specifications, State Standard 606001, and to the lines, grades and cross section shown on the plans and as directed by the Engineer.

The curb height for Combination Concrete Curb and Gutter Type B-V.12 shall vary between 3 and 9 inches and shall match the existing profile of the curb removed for construction.

Measurement and Payment. The work will be measured for payment at the contract unit price per foot for COMBINATION CONCRETE CURB AND GUTTER, TYPE B-V.12, which price will be considered payment in full to perform the work as specified.

REMOVAL AND DISPOSAL OF UNSUITABLE MATERIALS

This work must consist of removing and disposing of unsuitable materials encountered during construction. This work will include but not be limited to the removal and disposal of the top 6 in. of topsoil encountered within the construction limits of this Contract as shown on the plans or directed by the engineer.

This work must be performed, measured and paid for in accordance with Article 202 of the Standard Specification.

(CTE – 03/26/2004)

NON-SPECIAL WASTE WORKING CONDITIONS

This work shall be according to Article 669 of the Standard Specifications for Road and Bridge Construction adopted January 1, 2002 and the following:

Qualifications. The term environmental firm shall mean an environmental firm with at least five (5) documented leaking underground storage tank (LUST) cleanups or that is prequalified in hazardous waste by the Department. Documentation includes but not limited to verifying remediation and special waste operations for sites contaminated with gasoline, diesel, or waste oil in accordance with all Federal, State, or local regulatory requirements and shall be provided to the Engineer for approval.

General. Implementation of this Special Provision will likely require the Contractor to subContract for the execution of certain activities. It will be the Contractor's responsibility to assess the working conditions and adjust anticipated production rates accordingly.

The Contractor shall manage all contaminated materials as non-special waste as previously identified. This work shall include monitoring and potential sampling, analytical testing, and management of petroleum contaminated material.

The Contractor shall excavate and dispose of any soil classified as a non-special waste as directed by this project or the Engineer. Any excavation or disposal beyond what is required by this project or the Engineer shall be at the Contractor's expense. The preliminary site investigation (PSI) report, available through the District's Environmental Studies Unit, estimated the excavation quantity of non-special waste at the following location. The information available at the time of plan preparation determined the limits of the contamination and the quantities estimated were based on soil excavation for construction purposes only. The lateral distance is measured from centerline and the farthest distance is the offset distance or construction limit which ever is less. The Environmental Firm shall continuously monitor for worker protection and the Contractor shall manage and dispose of all soils excavated within the following areas as classified below. Any soil samples or analysis without the approval of the Engineer shall be at the Contractor's expense.

Skyway Entrance Ramp to Northbound Dan Ryan

1. Station 4406+85 to Station 4411+20 0 to 70 feet RT (People's Energy – 38 West 64th Street). Contaminants of concern sampling parameters: PNAS, Priority Pollutants Pesticides, PCBs, and TCLP Lead.
2. Station 4406+85 to Station 4411+20 0 to 20 feet LT (People's Energy – 38 West 64th Street). Contaminants of concern sampling parameters: PNAS, Priority Pollutants Pesticides, PCBs, and TCLP Lead

Northbound Dan Ryan

1. Station 4585+00 to 4587+10. Depth 0 to 7 feet. Station 4587+10 to 4587+90. Depth 0 to 13 feet. Station 4587+90 to 4588+70. Depth 0 to 7 feet. From 36' RT. To 146' RT. (Former Industrial/UST Site). Contaminants of concern sampling parameters: PNAs and Priority Pollutants Pesticides.

Southbound Dan Ryan

1. Station 3588+20 to 3591+00, 36' LT. to 106' LT. Depth 0 to 7 feet. (Former Industrial/UST Site). Contaminants of concern sampling parameters: PNAs and Priority Pollutants Pesticides.
2. Station 3601+00 to 3604+00, 36' LT. to 116' LT. Depth 0 to 7 feet. (Former Industrial/UST Site). Contaminants of concern sampling parameters: PNAs and Priority Pollutants Pesticides.
3. Station 3627+30 to 3628+70, 36' LT to 136' LT. Depth 0 to 6 feet. (Former Industrial/UST Site). Contaminants of concern sampling parameters: PNAs and Priority Pollutants Pesticides.

KEEPING THE EXPRESSWAY OPEN TO TRAFFIC

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

The Contractor shall request and gain approval from the Illinois Department of Transportation's Expressway Traffic Operations Engineer (847-705-4155) twenty-four (24) hours in advance of all daily lane, ramp and shoulder closures and seventy-two (72) hours in advance of all permanent and weekend closures on all Freeways and/or Expressways in District One.

Partial ramp and shoulder closures (TC 17) will not be permitted on weekdays (Monday thru Friday) from 5:00 a.m. to 9:00 a.m. and from 3:00 p.m. to 7:00 p.m.

Lane closures in the Express lanes and Local lanes will not be permitted in the same direction at the same time unless approved by traffic as part of special traffic control detail at slip ramps. The Skyway ramps shall remain open at all times.

Stationary one and two lane closures will only be permitted during the hours listed below:

WEEK NIGHT	TYPE OF CLOSURE	ALLOWABLE LANE CLOSURE HOURS	
		INBOUND	OUTBOUND
Sunday thru Thursday	One Lane Two Lanes	8:00 PM – 5:00 AM 10:00 PM – 5:00 AM	9:00 PM – 6:00 AM 11:59 PM – 6:00 AM
Friday	One Lane Two Lanes	8:00 PM (Fri) – 6:00 AM (Sat) 11:00 PM (Fri) – 6:00 AM (Sat)	9:00 PM (Fri) – 7:00 AM (Sat) 11:59 PM (Fri) – 7:00 AM (Sat)
Saturday	One Lane Two Lanes	8:00 PM (Sat) – Noon (Sun) 11:00 PM (Sat) – 9:00 AM (Sun)	9:00 PM (Sat) – Noon (Sun) 11:59 PM (Sat) – 9:00 AM (Sun)

Full Expressway Closures will only be permitted for a maximum of 15 minutes at a time during the low traffic volume hours of 1:00 a.m. to 5:00 a.m. Monday thru Friday and from 1:00 a.m. to 7:00 a.m. on Sunday. During Full Expressway Closures, the Contractor will be required to close off all lanes except one. Police forces should be notified and requested to close off the remaining lane at which time the work item may be removed or set in place. The District One Traffic Operations Department shall be notified (847-705-4155) seventy-two (72) hours in advance of the proposed road closure and will coordinate the closure operations with police forces.

All stage changes requiring the stopping and/or the pacing of traffic shall take place during the allowable hours for Full Expressway Closures and shall be approved by the Department. All daily lane closures shall be removed during adverse weather conditions such as rain, snow, and/or fog and as determined by the Engineer.

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

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

The Contractor will be required to cooperate with all other Contractors when erecting lane closures on the expressway. All lane closures within one (1) mile of each other in one direction of the expressway shall be on the same side of the pavement and any lane closure within a half (1/2) mile of each other should be connected. The maximum length of any lane closure on the project and combined with any adjacent projects shall be three (3) miles. Gaps between successive permanent lane closures shall be no less than two (2) miles in length. Private vehicles shall not be parked in the work zone. Contractor's equipment and/or vehicles shall not be parked on the shoulders or in the median during non-working hours. The parking of equipment and/or vehicles on State right-of-way will only be permitted at the locations approved by the Engineer.

FAILURE TO OPEN TRAFFIC LANES TO TRAFFIC

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

One Lane Blocked = \$ 3,000.00

Two Lanes Blocked = \$ 5,000.00

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

TRAFFIC CONTROL AND PROTECTION (EXPRESSWAYS)

Effective Date: March 8, 1996 Revised Date: September 27, 2002

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

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

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

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

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

Exit Gore Signs. The exit gore signs as shown in Standard 701411 shall be a minimum size of 1.2m (48 inch) by 1.2m (48 inch) with 300mm (12 inch) capital letters and a 500mm (20inch) arrow.

Rough Grooved Surface Signs. The Contractor shall furnish and erect "Rough Grooved Surface" signs (W8-1107) on both sides of the expressway, 300m (1000') in advance of any milled area. These signs shall be erect on all ramps that enter the milled area. All signs shall be mounted at a minimum clearance height of 2.1m (7').

Drums/Barricades. Check barricades shall be placed in work areas perpendicular to traffic every 300m (1000'), one per lane and per shoulder, to prevent motorists from using work areas as a traveled way. Check barricades shall also be placed in advance of each open patch, or excavation, or any other hazard in the work area, the first at the edge of the open traffic lane and the second centered in the closed lane. Check barricades, either Type I or II, or drums shall be equipped with the flashing light.

To provide sufficient lane widths (3m [10'] minimum) for traffic and also working room, the Contractor shall furnish and install vertical barricades with steady burn lights, in lieu of Type II or drums, along the cold milling and asphalt paving operations. The vertical barricades shall be placed at the same spacing as the drums.

Vertical Barricades. Vertical barricades shall not be used in lane closure tapers, lane shifts, and exit ramp gores. Also, vertical barricades shall not be used as patch barricades or check barricades. Special attention shall be given, and ballast provided per manufacture's specification, to maintain the vertical barricades in an upright position and in proper alignment.

Temporary Concrete Barrier Wall. Prismatic barrier wall reflectors shall be installed on both the face of the wall next to traffic and the top of all temporary concrete barrier wall. These reflectors shall be placed at 50 foot centers along tangents and at 25 foot centers on curves. The color of these reflectors shall match the color of the edgelines (yellow on the left and crystal or white on the right). If the base of the temporary concrete barrier wall is 12 inches or less from the travel lane, then the wall shall also have a 6 inch wide temporary pavement marking edgeline (yellow on the left and white on the right).

Method of Measurement. This item of work will be measured on a lump sum basis for furnishing, installing, maintaining, replacing, relocating, and removing traffic control devices required in the plans and these Special Provisions. Traffic control and protection required under Standards 701101, 701400, 701401, 701411, 701426 and 701446 will be included with this item.

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

In the event the sum total value of all the work items for which traffic control and protection is required is increased or decreased by more than ten percent (10%), the Contract bid price for Traffic Control and Protection will be adjusted as follows:

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

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

$$\text{Where "X"} = \frac{\text{Difference between original and final sum total value of all work items for which traffic control and protection is required.}}{\text{Original sum total value of all work items for which traffic control and protection is required.}}$$

The value of the work items used in calculating the increase and decrease will include only items that have been added to or deducted from the Contract under Article 104.02 of the Standard Specifications and only items which require use of Traffic Control and Protection.

The Engineer may require additional traffic control be installed in accordance with standards and/or designs other than those included in the plans. In such cases, the standards and/or designs will be made available to the Contractor at least one week in advance of the change in traffic control. Payment for any additional traffic control required will be in accordance with Article 109.04 of the Standard Specifications.

Revisions in the phasing of construction or maintenance operations, requested by the Contractor, may require traffic control to be installed in accordance with standards and/or designs other than those included in the plans. Revisions or modifications to the traffic control shown in the Contract shall be submitted by the Contractor for approval by the Engineer. No additional payment will be made for a Contractor requested modification.

Temporary concrete barrier wall and end sections will be measured and paid for according to Section 704.

Sand module impact attenuators, temporary bridge rail, and temporary rumble strips will be paid for separately.

All temporary pavement markings will be measured and paid for according to Section 703 and Section 780.

All pavement marking removal will be measured and paid for according to Section 703 or Section 783.

Temporary pavement marking at the base of the temporary concrete barrier wall will be measured and paid for as TEMPORARY PAVEMENT MARKING, 6".

All prismatic barrier wall reflectors will be measured and paid for according to Section 782.

TRAFFIC CONTROL FOR WORK ZONE AREAS

Effective Date: September 14, 1995 Revised Date: January 30, 2003

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

The Contractor shall plan his trucking operations into and out of the work zone as well as on to and off the expressway to maintain adequate merging distance. Merging distances to cross all lanes of traffic shall be no less than 1/2 mile. This distance is the length from where the trucks enter the expressway to where the trucks enter the work zone. It is also the length from where the trucks exit the work zone to where the trucks exit the expressway. The stopping of expressway traffic to allow trucks to change lanes and/or cross the expressway is prohibited. Failure to comply with the above requirements will result in a Traffic Control Deficiency charge. The deficiency charge will be calculated as outlined in the special provision for "TRAFFIC CONTROL DEFICIENCY DEDUCTION". The Contractor will be assessed this daily charge for each day a deficiency is documented by the Engineer.

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 120 N. Racine Avenue Chicago, IL 60607-2010	M-F 382 trains/day at 55 M Sat 338 trains/day at 55 M Sun 356 trains/day at 55 MPH	0 0 0
For Freight/Passenger Information Contact:	<u>Marvin A. Watson</u>	Phone: <u>312-681-3860</u>
For Insurance Information Contact:	<u>Marvin A. Watson</u>	Phone: <u>312-681-3860</u>

For various locations within the Contract limits

<u>Named Insured & Address</u>	<u>Number & Speed of Passenger Trains</u>	<u>Number & Speed of Freight Trains</u>
Metra/ Metropolitan Rail; The Northeast Illinois Regional Commuter Railroad Corporation; The Commuter Rail Division 547 W. Jackson Boulevard Chicago, IL 60661	63 trains / day / 70 mph	8 trains / day / 40 mph

All three names need to be listed on insurance policies relative to METRA.

For Freight/Passenger Information Contact: Kerry Brunette Phone: 312-322-6991

For Insurance Information Contact: Kerry Brunette Phone: 312-322-6991

For Right-of-Entry And Flagman Requirements Tony Ognibene Phone: 312-322-8006

All sub-Contractors will need to call to obtain their own Right-of-Entry Agreements for Entry onto METRA property.

Right-of-Entry Agreement Contract Preparation Fee: \$600.

Flagman Cost / \$350/day.

Railroad Protective Liability Insurance: \$2,000,000 / occurrence; \$6,000,000 aggregate/occurrence

Workers Compensation Insurance: \$500,000 / occurrence
Commercial General Liability: \$5,000,000 / occurrence;
\$10,000,000 aggregate/occurrence

Automobile Liability: \$2,000,000 / occurrence.

For crossings @ STA. 2237+15 NB/STA.1237+00 SB and STA. NB/STA. 1 SB.

<u>Named Insured & Address</u>	<u>Number & Speed of Passenger Trains</u>	<u>Number & Speed of Freight Trains</u>
Norfolk Southern Railway Company Pennsylvania Lines L.L.C. 3 Commercial Place Norfolk, VA 23510-2191	20 trains / day / 70 mph	50 trains / day / 50 mph 70 trains / day @ 30 mph (STA. 2237+15 NB & STA. 1237+005B)

For Freight/Passenger Information
Contact: Tom Bracey Phone: 404-527-2536

David Fries,
Director Risk
Management
For Insurance Information Contact: Phone: 757-629-2701
Railroad Protective Liability Insurance: \$5,000,000/occurrence;
\$10,000,000 aggregate/occurrence

Flagman Cost / \$400 / 10 hour day.

CRL RR over Dan Ryan Expressway South of Pershing Rd.

<u>Named Insured & Address</u>	<u>Number & Speed of Passenger Trains</u>	<u>Number & Speed of Freight Trains</u>
Chicago RailLink Omni Trax, Inc. 252 Clayton Street, 4 th floor Denver, Colorado 80206	-0-	1 train / day @10mph

For Freight/Passenger Information
Contact: Lucky Mitchel Phone: 773-978-8637

For Insurance Information Contact: Lisa Gallovich Phone: 303-393-0033

For crossing at STA. 2238+00 NB/STA. 1238+00 SB

<u>Named Insured & Address</u>	<u>Number & Speed of Passenger Trains</u>	<u>Number & Speed of Freight Trains</u>
The Belt Railway Co. of Chicago 6900 S. Central Avenue Bedford Park, IL 60638	-0-	50 trains / day @ 25 mph

For Freight/Passenger Information
Contact: Tim Coffey Phone: 708-496-4112

For Insurance Information Contact: Roy Gelder Phone: 708-496-4041

For crossing at STA. 2236+65 NB/STA. 1236+45SB

<u>Named Insured & Address</u>	<u>Number & Speed of Passenger Trains</u>	<u>Number & Speed of Freight Trains</u>
Chicago RailLink 2728 E. 104 th St. Chicago, IL 60617	-0-	4 trains / day @10mph
For Freight/Passenger Information Contact:	Dave Sass	Phone: 773-721-4000
For Insurance Information Contact:	Dave Sass	Phone: 773-721-4000

For crossing at STA. 218+70 NB/STA. 116+75 SB

<u>Named Insured & Address</u>	<u>Number & Speed of Passenger Trains</u>	<u>Number & Speed of Freight Trains</u>
Union Pacific Railroad Insurance Group M/C 10049 1416 Dodge St. Omaha, NE 68179	-0-	36 trains / day @40mph
For Freight/Passenger Information Contact:	Tom Andryuk or Gary Wilwerding	312-496-4726 or Phone: 708-649-5210
For Insurance Information Contact:	Nancy Savage	Phone: 402-271-2215

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.

(CTE – 10/16/2004)

STORM WATER POLLUTION PREVENTION PLAN



Storm Water Pollution Prevention Plan

Route	I-90/94 Dan Ryan Expressway	Marked	Dan Ryan Expressway I-57 at Illinois Route 1 (Halsted St) & I-90 at MLK to 31st Street
Section	See individual Contract	Project No.	Various Contract Numbers – Refer to Attachment
County	Cook		

This plan has been prepared to comply with the provisions of the MSY-Phase II NPDES Permit Number ILR40, issued by the Illinois Environmental Protection Agency for storm water discharges.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature	Date
Title	

1. Site Description

- a. The following is a description of the construction activity which is the subject of this plan:

The project is located at Interstate 94 (the Dan Ryan Expressway) from the I-57 interchange to Illinois 1 (Halsted Street) to the west and Martin Luther King (MLK) Drive to the east, and continues in a northerly direction to 31st Street.

Construction Descriptions

The Dan Ryan Expressway project consists of roadway improvements including added lanes, mainline and shoulder reconstruction, construction of retaining walls, new collector-distributor roadways, new and relocated exit and entrance ramps, lighting, drainage, signing, and surveillance improvements.

The Dan Ryan Expressway reconstruction project was designed in three segments in Phase I. The three segments are described from south to north.

The segment from 95th to 67th Streets (U.S. Route 20 / 45), the improvement includes reconstruction of the eight traffic lanes of the existing Dan Ryan Expressway pavement, the addition of a through travel lane in each direction, and modifications to entrance and exit ramps. The improvement involves the addition of a through travel lane along both northbound and southbound Dan Ryan onto Interstate 57 to the interchange with Halsted Street (Illinois Route 1). There are intersection improvements at 79th Street.

The segment from 67th to 47th Street includes reconstruction of the existing northbound and southbound express lanes (four lanes in each direction) and local lanes (two lanes in each direction). The improvement will also provide for an additional through travel lane in each direction to the local traffic lanes, and modifications to all entrance and exit ramps. There are intersection improvements at 67th Street. Frontage roads will be reconstructed both northbound and southbound from 63rd to 47th Streets. Additional work will involve bridge construction and reconfiguration of the Chicago Skyway / Dan Ryan Expressway interchange to provide an additional entrance ramp from the Chicago Skyway to connect directly to the northbound Dan Ryan Expressway express lanes.

The scope of the roadway work between 47th and 31st Streets will include reconstruction of the existing northbound and southbound express lanes (four lanes in each direction) and local lanes (three lanes in each direction) to the Dan Ryan Expressway pavement, and the reconstruction and/or reconfiguration of entrance and exit ramps. The Root Street structure (41st Street) will be removed.

The drainage work consists of removing or abandoning the existing collector storm sewer system and surface water collection system and constructing a new collector storm sewer and surface water collection system. The existing main drain will remain in place and remain functional, with new connections for the proposed storm sewer system. New collector sewers to drain the area directly tributary to the Dan Ryan Expressway (CTA tracks, local lanes, and adjacent ramps and grass areas), and overflows from offsite tributary areas (frontage roads) are planned. Separate collector sewers are required to drain the northbound and southbound lanes of the Dan Ryan Expressway. These proposed collector sewers are to be designed to convey the 50-year storm event.

The work will include the construction of new retaining walls and the rehabilitation, and/or modifications of several existing retaining walls and any roadway and traffic signal improvements required at cross streets and alternate routes.

In addition, other improvements include:

- A new highway lighting system (110 foot towers with lights on 11-foot mounting rings).
- New expressway signing (provides four new and upgrade three changeable message signs).

- Replacement of traffic surveillance equipment with upgraded technology.
- Closed circuit television for traffic conditions and crash incident monitoring.
- Accident investigation sites.
- Other incidental work as required completing the reconstruction of this segment of the expressway to AASHTO and IDOT criteria.

The improvement will also consolidate several points of access and improve the unsafe weaving conditions created by the existing substandard weaving distances. Currently, ramps are spaced evenly at one-half mile increments, resulting in weaving distances in the range of 300 feet. This is a major safety concern and suspected cause for the high incidence of sideswipe collisions in the ramp influence areas. The proposed access consolidation plan improves many of the mainline weaving movements while minimally influencing the local access to the Dan Ryan Expressway through the addition of collector-distributor roadways and both entrance and exit ramp removals. The presence of parallel city street frontage roads facilitates local access without substantive changes in through and local travel patterns. The proposals for ramp closure are:

- Northbound (NB) exit and southbound (SB) entrance at 76th Street (2 ramps)
- Northbound (NB) and southbound (SB) exits and entrances at 59th Street (4 ramps)
- Northbound (NB) and southbound (SB) exits and entrances at 51st Street (4 ramps)
- Northbound (NB) exit and southbound (SB) entrance at 43rd Street (2 ramps)

Capacity analyses indicate unsatisfactory conditions at the intersections of 55th Street (Garfield Boulevard) / Wells Street and 55th Street (Garfield Boulevard) / Wentworth Avenue. The improvements necessary to make this interchange operate effectively require right-of-way acquisition from three separate parcels. The parcels on the southwest quadrant of 55th Street (Garfield Boulevard) / Wells Street is occupied by a "Mobil Service Station" in which a portion of each of the two parcels must be acquired to construct an eastbound to southbound right turn lane. In addition, dual right turn lanes are proposed for the northbound to eastbound movement at the intersection of 55th Street (Garfield Boulevard) / Wentworth Avenue. These right turn lanes require securing property, the portion of the parcel that is currently vacant.

To construct the proposed two-lane, left-hand exit to the Chicago Skyway from the southbound lanes on the Dan Ryan Expressway, Wells Street needs to be relocated from 64th Street to 65th Street. The improvement requires reconstruction of an 18 foot high retaining wall adjacent to the mainline and the full replacement of the frontage road (Wells Street) pavement. The realignment shifts the centerline of the road approximately 10 feet west. A relocation and reconstruction of the west sidewalk bordering Wells Street does encroach into a parcel currently owned by the Chicago Housing Authority for the "Yale Street Apartment". The corner parcel would facilitate the relocation and reconstruction of the 5 foot sidewalk and modifications to the bituminous parking lot.

The right-of-way uses are summarized in the tabulation below:

Right-of-Way Acquisition	Acres	Number of Parcels
SW Corner of 55 th / Wells Street	0.05	6
SE Corner of 55 th / Wentworth Avenue	0.10	1
NE Corner of 57 th / Wentworth Avenue	0.12	2
SE Corner of 57 th / Wentworth Avenue	0.24	1
NE Corner of 59 th / Wentworth Avenue	0.007	1
SE Corner of 59 th / Wentworth Avenue	0.014	1
NW Corner of 63 rd / Wells Street	0.05	1
Along West edge of Wells Street From 65 th Street to 64 th Street	0.11	1
Temporary Construction Easement	Acres	Number of Parcels
Along west edge of Wells Street From 65 th Street to 64 th Street	0.07	1

The Total Acquired Right-of-Way (ROW) is 0.691 acres involving eight parcels, with a Temporary Construction Easement (TCE) of 0.07 acres involving one parcel.

Environmental Descriptions

Special waste for the Dan Ryan project has **HIGH** risk for the occurrence of regulated substances or natural hazards at twelve sites. A Preliminary Environmental Site Assessment (PESA #1106) with stipulations for excavation depths varies for twelve high risk locations. Depth stipulations can be met at Sites: 808-10A, 1106-17B, 1106-25B, 1106-44A, and 1106-51. A request for Preliminary Site Investigation (PSI) will be required for Sites: 1106-2B, 1106-4A, 1106-6A, and 1106-9, 1106-33B, 1106-47, and 1106-52.

Besides special waste, there are no ecologically sensitive areas in the Dan Ryan project area. The Environmental Survey Request Form (ESRF) on 10/15/99 requested only biological and special waste survey because all of the ground had been previously disturbed and no new right-of-way is to be involved with areas not previously occupied, excavated, or disturbed. The project, as described on the ESRF, does not require biological or wetland surveys. The Illinois Department of Natural Resources (IDNR) Natural Heritage Database has no records of listed species, natural areas or nature preserves within the Dan Ryan project corridor (IDNR Agency Action Report dated September 20, 1999). By agreement, no coordination with the Illinois Department of Natural Resources (IDNR) and the U.S. Fish and Wildlife Service (USFWS) are necessary.

No streams or rivers are involved with this project. There is no water resources in the area involved with the project. A closed drainage system for storm water and urban roadway cross section, including pavement and shoulder, will continue.

The project will result in the disturbance of 0.4 or more hectares (1.0 acre). Permit coverage for the project is secured either under the IEPA Phase II General Permit for Storm-water Discharges (NPDES Permit No. ILR40) or under an individual NPDES permit. Requirements applicable for a permit will be followed, including the preparation of a Storm-water Pollution Prevention Plan. The plan shall identify potential sources of pollution that may reasonably be expected to affect the quality of storm water discharges from the construction site. The plan shall describe and ensure the implementation of practices that will reduce the pollutants in discharges associated with construction site activity and assure compliance with terms of the permits.

Although there may be a remote possibility (not likely) of a potable water well within 200 feet (60 meters) of the centerline, this threshold is only relevant for routes and sources of groundwater pollution. Since this project will not introduce any new routes of groundwater pollution (dry wells, "French drains", or borrow pits) or sources (bulk road oil or deicing storage facilities), then there will be no violation of the wellhead setback requirements.

According to the National Flood Insurance Rate Maps (FIRM), there are no flood plains involved within this project limits.

From field inspection by project team environmental and wetland specialists, and their review of the available and published National Wetlands Inventory (NWI) maps, and the most recent available aerial photography of the area, determined wetlands are not involved. The project is within the existing rights-of-way, and no wetlands are located within or adjacent to the required parcels, which include: west edge of Wells Street from 65th to 64th Street; 63rd Street and South Wells Street, 59th Street and Wentworth Avenue; 57th Street and Wentworth Avenue; 55th Street and South Wentworth Avenue, and 55th Street and South Wells Street.

There is no use or proposed use of protected Section 4(f), Section 6f lands, or lands that have OSLAD funds involved with their purchase and/or development.

- b. The following is a description of the intended sequence of major activities for the reconstruction of the Dan Ryan Expressway. The construction year, Contract number, description, duration of construction, and highlights of work to be completed follow.

Contract # – Name/Description

Contract Duration

- Major Activities

Construction Year 2003

62573 – Shoulder Repair and Median Cross-Over

August 18 – October 31, 2003

- Reconstruction of the 65th to 47th Street local lane inside shoulder

- 62591** – Storm Sewer Jacking
November 15, 2003 – June 4, 2004
- Storm sewer jacking from 95th to 67th Streets

Construction Year 2004 to 2005

- 62594** – 83rd to 79th Street C-D System and Ramps
March 1 – October 31, 2004
- Reconstruction and reconfiguration of the collector-distributor (C-D) ramps between 83rd and 79th Streets
 - Replacement of the storm sewer
 - Retaining wall construction

- 62691** – Reconstruct Watermain Crossing under the Dan Ryan from 32nd Street to 63rd Street
May 3, 2004 – June 20, 2005

- 62590** – 71st to 67th Street C-D System and Ramps
June 21, 2004 – August 15, 2005
- Reconstruction of the collector-distributor (C-D) ramps between 71st and 67th Street
 - Improvements to 67th Street / State Street intersection
 - Retaining wall construction
 - Reconstruction of the 67th Street bridge

- 62587** – Wentworth Avenue Overpass and Wells Street Realignment
June 21, 2004 – June 30, 2005
- Reconstruction of Wells Street from 67th to 63rd Street
 - Reconstruction of Wentworth Avenue bridge

- 62589** – Skyway Interchange Bridges and Local Lanes Wentworth Avenue to 67th Street
June 21, 2004 – August 15, 2005
- Dan Ryan / Skyway interchange
 - Reconstruction of local lanes from 67th to 63rd Street
 - Retaining wall construction

- 62586** – 57th Street Bridge, Retaining Walls, Ramps and Frontage Roads 63rd to 47th Streets
August 1, 2004 – October 31, 2005
- Reconstruction of the frontage roads, Wells Street and Wentworth Avenue, between 63rd and 47th Street
 - Construction of eight (8) new ramps between 63rd and 47th Street
 - Construction of the new 57th Street bridge over the Dan Ryan
 - Retaining walls

62585 – Reconstruct SB Ramps between 39th and 31st Street and Shoulder Reconstruction

September 13, 2004 – November 30, 2005

- Reconstruction of the SB ramps between 39th and 31st Street

62584 – Reconstruct NB Ramps between 39th and 31st Street and Shoulder Reconstruction

September 13, 2004 – November 30, 2004

- Reconstruction of the NB ramps between 39th and 31st Street

62692 – Reconstruct Watermain Crossings under the Dan Ryan from 75th Street to the I-57 Interchange

September 27, 2004 – July 1, 2005

TBA – Reconstruct I-57 Bridge over WB Cross Connection from I-94 and Tunnel over SB I-94

December 21, 2004 – July 4, 2005

62694 – NB Retaining Walls and Ramps from 71st to I-57 and 71st to 75th Street C-D System

February 28, 2005 – December 30, 2005

62695 – SB Retaining Walls and Ramps from 71st Street to I-57 and 71st to 75th Street C-D System

February 28, 2005 – December 30, 2005

Construction Year 2006

62592 – NB Outside Lanes (4, 5, and Shoulder), 71st to I-57 and Miscellaneous Ramps

March 6 – October 27, 2006

- Reconstruction of the local lanes 4, 5, and the outside shoulder for the Dan Ryan I-57 interchange
- Replacement of the storm sewer
- Retaining wall construction

62593 – SB Outside Lanes (4, 5, and Shoulder), 71st to I-57 and Miscellaneous Ramps

March 6 – October 27, 2006

- Reconstruction of the local lanes 4, 5, and the outside shoulder for the Dan Ryan I-57 interchange
- Replacement of the storm sewer
- Retaining wall construction

62302 – SB Express Lanes 71st to 47th Streets

March 6 – October 27, 2006

- Reconstruction of the express lanes between 67th and 47th Street
- Construction of lanes 4 & 5 between 71st and 67th Street

62300 – NB Express Lanes 71st to 31st Streets

March 6 – October 27, 2006

- Reconstruction of the NB and SB express lanes between 71st to 31st Street

Construction Year 2007

62304 – NB Inside Lanes (1, 2 and 3, shoulder and barrier wall) from 71st Street and the I-57 Interchange and Miscellaneous Ramps

March – November 2007

- Reconstruction of the NB local lane 3
- Reconstruction of the I-57 interchange
- Replacement of the storm sewer
- Reconstruction of NB Dan Ryan inside Lanes 1 and 2
- Reconstruction of CTA wall

62305 – SB Inside Lanes (1, 2 and 3, shoulder and barrier wall) from 71st Street and the I-57 Interchange and Miscellaneous Ramps

March – November 2007

- Reconstruction of the SB local lanes 3
- Reconstruction of the I-57 interchange
- Replacement of the storm sewer
- Reconstruction of SB Dan Ryan inside Lanes 1 and 2
- Reconstruction of CTA wall

62303 – SB Local Lanes 71st to 31st Streets and Miscellaneous Ramps

March – November 2007

- Reconstruction of the local lanes between 67th and 47th Street
- Reconstruction of the local lanes 1, 2, and 3 between 71st and 67th Street
- Construction of the WB Skyway ramp to NB Dan Ryan Local

62301 – NB Local Lanes 71st to 31st Streets and Miscellaneous Ramps

March 7 – November 2007

- Reconstruction of the NB and SB local lanes between 47th to 31st Street

- c. The total area of the construction site is estimated to be 612 acres.

The total area of the site that it is estimated will be disturbed by excavation, grading or other activities is acres 433.

- d. The estimated runoff coefficients of the various areas of the site after construction activities are completed are contained in the project drainage study, which is hereby incorporated by reference in this plan. Information describing the soils at the site is contained in individual Soils Reports for each construction Contract.

- e. The design/project report, hydraulic report, or plan documents, hereby incorporated by reference, contain site map(s) indicating drainage patterns and approximate slopes anticipated after major grading activities, areas of major soil disturbance, the location of major structural and nonstructural controls identified in the plan, the location of areas where stabilization practices are expected to occur, surface waters (including wetlands), and locations where storm water is discharged to a surface water.
- f. The names of receiving water(s) and areal extent of wetland acreage at the site are in the design/project report or plan documents, which are incorporated by reference as a part of this plan.

2. Controls

This section of the plan addresses the various controls that will be implemented for each of the major construction activities described in 1.b. above. For each measure discussed, the Contractor that will be responsible for its implementation is indicated. Each such Contractor has signed the required certification on forms which are attached to, and a part of, this plan:

a. Erosion and Sediment Controls

- (i) Stabilization Practices. Provided below is a description of interim and permanent stabilization practices, including site-specific scheduling of the implementation of the practices. Site plans will ensure that existing vegetation is preserved where attainable and disturbed portions of the site will be stabilized. Stabilization practices may include: temporary seeding, permanent seeding, mulching, geotextiles, sod stabilization, vegetative buffer strips, protection of trees, preservation of mature vegetation, and other appropriate measures. Except as provided in 2.a.(i).(A) and 2.b., stabilization measures shall be initiated as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than 14 days after the construction activity in that portion of the site has temporarily or permanently ceased on all disturbed portions of the site where construction activity will not occur for a period of 21 or more calendar days.
 - (A) Where the initiation of stabilization measures by the 14th day after construction activity temporarily or permanently ceases is precluded by snow cover, stabilization measures shall be initiated as soon as practicable thereafter.

Description of Stabilization Practices:

1. Temporary Erosion Control Seeding shall be applied in accordance with the Special Provision. Seed mixture will depend on the time of year it is applied. Oats will be applied from January 1 to July 31 and Hard Red Winter Wheat from August 1 to December 31.
2. Short Term Seeding - Seeding Class 2A shall be used to protect bare earth from more than just one or two summer-winter cycles. Due to the length and complexity of this project, it is necessary that short term, final graded slopes be short term seeded as directed by the Engineer.

3. Stone Riprap - Class A4 stone riprap with filter fabric will be used as protection at the discharge end of most storm sewer and culvert end sections to prevent scouring at the end of pipes and to prevent downstream erosion.
 4. Temporary Tree Protection - Shall consist of items "temporary fencing" and "tree trunk protection" as directed by the engineer and in accordance with Article 201.05 of the Illinois Department of Transportation's Standard Specifications for Road and Bridge Construction.
 5. Permanent Stabilization - All areas disturbed by construction will be stabilized as soon as permitted with permanent seeding following the finished grading, but always within seven days with Temporary Erosion Control Seeding. Erosion Blankets will be installed over fill slopes, which have been brought to final grade and have been seeded to protect the slopes from rill and gully erosion and allow seeds to germinate properly.
 6. Erosion Control Blankets and Mulching - Erosion control blankets will be installed over fill slopes and in high velocity areas that have been brought to final grade and seeded to protect slopes from erosion and allow seeds to germinate. Mulch will be applied in relatively flat areas to prevent further erosion.
- (ii) Structural Practices. Provided below is a description of structural practices that will be implemented, to the degree attainable, to divert flows from exposed soils, store flows or otherwise limit runoff and the discharge of pollutants from exposed areas of the site. Such practices may include silt fences, earth dikes, drainage swales, sediment traps, check dams, subsurface drains, pipe slope drains, level spreaders, storm drain inlet protection, rock outlet protection, reinforced soil retaining systems, gabions and temporary or permanent sediment basins. The installation of these devices may be subject to Section 404 of the Clean Water Act.

Description of Structural Practices:

1. Sediment Control, Stabilized Construction Access - Coarse aggregate overlaying a geotextile fabric will be placed in locations necessary for Contractor access. The aggregate surface of the access points will capture soil debris, reducing the amount of soil deposits placed on to the roadway by vehicles leaving the work zones.
2. Inlet Filters - Inlet and Pipe Protection will be provided for storm sewers. These filters will be placed in every inlet, catch basin or manhole with an open lid, which will drain water during at least a 10-year storm event. The Erosion Control Plan will identify the structures requiring Inlet filters.
3. Sediment Control, Silt Fence - A silt fence will be placed adjacent to the areas of construction to intercept waterborne silt and prevent it from leaving the site. These areas are marked on the erosion control plans in each Contract.

4. Sediment Control, Temporary Ditch Checks - Rolled excelsior ditch checks will be placed in swales at the rate of one for every 0.3 meters in vertical drop, or as directed by the Engineer, in order to prevent downstream erosion.
5. Sediment Control, Temporary Stream Crossing - Coarse aggregate overlaying a geotextile fabric will be placed in locations necessary for Contractor access over water channels. The aggregate surface of the crossing will reduce the amount of soil disturbance in the streams.
6. Sediment Control, Temporary Pipe Slope Drain - This item consists of a pipe with flared end sections, placed daily, along with anchor devices in conjunction with temporary berms that direct runoff down an unstabilized slope.
7. Sediment Control, Dewatering Basins will be provided at wherever the Contractor is removing and discharging water from excavated areas and the water is not being routed through a sediment trap or basin.
8. Stone riprap will be provided at several storm and culvert outlets as a measure for erosion and sediment control where needed during and after the project.
9. Bridges will be designed to reduce the potential for scouring.
10. Underdrains will be used to minimize potential erosion caused by surface water flows by reducing the subsurface water which can cause failed pavements, unstable shoulders and other disturbed areas.
11. Covers will be placed on open ends of pipes in trenches.

The structural practices indicated above may not be used in every Contract. The Erosion Control Plans included in every Contract will indicate which structural practices are required for that Contract.

b. Storm Water Management

Provided below is a description of measures that will be installed during the construction process to control pollutants in storm water discharges that will occur after construction operations have been completed. The installation of these devices may be subject to Section 404 of the Clean Water Act.

- (i) Such practices may include: storm water detention structures (including wet ponds); storm water retention structures; flow attenuation by use of open vegetated swales and natural depressions; infiltration of runoff on site; and sequential systems (which combine several practices). **The practices selected for implementation were determined on the basis of the technical guidance in Section 10-300 (Design Considerations) in Chapter 10 (Erosion and Sedimentation Control) of**

the Illinois Department of Transportation Drainage Manual. If practices other than those discussed in Section 10-300 are selected for implementation or if practices are applied to situations different from those covered in Section 10-300, the technical basis for such decisions will be explained below.

- (ii) Velocity dissipation devices will be placed at discharge locations and along the length of any outfall channel as necessary to provide a non-erosive velocity flow from the structure to a water course so that the natural physical and biological characteristics and functions are maintained and protected (e.g., maintenance of hydrologic conditions, such as the hydroperiod and hydrodynamics present prior to the initiation of construction activities).
- (iii) The Department proposes to remove vegetation within the project limits as necessary for construction. The Department proposes to revegetate according to the City of Chicago Landscape Framework Plan.

c. Other Controls

- (i) Waste Disposal. No solid materials, including building materials, shall be discharged into Waters of the State, except as authorized by a Section 404 permit.
- (ii) The provisions of this plan shall ensure and demonstrate compliance with applicable State and/or local waste disposal, sanitary sewer or septic system regulations.

d. Approved State or Local Plans

The management practices, controls and provisions contained in this plan will be in accordance with IDOT specifications, which are at least as protective as the requirements contained in the Illinois Environmental Protection Agency's Illinois Urban Manual, 1995. Procedures and requirements specified in applicable sediment and erosion site plans or storm water management plans approved by local officials shall be described or incorporated by reference in the space provided below. Requirements specified in sediment and erosion site plans or site permits or storm water management site plans or site permits approved by local officials that are applicable to protecting surface water resources are, upon submittal of an NOI to be authorized to discharge under permit ILR40 incorporated by reference and are enforceable under this permit even if they are not specifically included in the plan.

Description of procedures and requirements specified in applicable sediment and erosion site plans or storm water management plans approved by local officials: See Landscape Design and Erosion Control for further details. In addition, Guidance Memorandums #02-14 and #02-22 leading up to the ILR40NPDES Permit Requirements IDOT Strategies of Storm Water Management will be complied with along with Construction Memorandum 02-60.

3. Maintenance

The following is a description of procedures that will be used to maintain, in good and effective operating conditions, vegetation, erosion and sediment control measures and other protective measures identified in this plan:

Construction equipment shall be stored and fueled only at designated locations. All necessary measures shall be taken to contain any fuel or pollution runoff in compliance with environmental law and EPA Water Quality Regulations. Leaking equipment or supplies shall be immediately repaired or removed from the site. The construction field engineer on a weekly basis shall inspect the project to determine that erosion controls efforts are in place and effective and if other control is necessary. Sediment collected during construction by the various temporary erosion systems shall be disposed on the site on a regular basis as directed by the Engineer.

All erosion and sediment control measures will be checked weekly and after each significant rainfall (13 mm (0.5 inch) or greater in a 24 hour period). The following items will be checked:

1. Seeding - all erodable bare earth areas will be temporarily seeded and inspected on a weekly basis to minimize the amount of erodable surface within the Contract limits.
2. Silt Filter Fence, all types
3. Erosion Control Blanket
4. Tree Protection
5. Ditch Checks
6. Temporary slope drains
7. Sediment/dewatering basins
8. Stabilized construction entrances

All maintenance of the erosion control systems will be the responsibility of the Contractor. All locations where vehicles enter and exit the construction site and all other areas subject to erosion should also be inspected periodically. Inspection of these areas shall be made at least once every seven days and within 24 hours of the end of each 13 mm (0.5 inch) or greater rainfall, or an equivalent snowfall.

4. Inspections

Qualified personnel shall inspect disturbed areas of the construction site, which have not been finally stabilized, structural control measures, and locations where vehicles enter or exit the site. Such inspections shall be conducted at least once every seven (7)-calendar days and within 24 hours of the end of a storm that is 0.5 inches or greater or equivalent snowfall.

- a. Disturbed areas and areas used for storage of materials that are exposed to precipitation shall be inspected for evidence of, or the potential for, pollutants entering the drainage system. Erosion and sediment control measures identified in the plan shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters. Locations where vehicles enter or exit the site shall be inspected for evidence of off site sediment tracking.
- b. Based on the results of the inspection, the description of potential pollutant sources identified in section 1 above and pollution prevention measures identified in section 2 above shall be revised as appropriate as soon as practicable after such inspection. Any changes to this plan resulting from the required inspections shall be implemented within 7 calendar days following the inspection.

- c. A report summarizing the scope of the inspection, name(s) and qualifications of personnel making the inspection, the date(s) of the inspection, major observations relating to the implementation of this storm water pollution prevention plan, and actions taken in accordance with section 4.b. shall be made and retained as part of the plan for at least three (3) years after the date of the inspection. The report shall be signed in accordance with Part VI. G of the general permit.
- d. If any violation of the provisions of this plan is identified during the conduct of the construction work covered by this plan, the Resident Engineer or Resident Technician shall complete and file an "Incidence of Noncompliance" (ION) report for the identified violation. The Resident Engineer or Resident Technician shall use forms provided by the Illinois Environmental Protection Agency and shall include specific information on the cause of noncompliance, actions which were taken to prevent any further causes of noncompliance, and a statement detailing any environmental impact which may have resulted from the noncompliance. All reports of noncompliance shall be signed by a responsible authority in accordance with Part VI. G of the general permit.

The report of noncompliance shall be mailed to the following address:

Illinois Environmental Protection Agency
Division of Water Pollution Control
Attn: Compliance Assurance Section
1021 North Grand East
Post Office Box 19276
Springfield, Illinois 62794-9276

5. Non-Storm Water Discharges

Except for flows from fire fighting activities, sources of non-storm water that is combined with storm water discharges associated with the industrial activity addressed in this plan must be described below. Appropriate pollution prevention measures, as described below, will be implemented for the non-storm water component(s) of the discharge.

Dewatering activities for footing and pier construction of retaining walls and bridges will be a source of non-storm water discharge during construction. Contractors should discharge dewatering activities to a temporary settling basing surrounded by silt fence.

The cutting of joints in PCC pavements or bridge deck grooving will result in slurry. This slurry must be contained on the deck/pavement and cleaned up.

An additional source of non-storm water discharge during construction is the slurry from washing out redi-mix concrete trucks. Redi-mix concrete trucks should wash out in in designated areas surrounded by silt fence. After all PCC items have been constructed, the dried concrete wash material should be cleaned up and properly disposed of. It will be the Contractor's responsibility to secure these designated areas for the duration of their use. The Engineer must approve the locations.

On site maintenance of equipment must be performed in accordance with environmental law, such as proper storage and no dumping of old engine oil or other fluids on site.

Good Housekeeping

1. An effort will be made to store only enough product required to do the job.
2. All materials stored on site will be stored in a neat, orderly manner in their appropriate containers, and if possible, under a roof or other enclosure.
3. Products will be kept in their original containers with the original manufacturer's label.
4. Substances will not be mixed with one another unless recommended by the manufacturer.
5. The site superintendent will inspect daily to ensure proper use and disposal of materials on the site.
6. Whenever possible, all of a product will be used up before disposing of the container.
7. Follow manufacturer's recommended practices for use and disposal.



Contractor Certification Statement

This certification statement is a part of the Storm Water Pollution Prevention Plan for the project described below, in accordance with NPDES Permit No. ILR40, issued by the Illinois Environmental Protection Agency on ____ ____, 2003.

Project Information:

Route I-90/94 Dan Ryan Expressway Marked Dan Ryan Expressway
I-57 at Illinois Route 1 (Halsted St)
& I-90 at MLK to 31st Street

Section See individual Contract Project No. Various Contract Numbers –
Refer to Attachment

County Cook

I certify under penalty of law that I understand the terms of the general National Pollutant Discharge Elimination System (NPDES) permit (ILR 40) that authorizes the storm water discharges associated with industrial activity from the construction site identified as part of this certification.

Signature

Date

Title

Name of Firm

Street Address

City State

Zip Code

Telephone Number

Storm Water Pollution Prevention Plan – Attachment

Project Limits: Dan Ryan Expressway I-57 at Illinois Route 1 (Halsted St) & I-90 at MLK to 31st Street

Attachment: Contract Numbers and Description. Note that the Contract numbers are listed in numerical order.

IDOT Contract No.	Description
62300	Reconstruct NB Express Lanes from 31st Street to 71st Street
62301	Reconstruct NB Local Lanes from 31st St. to Wentworth Ave. and Misc. Ramps
62302	Reconstruct SB Express Lanes from 31st Street to 71st Street
62303	Reconstruct SB Local Lanes from 31st St. to Wentworth Ave. and Misc. Ramps
62304	Reconstruct NB Inside Lanes (1-3, shoulder and barrier wall) from 71st Street to I-57 Interchange
62305	Reconstruct SB Inside Lanes (1-3, shoulder and barrier wall) from 71st Street to I-57 Interchange
62573	Shoulder Rehabilitation from 47th St. to 71st St.
62584	Reconstruct NB ramps between 31st and 39th Street and Shoulder Rehabilitation
62585	Reconstruct SB ramps between 31st and 39th Street and Shoulder Rehabilitation
62586	Reconstruct 57th St. Bridge, and Frontage Rds., Retaining Walls, and Ramps between 47th and 59th. Streets
62587	Wentworth Avenue Overpass Reconstruction and Wells Street Realignment
62589	Skyway Interchange Bridges and Local Lanes from Wentworth Avenue to 67th Street
62590	Reconstruct 67th St. Bridge and NB and SB C-D System between 67th and 71st St.
62591	Storm Sewer Jacking & Collector Sewers from 67th Street to 95th Street.
62592	Reconstruct NB Outside Lanes (4, 5, shoulder) from 71st to I-57 Interchange
62593	Reconstruct SB Outside Lanes (4, 5, shoulder) from 71st to I-57 Interchange
62594	Reconstruct NB and SB C-D System and Ramps between 79th and 83rd Streets
62691	Reconstruct Watermain crossings under Dan Ryan from 32nd to 63rd
62692	Reconstruct Watermain Crossings Under the Dan Ryan from 75th St. to I-57 Interchange
62693	Frontage Rds., Retaining Walls, and Ramps between 59th. and 63rd.
62694	Reconstruct NB Retaining Walls & Ramps from 71st to I-57 Interchange, and 71st to 75th C-D System
62695	Reconstruct SB Retaining Walls & Ramps from 71st to I-57 Interchange, and 71st to 75th C-D System
TBA	Reconstruct NB I-57 Bridge over WB cross connection from I-94 & tunnel over SB I-94

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.

Packaged Standby Engine Generator System, Installation Only

Description. The work specified in this section shall include, but shall not be limited to, installing packaged standby engine generator systems, complete with diesel engine, synchronous generator, weather protective enclosure, sub-base fuel storage tank, control panel, annunciator, automatic transfer switches and appurtenances as shown on the plans and as specified herein. The Contractor shall receive delivery of these items and install them according to the manufacturer's guidelines.

A pre-purchased 80 KW packaged standby engine generator system, including the annunciator and the automatic transfer switch, shall be installed at the designated Communications Shelters.

A pre-purchased 80 KW packaged standby engine generator system, including the annunciator and the automatic transfer switch, shall be installed as called for on the Communications Shelter site plans.

Contractor Responsibilities. The Contractor shall take delivery of the Department pre-purchased packaged standby engine generator systems, complete with diesel engine, synchronous generator, weather protective enclosure, sub-base fuel storage tank, control panel, annunciators, automatic transfer switches and appurtenances and install and wire complete at each Communications Shelter as shown on the Plans.

Services of a technical representative during installation of engine generators shall be furnished at no cost to the Department. The Contractor shall notify the Department, in writing, the exact dates when the representative will be required, not less than two weeks prior to such requirement. These representatives shall advise the Department and the Contractor personnel concerning the proper installation of the equipment and conduct field and validation tests.

The Contractor shall be responsible for coordinating and monitoring the schedule of the installation work.

Standards. The overall workmanship shall be of a high quality generally accepted as standard practices and procedures in the industry. All work shall be carefully and accurately performed. Contractor shall comply with the manufacturer's guidelines for handling and installation.

The Contractor shall maintain his work area at the engine generator site in a neat and orderly condition free of debris and unnecessary packing material.

Submittals.

General. Submit the following in accordance with the Standard Specifications.

- Submittal shall include highlighted component catalog information.
- Submittal shall include a coordinated interconnection diagram of the generator sets, the automatic transfer switches and the package annunciators.

Shop Drawings. Submit complete shop drawings as required to determine acceptability. Shop drawings shall include, but shall not be limited to, the following:

- Certified outline plans, general arrangement (setting plan), and anchor bolt details. Shop drawing shall show the total weight and center of gravity of the assembled engine generator system on the structural steel sub base.
- Arrangement detail of exhaust duct and muffler piping systems and the fuel oil piping systems.
- Arrangement or assembly drawings showing location of major auxiliary equipment in relation to the engine generator system and details of fabricating supports and connections thereto.
- Vibration data and isolation means.

Wiring Diagrams. Submit with shop drawings wiring diagrams for control circuits and devices. The diagrams shall be applicable only to this Project. Wiring diagrams shall include, but shall not be limited to, the following:

- Arrangement, size, and location of electrical interface connections to peripheral equipment and detailed elementary, schematic, wiring, and interconnection of the generator, exciter, governor, and other integral devices.
- Provide a wiring diagram, including a complete schematic diagram, showing the remote operation of the generator set from the automatic transfer switch attached to the generator load bus.

Testing. The pre-purchased engine generator sets, annunciators and automatic transfer switches incorporated in the engine generator package must be fully tested, as specified herein.

All tests shall be neatly recorded and a copy of the test results shall be given to the Department.

The completed package assembly shall be field tested to assure proper operations and connection of the engine generator set and all other components of the assembly. The tests shall include simulations of automatic, manual, and retransfer to normal, simulation of all alarm functions as well as tests of the fuel tank and other package auxiliary items.

The manufacturer of the engine generator package shall furnish the services of an experienced engineer to check the equipment and witness testing and file reports and certification, and such services shall be available within 10 days of notification that installation and connection is complete and ready for testing. The manufacturer's representative shall be available to assist in the adjusting and testing of the engine generator set and the assembled package in the field. These adjustments shall be made in the presence of the Department.

Tests shall demonstrate the proper operation of the set, including automatic starting and picking up of the load.

Except for the manufacturer's representative, all instruments, test equipment, fuel, lube oil, and personnel that are required for the test as confirmed with the manufacturer, will be furnished by the Contractor. The manufacturer may provide supplemental test equipment.

The representative of the engine generator manufacturer shall furnish certification in writing that the set has been properly installed at the site and that the trial operation has been satisfactory. Documentation shall include recorded test results. The certification shall be submitted to the Department in triplicate before final acceptance.

Field Quality Control. Upon completion of installation of the packaged engine generator system, test electrical and mechanical connections for physical integrity (i.e., proper torques, no leaks, etc.).

Adjusting and Cleaning. Adjust packaged engine generator system operating mechanisms for free mechanical movement.

Touch up scratched or marred surfaces to match original finishes.

Warranty. Work and equipment involved in the installation of the packaged engine generator system shall be warranted for a minimum period of two years from the date of completion.

Installation. Examination: Examine areas and conditions under which the work is to be installed and notify the Department in writing of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

The Contractor shall take delivery of the pre-purchased packaged standby engine generator system, complete with diesel engine, synchronous generator, weather protective enclosure, sub-base fuel storage tank, control panel, transfer switch, remote annunciator and appurtenances, and install the system at the three Communications Shelters as indicated in the

Plans. The two pre-purchased generator sets are model # 80DGDA as manufactured by Cummins/Onan. Three pre-purchased Cummins/Onan annunciators are also required for installation. The three pre-purchased automatic transfer switches, made by Zenith, are model # ZBTSDL40EC-7 400A bypass ATS. These pre-purchased items will be supplied by:

Gateway Industrial Power, Inc.
#1 Extra Mile Drive, Collinsville, IL 62234
Attn. Scott Watkins
(618) 345-0123

Coordination. Coordinate packaged engine generator systems installation work with other items as necessary to provide a complete installation.

General. Install complete engine generator systems, including battery racks as indicated, annunciators, and automatic transfer switches, in accordance with the equipment manufacturers written instructions. Comply with applicable requirements of NEC, UL, and NEMA standards to ensure that the finished products fulfill requirements.

Battery Rack. The battery racks for the generator sets are to be provided as part of the generator package.

Batteries. The batteries for the engine generator shall be installed, wired and tested by the manufacturer as a part of the generator package.

Caution. Before connecting battery circuit, be sure the emergency stop and lockout switch is in the off position.

Phase Rotation. Contractor shall verify that the phase rotation of the generators (alternator) is compatible with that of the incoming commercial lines, bypass/isolation switch, transfer switches, etc.

Placement of Engine Generator Set. The Contractor shall be responsible for placement of the engine generator sets. Generator sets shall be placed on concrete pads as shown on the Plans. Concrete pads and foundation shall be part of the Communications Shelter pay item. The instructions relative to the installation of and the placing in operation of the engine generator sets, as contained in the operator's manuals or instruction book furnished with the sets, shall be followed. The spare parts, special tools, and instruction book furnished with the sets shall be left with the Department Resident Engineer.

All labor, materials, equipment, tools, testing and incidentals necessary to complete the installation work will be considered incidental to this work and no separate payment will be made.

Basis of Payment. This item shall be paid at the contract unit price each for PACKAGED STANDBY ENGINE GENERATOR SYSTEM, INSTALLATION ONLY, for the size and type as defined herein, which shall be payment in full for the work specified herein.

(EK – 12/10/2004)

Packaged Standby Engine Generator System, Reimbursement Only

Description. The work under this item shall include reimbursement for packaged standby engine generator systems, complete with diesel engine, synchronous generator, weather protective enclosure, sub-base fuel storage tank, control panel, annunciator, automatic transfer switches and appurtenances as indicated. This work will involve reimbursement for equipment at more than one communication shelter location. For a summary of Locations see the Schedule contained herein.

General Requirements. It shall be the Contractor's responsibility to contact the Department at least 6 weeks in advance of need to make arrangements for the timely shipment and delivery of equipment in accordance with IDOT District 1 directions. The contractor shall fully coordinate the shipment and delivery so as not to delay his designated schedule of installation. No additional compensation will be granted under this pay item for failure to plan ahead.

Method of Payment. The Contractor will reimburse the Department for the exact amount of money paid for the PACKAGED STANDBY ENGINE GENERATOR SYSTEM, and directly related shipment costs.

For bidding purposes, this item shall be estimated as \$135,000.00.

Basis of Payment. The reimbursement will be paid for at the Contract lump sum price for PACKAGED STANDBY ENGINE GENERATOR SYSTEM, REIMBURSEMENT ONLY, which shall be reimbursement in full to the Department for exact costs.

Identification	Approximate Comm. Shelter Location	Equipment	Voltage	New/ or Existing
Comm. Shelter R01	I-55 Shelter (25 th Pl. and Normal Ave.)	Generator & Automatic Transfer Switch	120/240	New
Comm. Shelter R02	IDOT Maintenance Yard (6550 S. Wentworth Ave.)	Generator & Automatic Transfer Switch	120/240	New
Comm. Shelter R03	East Shelter (6650 S. State St.)	Generator & Automatic Transfer Switch	120/240	New

(EK – 12/14/2004)

Remove And Salvage Existing Surveillance Equipment

Description. This work shall consist of furnishing all labor, equipment, and materials required for the removal and salvage of the Department's Traffic Systems Center (TSC) surveillance equipment at the locations as indicated in the plans including, but not limited to, the removal and salvage of the following items:

Ramp Meter Signs
Detector/Ramp Meter Cabinet Components(incl./cabinet)
Detector/RampMeter Cabinet Components (not incl. cabinet)
DMS Sign Internal Components (not incl. housing/sign support structure)
DMS Sign Cabinet Components (not incl. cabinet)
Telephone Pedestal

This work shall also consist of furnishing all labor, equipment, and materials required for the removal of the Department's TSC surveillance equipment as indicated in the plans including, but not limited to, the removal of the following items:

Ramp Meter Flashers (incl. post)
Ramp Meter Signal Heads (incl. post)
Detector/Ramp Meter Cabinet
DMS Sign Support Structure
DMS Sign Housing
DMS Sign Cabinet
Bridge-Attached Conduit

Removal. Removal of existing TSC surveillance equipment shall meet the requirements of Section 895 of the Standard Specifications.

All of the existing TSC surveillance equipment noted above is to be removed. Only those materials specifically designated for salvage as indicated in the plans or as listed above shall be salvaged and delivered to the Department at a location within District 1 as designated by the Engineer. All items designated for removal only shall become property of the Contractor.

The existing concrete foundations for all items noted above shall be removed by others under separate contract. Underground electric cables and conduit shall be removed by the Contractor to a depth of 300mm (1 ft) below ground level and abandoned, unless otherwise noted. Electric cables in conduit may be removed from the duct and may become the property of the Contractor, unless otherwise noted. Where noted in the Plans, existing cables (both electric and fiber optic) are to be removed and coiled in existing handholes or junction boxes for future reinstallation. If insufficient room is available in the coiling enclosures, the Contractor shall identify an alternate location for approval by the Engineer. If an alternate location is unavailable, the cable shall be removed, salvaged, and replaced or removed and replaced as directed by the Engineer. In addition, if existing cable is of insufficient length to reach a proposed connection point, the Contractor shall replace the cable as part of this work.

CONSTRUCTION REQUIREMENTS

Any damage resulting from the removal and transportation of the existing TSC surveillance equipment (and associated items) designated for removal and salvage as indicated in the plans, shall be repaired or replaced in-kind, at the Contractors expense, to the satisfaction of the Engineer. The Engineer in conjunction with the TSC Engineer will be responsible for determining the extent of the damage and the suitability of repair or replacement.

No removal work shall be permitted without first notifying, and obtaining approval from, both the Engineer and Traffic Systems Engineer (708-524-2145) within 72 hours of commencing the removal operations. In addition, any existing TSC surveillance removal items shall not be removed until the temporary or permanent surveillance, as applicable, is placed in approved operation. An inspection and approval by the Engineer in conjunction with the Traffic Systems Engineer will take place before any associated proposed temporary or permanent surveillance is approved for operation.

The existing TSC surveillance equipment designated for removal and salvage as indicated in the plans, is to be delivered and unloaded at a storage facility of the Department's located within District 1, as designated by the Engineer. The Contractor shall contact the Traffic Systems Engineer (708-524-2145) to coordinate delivery of the existing surveillance equipment. All existing TSC surveillance equipment shall be delivered within 30 days of the removal operations.

The Contractor shall provide 5 copies of a list of existing equipment that is to remain the property of the Department, including model and serial numbers, where applicable. Existing controllers and peripheral equipment from the same location shall be boxed together (equipment from different locations shall not be mixed) and all boxes and controller cabinets shall be clearly marked and labeled with the location from which they were removed.

If necessary, the Contractor shall safely store and arrange for pick-up of all existing equipment to be returned to agencies other than the Department. The Contractor shall package the equipment and provide all necessary documentation as stated above.

Method of Measurement. Existing surveillance equipment to be removed and delivered to the Department's storage location located within District 1 as designated by the Engineer, and associated removals to be disposed of by the Contractor, shall be measured as a lump sum price.

Basis of Payment. Payment for the removal and salvage of all items designated for removal and salvage as indicated in the plans will be made at the lump sum price for REMOVE AND SALVAGE EXISTING SURVEILLANCE EQUIPMENT. This price shall be payment in full for all work done to remove and salvage existing surveillance equipment as indicated in these special provisions.

Payment for the removal of all items designated only for removal as indicated in the plans will be made at the lump sum price for REMOVE EXISTING SURVEILLANCE EQUIPMENT.

(EK – 12/17/2004)

DRILLED SHAFTS

Effective: May 1, 2001

Revised: June 21, 2004

Description. This work shall consist of all labor, materials, equipment and services necessary to complete the drilled shaft installation according to the details and dimensions shown on the plans, this specification and as directed by the Engineer.

Submittals. The Contractor shall submit the following:

- (a) Qualifications. At the time of the preconstruction conference, the Contractor shall provide the following documentation:
- (1) A list containing at least 3 projects completed within the 3 years prior to this project's bid date which the Contractor performing this work has installed drilled shafts of similar diameter, length and site conditions to those shown in the plans. The list of projects shall contain names and phone numbers of owner's representatives who can verify the Contractor's participation on those projects.
 - (2) Name and experience record of the drilled shaft supervisor, responsible for all facets of the shaft installation, and the drill operator(s) who will be assigned to this project. The supervisor and driller shall each have a minimum of 3 years experience in the construction of drilled shafts.
 - (3) A signed statement that the drilled shaft supervisor has inspected both the project site and all the subsurface information available. In addition to the subsurface information in the contract documents, rock core specimens and/or geotechnical reports, when available, should be requested for evaluation.
- (b) Installation Procedure. A submittal detailing the installation procedure will be required for all drilled shafts, unless directed otherwise by the Engineer. The Contractor, meeting the above qualifications, shall prepare the installation procedure, addressing all items shown below and will be responsible for directing all aspects of the shaft construction. The installation procedure shall be submitted to the Engineer at least 45 days prior to drilled shaft construction and shall address each of the following items:
- (1) List of proposed equipment to be used including cranes, drill rigs, augers, belling tools, casing, core barrels, bailing buckets, final cleaning equipment, slurry equipment, tremies or concrete pumps, etc.
 - (2) Details of the overall construction operation sequence, equipment access, and the sequence of individual shaft construction within each substructure bent or footing group. The submittal shall address the Contractor's proposed time delay and/or the minimum concrete strength necessary before initiating a shaft excavation adjacent to a recently installed drilled shaft.
 - (3) A step by step description of how the Contractor anticipates the shaft excavation to be advanced based on their evaluation of the subsurface data and conditions expected to be encountered. This sequence shall note the method of casing advancement, anticipated casing lengths, tip elevations and diameters, the excavation tools used and drilled diameters created. The Contractor shall indicate whether wet or dry drilling conditions are expected or if the water table will be sealed from the excavation.
 - (4) When slurry is proposed, details covering the measurement and control of the hardness of the mixing water, agitation, circulation, de-sanding, sampling, testing and chemical properties of the slurry shall be submitted.

- (5) Method(s) and sequence proposed for the shaft cleaning operation as well as recommendations on how the shaft excavation will be inspected under the installation conditions anticipated.
- (6) Details of reinforcement placement including cage centralization devices to be used and method to maintain proper elevation and plan location of cage within the shaft excavation during concrete placement. The method(s) of adjusting the cage length if rock is encountered at an elevation other than as estimated in the plans.
- (7) Details of concrete placement including proposed operational procedures for free fall, tremie or pumping methods. The sequence and method of casing removal shall also be stated along with the top of pour elevation, and method of forming through water above streambed.
- (8) The proposed concrete mix design(s).

The Engineer will evaluate the drilled shaft installation plan and notify the Contractor of acceptance, or if additional information is required, or if there are concerns with the installation's effect on the existing or proposed structure(s).

Materials. The materials used for the construction of the drilled shaft shall satisfy the following requirements:

- (a) The drilled shaft portland cement concrete shall be according to Section 1020, except the mix design shall be as follows:
 - (1) A Type I or II cement shall be used at 395 kg/cu m (665 lb/cu yd). When specified in the plans that soil and ground water sulfate contaminates exceed 500 parts per million, a Type V cement shall be required.
 - (2) Class C or F fly ash may replace Type I or II cement. The cement replacement shall not exceed 15 percent by mass (weight) at a minimum replacement ratio of 1.5:1. The fly ash shall not be used in combination with ground granulated blast-furnace slag.
 - (3) Grade 100 or 120 ground granulated blast-furnace slag may replace Type I or II cement. The cement replacement shall not exceed 25 percent by mass (weight) at a minimum replacement ratio of 1:1. The ground granulated blast-furnace slag shall not be used in combination with fly ash.
 - (4) The maximum water/cement ratio shall be 0.44.
 - (5) The mortar factor shall be a value which produces a coarse aggregate content comprising between 55 and 65 percent of total aggregate by mass (weight).
 - (6) The slump at point of placement shall be 175 mm \pm 25 mm (7 \pm 1 in.). If concrete is placed to displace drilling fluid, or against temporary casing, the slump shall be 200 mm \pm 25 mm (8 \pm 1 in.) at point of placement. The concrete mix shall be designed to remain fluid throughout the anticipated duration of the pour plus 1 hour.

- (7) An air entraining admixture shall be required and the air content range shall be 4.0 to 7.0 percent.
- (8) The minimum compressive strength shall be 27,500 kPa (4000 psi) at 14 days. The minimum flexural strength shall be 4,650 kPa (675 psi) at 14 days.
- (9) A retarding admixture shall be required.
- (10) A water-reducing or high range water-reducing admixture shall be required.
- (11) An accelerating admixture may be used with the permission of the Engineer in extraordinary situations.
- (12) The coarse aggregate shall be a CA 13, CA 14, CA 16 or a blend of these gradations. The fine aggregate shall consist of washed sand only.

At the Engineers discretion, and at no additional cost to the Department, the Contractor may be required to conduct a minimum 0.76 cu m (1 cu yd) trial batch to verify the mix design.

- (b) The sand-cement grout mix used to fill any visible gaps, which may exist between the permanent casing and either the drilled excavation or temporary casing, shall be as follows:
 - (1) A Type I or II cement shall be used at 110 kg/cu m (185 lb/cu yd). When specified in the plans that soil and ground water sulfate contaminates exceed 500 parts per million, a Type V cement shall be required. The cement shall be according to Section 1001.
 - (2) The fine aggregate shall be according to Articles 1003.01 and 1003.02.
 - (3) The water shall be according to Section 1002.
 - (4) The maximum water/cement ratio shall be 1.0.
- (c) Reinforcement shall be according to Section 508 of the Standard Specifications.
- (d) Drilling slurry, when required, shall consist of a polymer or mineral base material. Mineral slurry shall have both a mineral grain size that will remain in suspension with sufficient viscosity and gel characteristics to transport excavated material to a suitable screening system. The percentage and specific gravity of the material used to make the suspension shall be sufficient to maintain the stability of the excavation and to allow proper concrete placement. For polymer slurry, the calcium hardness of the mixing water shall not exceed 100 mg/L.
- (e) Permanent casing, when required, shall be fabricated from steel satisfying ASTM A252 Grade 2, produced by electric seam, butt, or spiral welding to satisfy the outside diameter(s) and lengths shown in the contract plans or as shown in the Contractor's installation procedure. The minimum wall thickness shall be as required to resist the anticipated installation and dewatering stresses, as determined by the Contractor, but in no case less than 6 mm (1/4 in.).

Equipment. The drilling equipment shall have adequate capacity, including power, torque and down thrust, to create a shaft excavation of the maximum diameter specified to a depth of 20 percent beyond the depths shown on the plans. Standby equipment of sufficient capacity shall be available so that there will be no delay in placing of the concrete once the operation has started. Concrete equipment shall be according to Article 1020.03 of the Standard Specifications.

Construction Requirements. Excavation for drilled shaft(s) shall not proceed until written authorization is received from the Engineer. The Contractor shall furnish an installation log for each shaft installed. Excavation by blasting shall not be permitted unless authorized in writing by the Engineer.

No shaft excavation shall be made within 4 shaft diameters center to center of a shaft with concrete that has a compressive strength less than 10,342 kPa (1500 psi) unless otherwise approved in the Contractor's installation procedure. The site-specific soil strengths and installation methods selected will determine the actual required minimum spacing, if any, to address vibration and blow out concerns.

Materials removed or generated from the shaft excavations shall be disposed of by the Contractor according to Article 202.03 of the Standard Specifications.

The Contractor's methods and equipment shall be suitable for the anticipated conditions and the following requirements noted below:

(a) Construction Tolerances. The following construction tolerances shall apply to all drilled shafts unless otherwise stated in the contract documents:

- (1) The center of the drilled shaft shall be within 75 mm (3 in.) of the plan station and offset at the top of the shaft.
- (2) The center of the reinforcement cage shall be within 38 mm (1 1/2 in.) of plan station and offset at the top of the shaft.
- (3) The out of vertical plumbness of the shaft shall not exceed 1.5 percent.
- (4) The out of vertical plumbness of the shaft reinforcement cage shall not exceed 0.83 percent.
- (5) The top of the reinforcing steel cage shall be no more than 25 mm (1 in.) above and no more than 75 mm (3 in.) below the plan elevation.
- (6) The top of the shaft shall be no more than 25 mm (1 in.) above and no more than 75 mm (3 in.) below the plan elevation.
- (7) Excavation equipment and methods used to complete the shaft excavation shall have a nearly planar bottom. The cutting edges of excavation equipment used to create the bottom of shafts in rock shall be normal to the vertical axis of the shaft within a tolerance of 6.25 percent.

(b) Construction Methods. The construction of drilled shafts may involve the use of one or more of the following methods to support the excavation during the various phases of shaft drilling, cleaning and concrete placement dependent on the site conditions encountered. The following are general descriptions indicating the conditions when these methods may be used:

- (1) Dry Method. The dry method consists of drilling the shaft excavation, removing accumulated water and loose material from the excavation, placing the reinforcing cage, and concrete in a predominately dry excavation. This method shall be used only at sites where the groundwater and soil conditions are suitable to permit the drilling and dewatering of the excavation without causing excessive water infiltration, boiling, squeezing, or caving of the shaft side walls. This method allows the concrete placement by tremie or concrete pumps, or if the excavation can be dewatered, the concrete can be placed by free fall within the limits specified for concrete placement.
- (2) Wet Method. The wet construction method may be used at sites where dewatering the excavation would cause collapse of the shaft sidewalls or when the volume and head of water flowing into the shaft is likely to contaminate the concrete during placement resulting in a shaft defect. This method uses water or slurry to maintain stability of the shaft perimeter while advancing the excavation. After the excavation is completed, the water level in the shaft is allowed to seek equilibrium, the base is cleaned, the reinforcing cage is set and the concrete is discharged at the base using a tremie pipe or concrete pump, displacing the drilling fluid upwards.
- (3) Temporary Casing Method. Temporary casing shall be used when either the wet or dry methods provide inadequate support to prevent sidewall caving or ensure excessive deformation of the hole. Temporary casing may also be used to reduce the flow of water into the excavation to allow dewatering, adequate cleaning and inspection, or to insure proper concrete placement. Temporary casing left in place may constitute a shaft defect; no temporary casing will be allowed to remain permanently in place without the specific approval of the Engineer.

Before the temporary casing is broken loose, the level of concrete in the casing shall be a minimum of 1.5 m (5 ft) above the bottom of the casing. After being broken loose and as the casing is withdrawn, additional concrete shall be added to maintain sufficient head so that water and soil trapped behind the casing can be displaced upward and discharged at the ground surface without contaminating the concrete in the shaft or at the finished construction joint.

- (4) Permanent Casing Method. When called for on the plans or proposed as part of the Contractor's accepted installation procedure, the Contractor shall install a permanent casing of the diameter, length, thickness and strength specified. When permanent casings are used, the lateral loading design requires intimate contact between the casing and the surrounding soils. If the installation procedure used to set the permanent casing results in annular voids between the permanent casing and the drilled excavation, the voids shall be filled with a sand-cement grout to maintain the lateral load capacity of the surrounding soil, as assumed in the design. No permanent casing will be allowed to remain in place beyond the limits shown on the plans without the specific approval of the Engineer.

- (5) Removable Forms. When the shaft extends above streambed through a body of water and permanent casing is not shown, the portion above the streambed shall be formed with removable casings, column forms, or other forming systems as approved by the Engineer. The forming system shall not scar or spall the finished concrete or leave in place any forms or casing within the removable form limits as shown on the plans unless approved as part of the installation procedure. The forming system shall not be removed until the concrete has attained a minimum compressive strength of 17,237 kPa (2500 psi) and cured for a minimum of 72 hours. For shafts extending through water, the concrete shall be protected from water action after placement for a minimum of 7 days.
- (c) Slurry. If the Contractor proposes to use a method of slurry construction, it shall be submitted with the installation plan. During construction, the level of the slurry shall be maintained at a height sufficient to prevent caving of the hole. In the event of a sudden or significant loss of slurry to the hole, the construction of that foundation shall be stopped and the shaft excavation backfilled or supported by temporary casing, until a method to stop slurry loss, or an alternate construction procedure has been approved by the Engineer.
- (d) Obstructions. Obstructions shall be defined as any object (such as but not limited to, boulders, logs, old foundations etc.) that cannot be removed with normal earth drilling procedures but requires special augers, tooling, core barrels or rock augers to remove the obstruction. When obstructions are encountered, the Contractor shall notify the Engineer and upon concurrence of the Engineer, the Contractor shall begin working to core, break up, push aside, or remove the obstruction. Lost tools or equipment in the excavation as a result of the Contractor's operation shall not be defined as obstructions and shall be removed at the Contractor's expense.
- (e) Top of Rock. The actual top of rock will be defined as the point when material is encountered which can not be drilled with a conventional earth auger and/or underreaming tool, and requires the use of special rock augers, core barrels, air tools, blasting or other methods of hand excavation.
- (f) Sidewall overreaming. Sidewall overreaming shall be required when the sidewall of the hole is determined by the Engineer to have either softened due to the excavation methods, swelled due to delay in concreting, or degraded because of slurry cake buildup. It may also be required to correct a shaft excavation which has been drilled out of tolerance. Overreaming thickness shall be a minimum of 13 mm (1/2 in.). Overreaming may be accomplished with a grooving tool, overreaming bucket or other approved equipment. Any extra concrete needed as a result of the overreaming shall be furnished and installed at the Contractor's expense.
- (g) Excavation Inspection. The Contractor shall be responsible for verification of the dimensions and alignment of each shaft excavation as directed by the Engineer. Unless otherwise specified in the contract documents, the Contractor's cleaning operation shall be adjusted so that a minimum of 50 percent of the base of each shaft shall have less than 13 mm (1/2 in.) of sediment or debris at the time of placement of the concrete. The maximum depth of sediment or any debris at any place on the base of the shaft shall not exceed 38 mm (1 1/2 in.).

Shaft cleanliness will be determined by the Contractor using the methods as submitted in their installation procedure. Visual inspection coupled with the use of a weighted tape may also be used to confirm adequate cleanliness.

- (h) Design Modifications. If the top of rock elevation differs from that shown on the plans by more than 10 percent of the length of the shaft above the rock, the Engineer shall be contacted to determine if any drilled shaft design changes may be required. In addition, if the type of soil or rock encountered is not similar to that shown in the subsurface exploration data, the Contractor may be required to extend the drilled shaft length(s) beyond those specified in the plans. In either case, the Engineer will determine if revisions are necessary and the extent of the modifications required.
- (i) Reinforcement Cage Construction and Placement. The shaft excavation shall be cleaned, inspected and accepted prior to placing the reinforcement cage. The reinforcement cage shall be completely assembled prior to drilling and be ready for adjustment in length as required by the conditions encountered. The cage shall be lifted using multiple point sling straps or other approved methods to avoid cage distortion or stress. Additional cross frame stiffeners may also be required for lifting or to keep the cage in proper position during lifting and concrete placement.

The Contractor shall attach suitable centralizers to keep the cage away from the sides of the shaft excavation and ensure that at no point will the finished shaft have less than the minimum concrete cover(s) shown on the plans. The cage centralizers or other approved non-corrosive spacing devices shall be used at sufficient intervals (near the bottom and at intervals not exceeding 3 m (10 ft) throughout the length of the shaft) to ensure proper cage alignment and clearance for the entire shaft.

If the top of rock encountered is deeper than estimated in the plans, and/or if the conditions differ such that the length of the shaft is increased, additional longitudinal bars shall be either mechanically spliced or lap spliced to the lower end of the cage and confined with either hoop ties or spirals to provide the additional length. If the additional shaft length is less than the lap splice shown, subject to the approval of the Engineer, a mechanical splice may be used in lieu of the lap splice in order to take advantage of or utilize that lap length in the extension of the shaft reinforcement. The Contractor shall have additional reinforcement available or fabricate the cages with additional length as necessary to make the required adjustments in a timely manner as dictated by the encountered conditions. The additional reinforcement may be non-epoxy coated at the option of the Contractor. Any reinforcement fabricated in advance but not incorporated into the installed shaft(s) shall not be paid for but shall remain the property of the Contractor.

- (j) Concrete placement. Concrete work shall be performed according to the applicable portions of Section 503 of the Standard Specifications and as specified herein.

Concrete shall be placed as soon as possible after reinforcing steel is set and secured in proper position. The pour shall be made in a continuous manner from the bottom to the top elevation of the shaft as shown on the contract plan or as approved in the Contractor's installation procedure. Concrete placement shall continue after the shaft excavation is full and until good quality, uncontaminated concrete is evident at the top of shaft. The elapsed

time from the beginning of concrete placement in the shaft to the completion of the placement shall not exceed 2 hours. The Contractor may request a longer placement time provided the concrete mix maintains the minimum slump requirements over the longer placement time as demonstrated by trial mix and slump loss tests. Concrete shall be placed either by free fall, or through a tremie or concrete pump subject to the following conditions:

- (1) The free fall placement shall only be permitted in shafts that can be dewatered to ensure less than 75 mm (3 in.) of standing water exist at the time of placement without causing side wall instability. The maximum height of free fall placement shall not exceed 18.3 m (60 ft). Concrete placed by free fall shall fall directly to the base without contacting either the rebar cage or hole sidewall. Drop chutes may be used to direct concrete to the base during free fall placement.

Drop chutes used to direct placement of free fall concrete shall consist of a smooth tube of either one continuous section or multiple pieces that can be added and removed. Concrete may be placed through either a hopper at the top of the tube or side openings as the drop chute is retrieved during concrete placement. The drop chute shall be supported so that the free fall does not exceed 18.3 m (60 ft) at all times and to ensure the concrete does not strike the rebar cage. If placement cannot be satisfactorily accomplished by free fall in the opinion of the Engineer, the Contractor shall use either tremie or pumping to accomplish the pour.

- (2) Tremies shall consist of a tube of sufficient length, weight, and diameter to discharge the initial concrete at the base of the shaft. The tremie shall be according to Article 503.08 of the Standard Specifications and contain no aluminum parts that may have contact with the concrete. The inside and outside surfaces of the tremie shall be clean and smooth to permit both flow of concrete and unimpeded withdrawal during concrete placement.
- (3) Concrete pumps: Pumps and lines may be used for concrete placement and shall have a minimum 100 mm (4 in.) diameter.

The tremie or pump lines used for wet method concrete placement shall be watertight and not begin discharge until placed within 250 mm (10 in.) of the shaft base. Valves, bottom plates or plugs may be used only when they can be removed from the excavation or be of a material approved by the Engineer that will not cause a defect in the shaft if not removed. The discharge end shall be immersed at least 1.5 m (5 ft) in concrete at all times after starting the pour. Sufficient concrete head shall be maintained in the tremie at all times to prevent water or slurry intrusion in the shaft concrete.

If at any time during the concrete pour in the "wet" hole, the tremie or pump line orifice is removed from the fluid concrete and discharges through drilling fluid or water above the rising concrete level, the shaft may be considered defective.

Vibration of concrete is not recommended when placed while displacing drilling fluid or water. In dry excavations, vibration is allowed only in the top 3 m (10 ft) of the shaft.

Conformity with Contract. In addition to Article 105.03, the Contractor shall be responsible for correcting all out of tolerance excavations and completed shafts as well as repairing any defects in the shaft to the satisfaction of the Engineer at no additional cost to the Department. No time extensions will be allowed to repair or replace unacceptable work. When a shaft excavation is completed with unacceptable tolerances, the Contractor will be required to submit for approval his/her proposed corrective measures. Any proposed design modification with computations submitted by the Contractor shall be signed and sealed by an Illinois licensed Structural Engineer.

Method of Measurement. The items Drilled Shaft in Soil and Drilled Shaft in Rock, will be measured for payment and the length computed in meters (feet) for all drilled shafts installed according to the plans, specifications, and accepted by the Engineer. The length shall be measured at each shaft. The length in soil will be defined as the difference in elevation between the top of the drilled shaft shown on the plans, or as installed as part of the Contractor's installation procedure, and the bottom of the shaft or the top of rock (when present) whichever is higher. The length in rock will be defined as the difference in elevation between the measured top of rock and the bottom of the shaft. When permanent casing is installed as specified on the plans, it will be measured in meters (feet) and shall be the length of casing installed.

Basis of Payment. This work will be paid for at the contract unit price per meter (foot) for DRILLED SHAFT IN SOIL, and/or DRILLED SHAFT IN ROCK, of the diameter(s) specified. The price shall be payment in full for all labor, materials, equipment, and services necessary to complete the work as specified. When the shaft is detailed with a belled base, furnishing and installing it shall not be paid for separately but shall be included in the cost of the appropriate drilled shaft item(s).

When permanent casing is furnished and installed as specified, it will be paid for at the contract unit price per meter (foot) for PERMANENT CASING. Permanent casing installed at the Contractor's option shall not be included in this item, but shall be considered as included in the appropriate drilled shaft item(s) above.

Obstruction mitigation shall be paid for according to Article 109.04 of the Standard Specifications.

No additional compensation, other than noted above, will be allowed for removing and disposing of excavated materials, for furnishing and placing concrete, bracing, lining, temporary casings placed and removed or left in place, for grouting of any voids, or for any excavation made or concrete placed outside of the plan diameter(s) of the shaft(s) specified.

Reinforcement bars, spirals and ties shall be as specified and paid for under the items, REINFORCEMENT BARS or REINFORCEMENT BARS EPOXY COATED, according to Section 508 of the Standard Specifications.

AUTHORITY OF RAILROAD ENGINEER (BDE)

Effective: July 1, 2004

Revise Article 105.02 of the Standard Specifications to read:

“105.02 Authority of Railroad Engineer. Whenever the safety of railroad traffic is concerned, the Railroad Engineer will have jurisdiction over safety measures to be taken and his/her decision as to the methods, procedures, and measures used shall be final, and any and all Contractors performing work near or about the railroad shall be governed by such decision. Instructions to the Contractor by the Railroad Engineer will be given through the Engineer. Work ordered as specified herein will be classified and paid for according to Article 104.02. Work performed for the Contractor’s convenience will not be paid for separately but shall be considered as included in the contract.”

BITUMINOUS CONCRETE SURFACE COURSE (BDE)

Effective: April 1, 2001

Revised: April 1, 2003

Replace the fourth paragraph of Article 406.23(b) of the Standard Specifications with the following:

“Mixture for cracks, joints, flangeways, leveling binder (machine method), leveling binder (hand method) and binder course in excess of 103 percent of the quantity specified by the Engineer will not be measured for payment.

Surface course mixture in excess of 103 percent of adjusted plan quantity will not be measured for payment. The adjusted plan quantity for surface course mixtures will be calculated as follows:

Adjusted Plan Quantity = C x quantity shown on the plans or as specified by the Engineer.

where C = metric: $C = \frac{G_{mb} \times 24.99}{U}$ English: $C = \frac{G_{mb} \times 46.8}{U}$

and where:

G_{mb} = average bulk specific gravity from approved mix design.

U = Unit weight of surface course shown on the plans in kg/sq m/25 mm (lb/sq yd/in.), used to estimate plan quantity.

24.99 = metric constant.

46.8 = English constant.

If project circumstances warrant a new surface course mix design, the above equations shall be used to calculate the adjusted plan quantity for each mix design using its respective average bulk specific gravity.”

BITUMINOUS EQUIPMENT, SPREADING AND FINISHING MACHINE (BDE)

Effective: January 1, 2005

Revise the fourth paragraph of Article 1102.03 of the Standard Specifications to read:

“The paver shall be equipped with a receiving hopper having sufficient capacity for a uniform spreading operation. The hopper shall be equipped with a distribution system to uniformly place a non-segregated mixture in front of the screed. The distribution system shall have chain curtains, deflector plates, and/or other devices designed and built by the paver manufacturer to prevent segregation during distribution of the mixture from the hopper to the paver screed. The Contractor shall submit a written certification that the devices recommended by the paver manufacturer to prevent segregation have been installed and are operational. Prior to paving, the Contractor, in the presence of the Engineer, shall visually inspect paver parts specifically identified by the manufacturer for excessive wear and the need for replacement. The Contractor shall supply a completed check list to the Engineer noting the condition of the parts. Worn parts shall be replaced. The Engineer may require an additional inspection prior to the placement of a surface course or at other times throughout the work.”

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)”

CURB RAMPS FOR SIDEWALK (BDE)

Effective: January 1, 2004

Description. This work shall consist of constructing sidewalk curb ramps with detectable warnings in compliance with the Americans with Disabilities Act, Accessibility Guidelines (ADAAG). Work shall be according to Section 424 of the Standard Specifications except as modified herein.

The detectable warnings shall consist of an area of truncated domes that provide both visual and tactile cues to pedestrians who are about to enter into traffic. The warning area shall begin 150 mm (6 in.) from the back of the curb and continue 600 mm (2 ft) in the direction of pedestrian travel for the entire width of the walking surface.

The detectable warnings shall also present a contrast in color from the adjacent sidewalk. This shall be accomplished by constructing the warning area, plus the 150 mm (6 in.) area between the warning area and the back of curb, out of concrete that is integrally colored red. However if the sidewalk is brick or of some dark color, the contrast requirement shall be achieved with normal (grey), Class SI concrete.

Materials. Materials for the detectable warning area of the curb ramps shall meet the following requirements.

- a) Integrally Colored Concrete. Integrally colored concrete shall be according to Section 1020 of the Standard Specification for Class SI concrete except as follows.

Article 1020.04 The allowable water/cement ratio range shall be 0.40 minimum to 0.44 maximum.

Article 1020.04 The allowable slump range shall be 75 mm (3 in.) minimum to 125 mm (5 in.) maximum.

Article 1020.04 The allowable coarse aggregate gradations shall be CA 11, CA 13, CA 14, and CA 16.

- Article 1020.05(b) A calcium chloride accelerating admixture shall not be used.
- Article 1020.05(b) The cement factor shall not be reduced if a water-reducing or high range water-reducing admixture is used.
- Article 1020.05(c) Fly ash shall not be used.
- Article 1020.05(k) Ground granulated blast-furnace slag shall not be used.
- Article 1020.11 Pigment for integrally colored concrete shall be added to the concrete and mixed per the Manufacturer's recommendation.
- Article 1020.13 The curing method shall be Type I membrane curing.
- Article 1020.13. The protection method shall be according to Article 1020.13(e)(1) and the protection period shall be 96 hours. No material, including the insulating material, shall be placed in direct contact with the concrete surface.

(b) Pigment for Integrally Colored Concrete. The pigment shall meet the requirements of ASTM C 979, match color number 30166 of Federal Standard 595, and be on the Department's Approved List of Pigments for Integrally Colored Concrete.

(c) Release Agent for Concrete Stamping Tools. The release agent shall be according to the stamping tool manufacturer's recommendations and the following: it shall be a clear liquid that will evaporate, it shall not harm the concrete, and it shall allow the application of Type I membrane curing.

Equipment. Equipment for the detectable warning area of the curb ramps shall meet the following requirements.

(a) Concrete Stamps. Sufficient numbers and sizes of stamps shall be furnished to cover the various widths of the curb ramps. The stamps shall have an air opening at the top of each truncated dome recess; and shall be rigid enough to evenly distribute the force exerted during tamping.

(b) Tamper. The tamper shall be according to the concrete stamp manufacturer's recommendations.

CONSTRUCTION REQUIREMENTS

Stamping. The concrete shall be placed and finished according to Article 424.06 except the area to be stamped shall not be brushed. When the bleed water has been absorbed, stamping shall begin. The entire width of the curb ramp shall be stamped at the same time. A single stamp or a combination of stamps may be used.

Prior to placing the stamp on the concrete, the stamp shall be coated with the release agent. When recommended by the manufacturer, the release agent shall also be applied to the concrete surface. Once the stamp has been placed on the ramp, it shall remain down until the stamping is complete.

The entire area of the stamp shall be tamped with a short, slow, repetitive action such that the concrete is caused to move up and into the dome recesses of the stamp. Tamping shall continue until mortar has come through the air openings in the stamp. Stepping or walking on the stamp will not be allowed. The base elevation of the domes shall be even with the adjacent sidewalk surface; the stamp shall not be forced down into the concrete.

When stamping is complete, the stamp shall be removed and the concrete cured.

Upon completion of curing, or after cold weather protection if required, the protruding mortar tip on the top of each dome shall be removed and the dome rubbed or ground smooth.

CURING AND PROTECTION OF CONCRETE CONSTRUCTION (BDE)

Effective: January 1, 2004

Revise the second and third sentences of the eleventh paragraph of Article 503.06 of the Standard Specifications to read:

“Forms on substructure units shall remain in place at least 24 hours. The method of form removal shall not result in damage to the concrete.”

Delete the twentieth paragraph of Article 503.22 of the Standard Specifications.

Revise the “Unit Price Adjustments” table of Article 503.22 of the Standard Specifications to read:

“UNIT PRICE ADJUSTMENTS	
Type of Construction	Percent Adjustment in Unit Price
For concrete in substructures, culverts (having a waterway opening of more than 1 sq m (10 sq ft)), pump houses, and retaining walls (except concrete pilings, footings and foundation seals):	
When protected by:	
Protection Method II	115%
Protection Method I	110%
For concrete in superstructures:	
When protected by:	
Protection Method II	123%
Protection Method I	115%
For concrete in footings:	
When protected by:	
Protection Method I, II or III	107%
For concrete in slope walls:	
When protected by:	
Protection Method I	107%”

Delete the fourth paragraph of Article 504.05(a) of the Standard Specifications.

Revise the second and third sentences of the fifth paragraph of Article 504.05(a) of the Standard Specifications to read:

“All test specimens shall be cured with the units according to Article 1020.13.”

Revise the first paragraph of Article 504.06(c)(6) of the Standard Specifications to read:

“Curing and Low Air Temperature Protection. The curing and protection for precast, prestressed concrete members shall be according to Article 1020.13 and this Article.”

Revise the first sentence of the second paragraph of Article 504.06(c)(6) of the Standard Specifications to read:

“For curing, air vents shall be in place, and shall be so arranged that no water can enter the void tubes during the curing of the members.”

Revise the first sentence of the third paragraph of Article 504.06(c)(6) of the Standard Specifications to read:

“As soon as each member is finished, the concrete shall be covered with curing material according to Article 1020.13.”

Revise the eighth paragraph of Article 504.06(c)(6) of the Standard Specifications to read:

“The prestressing force shall not be transferred to any member before the concrete has attained the compressive strength of 28,000 kPa (4000 psi) or other higher compressive release strength specified on the plans, as determined from tests of 150 mm (6 in.) by 300 mm (12 in.) cylinders cured with the member according to Article 1020.13. Members shall not be shipped until 28-day strengths have been attained and members have a yard age of at least 4 days.”

Delete the third paragraph of Article 512.03(a) of the Standard Specifications.

Delete the last sentence of the second paragraph of Article 512.04(d) of the Standard Specifications.

Revise the “Index Table of Curing and Protection of Concrete Construction” table of Article 1020.13 of the Standard Specifications to read:

“INDEX TABLE OF CURING AND PROTECTION OF CONCRETE CONSTRUCTION			
TYPE OF CONSTRUCTION	CURING METHODS	CURING PERIOD DAYS	LOW AIR TEMPERATURE PROTECTION METHODS
Cast-in-Place Concrete: ^{11/}			
Pavement			
Shoulder	1020.13(a)(1)(2)(3)(4)(5) ^{3/ 5/}	3	1020.13(c)
Base Course			
Base Course Widening	1020.13(a)(1)(2)(3)(4)(5) ^{1/ 2/}	3	1020.13(c)
Driveway			
Median			
Curb			
Gutter	1020.13(a)(1)(2)(3)(4)(5) ^{4/ 5/}	3	1020.13(c) ^{16/}
Curb and Gutter			
Sidewalk			
Slope Wall			
Paved Ditch			
Catch Basin			
Manhole	1020.13(a)(1)(2)(3)(4)(5) ^{4/}	3	1020.13(c)
Inlet			
Valve Vault			
Pavement Patching	1020.13(a)(1)(2)(3)(4)(5) ^{2/}	3 ^{12/}	1020.13(c)
Pavement Replacement	1020.13(a)(1)(2)(3)(4)(5) ^{1/ 2/}	3	442.06(h) and 1020.13(c)
Railroad Crossing	1020.13(a)(3)(5)	1	1020.13(c)
Piles	1020.13(a)(3)(5)	7	1020.13(e)(1)(2)(3)
Footings			
Foundation Seals	1020.13(a)(1)(2)(3)(4)(5) ^{4/6/}	7	1020.13(e)(1)(2)(3)
Substructure	1020.13(a)(1)(2)(3)(4)(5) ^{1/7/}	7	1020.13(e)(1)(2)(3)
Superstructure (except deck)	1020.13(a)(1)(2)(3)(5) ^{8/}	7	1020.13(e)(1)(2)
Deck	1020.13(a)(5)	7	1020.13(e)(1)(2) ^{17/}
Retaining Walls	1020.13(a)(1)(2)(3)(4)(5) ^{1/7/}	7	1020.13(e)(1)(2)
Pump Houses	1020.13(a)(1)(2)(3)(4)(5) ^{1/}	7	1020.13(e)(1)(2)
Culverts	1020.13(a)(1)(2)(3)(4)(5) ^{4/6/}	7	1020.13(e)(1)(2) ^{18/}
Other Incidental Concrete	1020.13(a)(1)(2)(3)(5)	3	1020.13(c)
Precast Concrete: ^{11/}			
Bridge Beams			
Piles			
Bridge Slabs	1020.13(a)(3)(5) ^{9/10/}	As required.	^{13/} 504.06(c)(6), 1020.13(e)(2) ^{19/}
Nelson Type Structural Member			
All Other Precast Items	1020.13(a)(3)(4)(5) ^{2/9/10/}	As required.	^{14/} 504.06(c)(6), 1020.13(e)(2) ^{19/}
Precast, Prestressed Concrete: ^{11/}			
All Items	1020.13(a)(3)(5) ^{9/10/}	Until strand	504.06(c)(6), 1020.13(e)(2) ^{19/} tensioning is released. ^{15/}

Notes-General:

- 1/ Type I, membrane curing only
- 2/ Type II, membrane curing only
- 3/ Type III, membrane curing only
- 4/ Type I, II and III membrane curing
- 5/ Membrane curing will not be permitted between November 1 and April 15.
- 6/ The use of water to inundate footings, foundation seals or the bottom slab of culverts is permissible when approved by the Engineer, provided the water temperature can be maintained at 7 °C (45 °F) or higher.
- 7/ Asphalt Emulsion for Waterproofing may be used in lieu of other curing methods when specified and permitted according to Article 503.18.
- 8/ On non-traffic surfaces which receive protective coat according to Article 503.19, a linseed oil emulsion curing compound may be used as a substitute for protective coat and other curing methods. The linseed emulsion curing compound will be permitted between April 16 and October 31 of the same year, provided it is applied with a mechanical sprayer according to Article 1101.09 (b), and meets the material requirements of Article 1022.07.
- 9/ Steam curing (heat and moisture) is acceptable and shall be accomplished by the method specified in Article 504.06(c)(6).
- 10/ A moist room according to AASHTO M 201 is acceptable for curing.
- 11/ If curing is required and interrupted because of form removal for cast-in-place concrete items, precast concrete products, or precast prestressed concrete products, the curing shall be resumed within two hours from the start of the form removal.
- 12/ Curing maintained only until opening strength is attained, with a maximum curing period of three days.
- 13/ The curing period shall end when the concrete has attained the mix design strength. The producer has the option to discontinue curing when the concrete has attained 80 percent of the mix design strength or after seven days. All strength test specimens shall remain with the units and shall be subjected to the same curing method and environmental condition as the units, until the time of testing.
- 14/ The producer shall determine the curing period or may elect to not cure the product. All strength test specimens shall remain with the units and shall be subjected to the same curing method and environmental condition as the units, until the time of testing.
- 15/ The producer has the option to continue curing after strand release.
- 16/ When structural steel or structural concrete is in place above slope wall, Article 1020.13(c) shall not apply. The protection method shall be according to Article 1020.13(e)(1).
- 17/ When Article 1020.13(e)(2) is used to protect the deck, the housing may enclose only the bottom and sides. The top surface shall be protected according to Article 1020.13(e)(1).
- 18/ For culverts having a waterway opening of 1 sq m (10 sq ft) or less, the culverts may be protected according to Article 1020.13(e)(3).
- 19/ The seven day protection period in the first paragraph of Article 1020.13(e)(2) shall not apply. The protection period shall end when curing is finished. For the third paragraph of Article 1020.13(e)(2), the decrease in temperature shall be according to Article 504.06(c)(6)."

Add the following to Article 1020.13(a) of the Standard Specifications:

“(5) Wetted Cotton Mat Method. After the surface of concrete has been textured or finished, it shall be covered immediately with dry cotton mats. The cotton mats shall be placed in a manner which will not mar the concrete surface. A texture resulting from the cotton mat material is acceptable. The cotton mats shall then be wetted immediately and thoroughly soaked with a gentle spray of water. For bridge decks, a foot bridge shall be used to place and wet the cotton mats.

The cotton mats shall be maintained in a wetted condition until the concrete has hardened sufficiently to place soaker hoses without marring the concrete surface. The soaker hoses shall be placed on top of the cotton mats at a maximum 1.2 m (4 ft) spacing. The cotton mats shall be kept wet with a continuous supply of water for the remainder of the curing period. Other continuous wetting systems may be used if approved by the Engineer.

After placement of the soaker hoses, the cotton mats shall be covered with white polyethylene sheeting or burlap-polyethylene blankets.

For construction items other than bridge decks, soaker hoses or a continuous wetting system will not be required if the alternative method keeps the cotton mats wet. Periodic wetting of the cotton mats is acceptable.

For areas inaccessible to the cotton mats on bridge decks, curing shall be according to Article 1020.13(a)(3).”

Revise the first paragraph of Article 1020.13(c) of the Standard Specifications to read:

“Protection of Portland Cement Concrete, Other Than Structures, From Low Air Temperatures. When the official National Weather Service forecast for the construction area predicts a low of 0 °C (32 °F), or lower, or if the actual temperature drops to 0 °C (32 °F), or lower, concrete less than 72 hours old shall be provided at least the following protection.”

Delete Article 1020.13(d) and Articles 1020.13(d)(1),(2),(3),(4) of the Standard Specifications.

Revise the first five paragraphs of Article 1020.13(e) of the Standard Specifications to read:

“Protection of Portland Cement Concrete Structures From Low Air Temperatures. When the official National Weather Service Forecast for the construction area predicts a low below 7 °C (45 °F), or if the actual temperature drops below 7 °C (45 °F), concrete less than 72 hours old shall be provided protection. Concrete shall also be provided protection when placed during the winter period of December 1 through March 15. Concrete shall not be placed until the materials, facilities and equipment for protection are approved by the Engineer.

When directed by the Engineer, the Contractor may be required to place concrete during the winter period. If winter construction is specified, the Contractor shall proceed with the construction, including concrete, excavation, pile driving, steel erection and all appurtenant work required for the complete construction of the item, except at times when weather conditions make such operations impracticable.

Regardless of the precautions taken, the Contractor shall be responsible for protection of the concrete placed and any concrete damaged by cold temperatures shall be removed and replaced by the Contractor at his/her own expense.”

Add the following at the end of the third paragraph of Article 1020.13(e)(1) of the Standard Specifications:

“The Contractor shall provide means for checking the temperature of the surface of the concrete during the protection period.”

Revise the second sentence of the first paragraph of Article 1020.13(e)(2) of the Standard Specifications to read:

“The Contractor shall provide means for checking the temperature of the surface of the concrete or air temperature within the housing during the protection period.”

Delete the last sentence of the first paragraph of Article 1020.13(e)(3) of the Standard Specifications.

Add the following Article to Section 1022 of the Standard Specifications:

“1022.06 Cotton Mats. Cotton mats shall consist of a cotton fill material, minimum 400 g/sq m (11.8 oz/sq yd), covered with unsized cloth or burlap, minimum 200 g/sq m (5.9 oz/sq yd), and be tufted or stitched to maintain stability.

Cotton mats shall be in a condition satisfactory to the Engineer. Any tears or holes in the mats shall be repaired.

Add the following Article to Section 1022 of the Standard Specifications:

“1022.07 Linseed Oil Emulsion Curing Compound. Linseed oil emulsion curing compound shall be composed of a blend of boiled linseed oil and high viscosity, heavy bodied linseed oil emulsified in a water solution. The curing compound shall meet the requirements of a Type I, II, or III according to Article 1022.01, except the drying time requirement will be waived. The oil phase shall be 50 ± 4 percent by volume. The oil phase shall consist of 80 percent by mass (weight) boiled linseed oil and 20 percent by mass (weight) Z-8 viscosity linseed oil. The water phase shall be 50 ± 4 percent by volume.”

Revise Article 1020.14 of the Standard Specifications to read:

“1020.14 Temperature Control for Placement. Temperature control for concrete placement shall conform to the following requirements:

- (a) Temperature Control other than Structures. The temperature of concrete immediately before placing, shall be not less than 10 °C (50 °F) nor more than 32 °C (90 °F). Aggregates and/or water shall be heated or cooled as necessary to produce concrete within these temperature limits.

When the temperature of the plastic concrete reaches 30 °C (85 °F), an approved retarding admixture shall be used or the approved water reducing admixture in use shall have its dosage increased by 50 percent over the dosage recommended on the Department’s Approved List of Concrete Admixtures for the temperature experienced.

The amount of retarding admixture to be used will be determined by the Engineer. This requirement may be waived by the Engineer when fly ash compensated mixtures are used.

Plastic concrete temperatures up to 35 °C (96 °F), as placed, may be permitted provided job site conditions permit placement and finishing without excessive use of water on and/or overworking of the surface. The occurrence within 24 hours of unusual surface distress shall be cause to revert to a maximum 32 °C (90 °F) plastic concrete temperature.

Concrete shall not be placed when the air temperature is below 5 °C (40 °F) and falling or below 2 °C (35 °F), without permission of the Engineer. When placing of concrete is authorized during cold weather, the Engineer may require the water and/or the aggregates to be heated to not less than 20 °C (70 °F) nor more than 65 °C (150 °F). The aggregates may be heated by either steam or dry heat prior to being placed in the mixer. The apparatus used shall heat the mass uniformly and shall be so arranged as to preclude the possible occurrence of overheated areas which might damage the materials. No frozen aggregates shall be used in the concrete.

For pavement patching, refer to Article 442.06(e) for additional information on temperature control for placement.

- (b) Temperature Control for Structures. The temperature of concrete as placed in the forms shall be not less than 10 °C (50 °F) nor more than 32 °C (90 °F). Aggregates and/or water shall be heated or cooled as necessary to produce concrete within these temperature limits. When insulated forms are used, the temperature of the concrete mixture shall not exceed 25 °C (80 °F). If the Engineer determines that heat of hydration might cause excessive temperatures in the concrete, the concrete shall be placed at a temperature between 10 °C (50 °F) and 15 °C (60 °F), per the Engineer's instructions. When concrete is placed in contact with previously placed concrete, the temperature of the concrete may be increased as required to offset anticipated heat loss.

Concrete shall not be placed when the air temperature is below 7 °C (45 °F) and falling or below 4 °C (40 °F), without permission of the Engineer. When placing of concrete is authorized during cold weather, the Engineer may require the water and/or the aggregates to be heated to not less than 20 °C (70 °F) nor more than 65 °C (150 °F). The aggregates may be heated by either steam or dry heat prior to being placed in the mixer. The apparatus used shall heat the mass uniformly and shall be so arranged as to preclude the possible occurrence of overheated areas which might damage the materials. No frozen aggregates shall be used in the concrete.

When the temperature of the plastic concrete reaches 30 °C (85 °F), an approved retarding admixture shall be used or the approved water reducing admixture in use shall have its dosage increased by 50 percent over the dosage recommended on the Department's Approved List of Concrete Admixtures for the temperature experienced. The amount of retarding admixture to be used will be determined by the Engineer. This requirement may be waived by the Engineer when fly ash compensated mixtures are used.

- (c) Temperature. The concrete temperature shall be determined according to ASTM C 1064."

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 25.00% 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 Flagger. 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.”

FREEZE-THAW RATING (BDE)

Effective: November 1, 2002

Revise the first sentence of Article 1004.02(f) of the Standard Specifications to read:

“When coarse aggregate is used to produce portland cement concrete for base course, base course widening, pavement, driveway pavement, sidewalk, shoulders, curb, gutter, combination curb and gutter, median, paved ditch or their repair using concrete, the gradation permitted will be determined from the results of the Department’s Freeze-Thaw Test.”

HAND VIBRATOR (BDE)

Effective: November 1, 2003

Add the following paragraph to Article 1103.17(a) of the Standard Specifications:

“The vibrator shall have a non-metallic head for areas containing epoxy coated reinforcement. The head shall be coated by the manufacturer. The hardness of the non-metallic head shall be less than the epoxy coated reinforcement, resulting in no damage to the epoxy coating. Slip-on covers will not be allowed.”

INLET FILTERS (BDE)

Effective: August 1, 2003

Add the following to Article 280.02 of the Standard Specifications:

“(k) Inlet Filters..... 1081.15(h)”

Add the following paragraph after the first paragraph of Article 280.04(c) of the Standard Specifications:

“When specified, drainage structures shall be protected with inlet filters. Inlet filters shall be installed either directly on the drainage structure or under the grate of the drainage structure resting on the lip of the frame. The fabric bag shall hang down into the drainage structure. Prior to ordering materials, the Contractor shall determine the size and shape of the various drainage structures being protected.”

Revise Article 280.07(d) of the Standard Specifications to read:

“(d) Inlet and Pipe Protection. This work will be paid for at the contract unit price per each for INLET AND PIPE PROTECTION.

Protection of drainage structures with inlet filters will be paid for at the contract unit price per each for INLET FILTERS.”

Add the following to Article 1081.15 of the Standard Specifications:

“(h) Inlet Filters. An inlet filter shall consist of a steel frame with a two piece geotextile fabric bag attached with a stainless steel band and locking cap that is suspended from the frame. A clean, used bag and a used steel frame in good condition meeting the approval of the Engineer may be substituted for new materials. Materials for the inlet filter assembly shall conform to the following requirements:

(1) Frame Construction. Steel shall conform to Article 1006.04.

Frames designed to fit under a grate shall include an overflow feature that is welded to the frame’s ring. The overflow feature shall be designed to allow full flow of water into the structure when the filter bag is full. The dimensions of the frame shall allow the drainage structure grate to fit into the inlet filter assembly frame opening. The assembly frame shall rest on the inside lip of the drainage structure frame for the full variety of existing and proposed drainage structure frames that are present on this contract. The inlet filter assembly frame shall not cause the drainage structure grate to extend higher than 6 mm (1/4 in.) above the drainage structure frame.

(2) Grate Lock. When the inlet is located in a traffic lane, a grate lock shall be used to secure the grate to the frame. The grate lock shall conform to the manufacturer’s requirements for materials and installation.

(3) Geotextile Fabric Bag. The sediment bag shall be constructed of an inner filter bag and an outer reinforcement bag.

a. Inner Filter Bag. The inner filter bag shall be constructed of a polypropylene geotextile fabric with a minimum silt and debris capacity of 0.06 cu m (2.0 cu ft). The bag shall conform to the following requirements:

Inner Filter Bag		
Material Property	Test Method	Minimum Avg. Roll Value
Grab Tensile Strength	ASTM D 4632	45 kg (100 lb)
Grab Tensile Elongation	ASTM D 4632	50%
Puncture Strength	ASTM D 4833	29 kg (65 lb)
Trapezoidal Tear	ASTM D 4533	20 kg (45 lb)
UV Resistance	ASTM D 4355	70% at 500 hours
Actual Open Size	ASTM D 1420	212 µm (No. 70 sieve US)
Permittivity	ASTM D 4491	2.0/sec
Water Flow Rate	ASTM D 4491	5900 Lpm/sq m (145 gpm/sq ft)

- b. Outer Reinforcement Bag. The outer reinforcement bag shall be constructed of polyester mesh material that conforms to the following requirements:

Outer Reinforcement Bag		
Material Property	Test Method	Value
Content	ASTM D 629	Polyester
Weight	ASTM D 3776	155 g/sq m (4.55 oz/sq yd) ±15%
Whales (holes)	ASTM D 3887	7.5 ± 2 holes/25 mm (1 in.)
Chorses (holes)	ASTM D 3887	15.5 ± 2holes/25 mm (1 in.)
Instronball Burst	ASTM D 3887	830 kPa (120 psi) min.
Thickness	ASTM D 1777	1.0 ± 0.1 mm (0.040 ± 0.005 in.)

- (4) Certification. The manufacturer shall furnish a certification with each shipment of inlet filters, stating the amount of product furnished, and that the material complies with these requirements.”

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.”

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."

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.

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.

PLASTIC BLOCKOUTS FOR GUARDRAIL (BDE)

Effective: November 1, 2004

Add the following to Article 630.02 of the Standard Specifications:

“(h) Plastic Blockouts (Note 1.)

Note 1. Plastic blockouts, 150 mm (6 in.) deep, may be used in lieu of 150 mm (6 in.) deep wood block-outs for steel plate beam guardrail. The plastic blockouts shall be on the Department's approved list.”

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 location(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.

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.”

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”.”

PRECAST CONCRETE PRODUCTS (BDE)

Effective: July 1, 1999

Revised: November 1, 2004

Product Approval. Precast concrete products shall be produced according to the Department’s current Policy Memorandum, “Quality Control/Quality Assurance Program for Precast Concrete Products”. The Policy Memorandum applies to precast concrete products listed under the Products Key of the “Approved List of Certified Precast Concrete Producers”.

Precast Concrete Box Culverts. Add the following sentence to the end of the fourth paragraph of Article 540.06:

“After installation, the interior and exterior joint gap between precast concrete box culvert sections shall not exceed 38 mm (1 1/2 in.)”

Portland Cement Replacement. For precast concrete products using Class PC concrete or other mixtures, portland cement replacement with fly ash or ground granulated blast-furnace (GGBF) slag shall be governed by the AASHTO or ASTM standard specification referenced in the Standard Specifications.

For all other precast concrete products using Class PC concrete or other mixtures, portland cement replacement with fly ash or GGBF slag shall be approved by the Engineer. Class F fly ash shall not exceed 15 percent by mass (weight) of the total portland cement and Class F fly ash. Class C fly ash shall not exceed 20 percent by mass (weight) of the total portland cement and Class C fly ash. GGBF slag shall not exceed 25 percent by mass (weight) of the total portland cement and GGBF slag.

Concrete mix designs, for precast concrete products, shall not consist of portland cement, fly ash and GGBF slag.

Ready-Mixed Concrete. Delete the last paragraph of Article 1020.11(a) of the Standard Specifications.

Shipping. When a precast concrete product has attained the specified strength, the earliest the product may be loaded, shipped, and used is on the fifth calendar day. The first calendar day shall be the date casting was completed.

Acceptance. Products which have been lot or piece inspected and approved by the Department prior to July 1, 1999, will be accepted for use on this contract.

PERFORMED RECYCLED RUBBER JOINT FILLER (BDE)

Effective: November 1, 2002

Revise Article 503.02(c) of the Standard Specifications to read:

“(c) Performed Expansion Joint Filler 1051”

Revise Article 637.02(d) of the Standard Specifications to read:

“(d) Performed Expansion Joint Filler 1051”

Add the following Article to Section 1051 of the Standard Specifications:

“1051.10 Performed Recycled Rubber Joint Filler. Performed recycled rubber joint filler shall consist of ground tire rubber, free of steel and fabric, combined with ground scrap or waste polyethylene. It shall not have a strong hydrocarbon or rancid odor and shall meet the physical property requirements of ASTM D 1752. Water absorption by volume shall not exceed 5.0 percent.”

RAP FOR USE IN BITUMINOUS CONCRETE MIXTURES (BDE)

Effective: January 1, 2000

Revised: April 1, 2002

Revise Article 1004.07 to read:

“1004.07 RAP Materials. RAP is reclaimed asphalt pavement resulting from cold milling or crushing of an existing dense graded hot-mix asphalt pavement. RAP must originate from routes or airfields under federal, state or local agency jurisdiction. The Contractor shall supply documentation that the RAP meets these requirements.

(a) Stockpiles. The Contractor shall construct individual, sealed RAP stockpiles meeting one of the following definitions. No additional RAP will be allowed on top of the pile after the pile has been sealed.

(1) Homogeneous. Homogeneous RAP stockpiles shall consist of RAP from Class I/ Superpave, or equivalent mixtures only and represent the same aggregate quality, but shall be at least C quality or better, the same type of crushed aggregate (either crushed natural aggregate, ACBF slag, or steel slag), similar gradation and similar AC content. If approved by the Engineer, combined single pass surface/binder millings may be considered “homogenous”, with a quality rating dictated by the lowest coarse aggregate quality present in the mixture. Homogenous stockpiles shall meet the requirements of Article 1004.07(d). Homogeneous RAP stockpiles not meeting these requirements may be processed (crushing and screening) and retested.

(2) Conglomerate. Conglomerate RAP stockpiles shall consist of RAP from Class I/ Superpave, or equivalent mixtures only. The coarse aggregate in this RAP shall be crushed aggregate only and may represent more than one aggregate type and/or quality but shall be at least C quality or better. This RAP may have an inconsistent gradation and/or asphalt cement content prior to processing. All conglomerate RAP shall be processed prior to testing by crushing to where all RAP shall pass the 16 mm (5/8 in.) or smaller screen. Conglomerate RAP stockpiles shall not contain steel slag or other expansive material as determined by the Department. Conglomerate RAP stockpiles shall meet the requirements of Article 1004.07(d).

(3) Conglomerate “D” Quality (DQ). Conglomerate DQ RAP stockpiles shall consist of RAP containing coarse aggregate (crushed or round) that is at least D quality or better. This RAP may have an inconsistent gradation and/or asphalt content. Conglomerate DQ RAP stockpiles shall not contain steel slag or other expansive material as determined by the Department. Conglomerate DQ RAP shall meet the requirements of Article 1004.07(d).

Reclaimed Superpave Low ESAL IL-9.5L surface mixtures shall only be placed in conglomerate DQ RAP stockpiles due to the potential for rounded aggregate.

(4) Other. RAP stockpiles that do not meet the requirements of the stockpile categories listed above shall be classified as “Other”. “Other” RAP stockpiles shall not be used in any of the Department’s bituminous mixtures.

(b) Use. The allowable use of a RAP stockpile shall be set by the lowest quality of coarse aggregate in the RAP stockpile. Class I/Superpave surface mixtures are designated as containing Class B quality coarse aggregate only. Superpave Low ESAL IL-19.0L binder and IL-9.5L surface mixtures are designated as Class C quality coarse aggregate only.

Class I/Superpave binder mixtures, bituminous base course mixtures, and bituminous base course widening mixtures are designated as containing Class C quality coarse aggregate only. Bituminous stabilized subbase and BAM shoulders are designated as containing Class D quality coarse aggregate only. Any mixture not listed above shall have the designated quality determined by the Department.

RAP containing steel slag or other expansive material, as determined by the Department, shall be homogeneous and will be approved for use in Class I/Superpave (including Low ESAL) surface mixtures only. RAP stockpiles for use in Class I/Superpave mixtures (including Low ESAL), base course, base course widening and Class B mixtures shall be either homogeneous or conglomerate RAP stockpiles except conglomerate RAP stockpiles shall not be used in Superpave surface mixture Ndesign 50 or greater. RAP for use in bituminous aggregate mixtures (BAM) shoulders and BAM stabilized subbase shall be from homogeneous, conglomerate, or conglomerate DQ stockpiles.

Additionally, RAP used in Class I/Superpave surface mixtures shall originate from milled or crushed mixtures only, in which the coarse aggregate is of Class B quality or better. RAP stockpiles for use in Class I/Superpave (including Low ESAL) binder mixes as well as base course, base course widening and Class B mixtures shall originate from milled or processed surface mixture, binder mixture, or a combination of both mixtures uniformly blended to the satisfaction of the Engineer, in which the coarse aggregate is of Class C quality or better.

(c) Contaminants. RAP containing contaminants, such as earth, brick, sand, concrete, sheet asphalt, bituminous surface treatment (i.e. chip seal), pavement fabric, etc., will be unacceptable unless the contaminants are removed to the satisfaction of the Engineer. Sheet asphalt shall be stockpiled separately.

(d) Testing. All RAP shall be sampled and tested either during or after stockpiling.

For testing during stockpiling, washed extraction samples shall be run at the minimum frequency of one sample per 450 metric tons (500 tons) for the first 1800 metric tons (2,000 tons) and one sample per 1800 metric tons (2,000 tons) thereafter. A minimum of five tests shall be required for stockpiles less than 3600 metric tons (4,000 tons).

For testing existing stockpiles, the Contractor shall submit a plan for approval to the District proposing a satisfactory method of sampling and testing the RAP pile either in-situ or by restockpiling. The sampling plan shall meet the minimum frequency required above and detail the procedure used to extract representative samples throughout the pile for testing.

Before extraction, each field sample shall be split to test sample size. One of the two test samples from the final split shall be labeled and stored for Department use. The Contractor shall extract the other test sample according to Department procedure. The Engineer reserves the right to test any sample (split or Department-taken) to verify Contractor test results.

All of the extraction results shall be compiled and averaged for asphalt content and gradation. Individual extraction test results, when compared to the averages, will be accepted if within the tolerances listed below.

Parameter	Homogeneous / Conglomerate	Conglomerate "D" Quality
25 mm (1 in.)		± 5%
12.5 mm (1/2 in.)	± 8%	± 15%
4.75 mm (No. 4)	± 6%	± 13%
2.36 mm (No. 8)	± 5%	
1.18 mm (No. 16)		± 15%
600 μm (No. 30)	± 5%	
75 μm (No. 200)	± 2.0%	± 4.0%
AC	± 0.4%	± 0.5%

If more than 20 percent of the individual sieves are out of the gradation tolerances, or if more than 20 percent of the asphalt content test results fall outside the appropriate tolerances, the RAP will not be allowed to be used in the Department's bituminous concrete mixtures unless the RAP representing the failing tests is removed from the stockpile to the satisfaction of the Engineer. All test data and acceptance ranges shall be sent to the District for evaluation.

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

- (e) Designs. At the Contractor's option, bituminous concrete mixtures may be constructed utilizing RAP material meeting the above detailed requirements. The amount of RAP included in the mixture shall not exceed the percentages specified in the plans.

RAP designs shall be submitted for volumetric verification. If additional RAP stockpiles are tested and found that no more than 20 percent of the results, as defined under "Testing" herein, are outside of the control tolerances set for the original RAP stockpile and design, and meets all of the requirements herein, the additional RAP stockpiles may be used in the original mix design at the percent previously verified.

- (f) Production. The coarse aggregate in all RAP used shall be equal to or less than the nominal maximum size requirement for the bituminous mixture being produced.

To remove or reduce agglomerated material, a scalping screen, crushing unit or comparable sizing device approved by the Engineer shall be used in the RAP feed system to remove or reduce oversized material. If material passing the sizing device adversely affects the mix production or quality of the mix, the sizing device shall be set at a size specified by the Engineer.

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

SEEDING AND SODDING (BDE)

Effective: July 1, 2004

Revised: November 1, 2004

Revise Class 1A and 2A seeding mixtures shown in Table 1 of Article 250.07 of the Standard Specifications to read:

"Table 1 - SEEDING MIXTURES		
Class – Type	Seeds	kg/hectare (lb/acre)
1A Salt Tolerant Lawn Mixture 7/	Bluegrass	70 (60)
	Perennial Ryegrass	20 (20)
	Audubon Red Fescue	20 (20)
	Rescue 911 Hard Fescue	20 (20)
	Fults Salt Grass*	70 (60)
2A Salt Tolerant Roadside Mixture 7/	Alta Fescue or Ky 31	70 (60)
	Perennial Ryegrass	20 (20)
	Audubon Red Fescue	20 (30)
	Rescue 911 Hard Fescue	20 (30)
	Fults Salt Grass 1/	70 (60)"

Revise Note 7 of Article 250.07 of the Standard Specifications to read:

"Note 7. In Districts 1 through 6, the planting times shall be April 1 to June 15 and August 1 to November 1. In Districts 7 through 9, the planting times shall be March 1 to June 1 and August 1 to November 15. Seeding may be performed outside these dates provided the Contractor guarantees a minimum of 75 percent coverage over the entire seeded area(s) after one growing season. The guarantee shall be submitted to the Engineer in writing prior to performing the work. After one growing season, areas not sustaining 75 percent growth shall be interseeded or reseeded, as determined by the Engineer, at the Contractor's expense."

Add the following sentence to Article 252.04 of the Standard Specifications:

"Sod shall not be placed during the months of July and August."

Revise the first paragraph of Article 252.08 of the Standard Specifications to read:

"252.08 Sod Watering. Within two hours after the sod has been placed, water shall be applied at a rate of 25 L/sq m (5 gal/sq yd). Additional water shall be applied every other day at a rate of 15 L/sq m (3 gal/sq yd) for a total of 15 additional waterings. During periods exceeding 26 °C (80 °F) or subnormal rainfall, the schedule of additional waterings may be altered with the approval of the Engineer."

Revise Article 252.09 of the Standard Specifications to read:

“252.09 Supplemental Watering. During periods exceeding 26 °C (80 °F) or subnormal rainfall, supplemental watering may be required after the initial and additional waterings. Supplemental watering shall be performed when directed by the Engineer. Water shall be applied at the rate specified by the Engineer within 24 hours of notice.”

Revise the first and third paragraphs of Article 252.12 of the Standard Specifications to read:

“252.12 Method of Measurement. Sodding will be measured for payment in place and the area computed in square meters (square yards). To be acceptable for final payment, the sod shall be growing in place for a minimum of 30 days in a live, healthy condition. When directed by the Engineer, any defective or unacceptable sod shall be removed, replaced and watered by the Contractor at his/her own expense.”

“Supplemental watering will be measured for payment in units of 1000 L (1000 gal) of water applied on the sodded areas. Waterings performed in addition to those required by Article 252.08 or after the 30 day establishment period will be considered as supplemental watering.”

Replace the first paragraph of Article 252.13 of the Standard Specifications with the following:

“252.13 Basis of Payment. Sodding will be paid for at the contract unit price per square meter (square yard) for SODDING or SODDING, SALT TOLERANT according to the following schedule.

- (a) Initial Payment. Upon placement of sod, 25 percent of the pay item will be paid.
- (b) Final Payment. Upon acceptance of sod, the remaining 75 percent of the pay item will be paid.”

Revise Article 1081.03(b) of the Standard Specifications to read:

“(b) Salt Tolerant Sod.

Variety	Percent by Weight
Buffalo Grass	30%
Buchloe Dactyloides	
Amigo Fineleaf Tall Fescue	20%
Audubon Red Fescue	15%
Rescue 911 Hard Fescue	15%
Rugby Kentucky Bluegrass	5%
Fults Pucinnellia Distans	15%”

Revise Table II of Article 1081.04(c)(6) of the Standard Specifications to read:

TABLE II						
Variety of Seeds	Hard Seed Percent Maximum	Purity Percent Minimum	Pure, Live Seed Percent Minimum	Weed Percent Maximum	Secondary Noxious Weeds No. per kg (oz) Max. Permitted*	Remarks
Alfalfa	20	92	89	0.50	211 (6)	1/
Brome Grass	-	90	75	0.50	175 (5)	-
Clover, Alsike	15	92	87	0.30	211 (6)	2/
Clover, Crimson	15	92	83	0.50	211 (6)	-
Clover, Ladino	15	92	87	0.30	211 (6)	-
Clover, Red	20	92	87	0.30	211 (6)	-
Clover, White Dutch	30	92	87	0.30	211 (6)	3/
Audubon Red Fescue	0	97	82	0.10	105 (3)	-
Fescue, Alta or Ky. 31	-	97	82	1.00	105 (3)	-
Fescue, Creeping Red	-	97	82	1.00	105 (3)	-
Fults Salt Grass	0	98	85	0.10	70 (2)	-
Kentucky Bluegrass	-	97	80	0.30	247 (7)	5/
Lespedeza, Korean	20	92	84	0.50	211 (6)	3/
Oats	-	92	88	0.50	70 (2)	4/
Orchard Grass	-	90	78	1.50	175 (5)	4/
Redtop	-	90	78	1.80	175 (5)	4/
Ryegrass, Perennial, Annual	-	97	85	0.30	175 (5)	4/
Rye, Grain, Winter	-	92	83	0.50	70 (2)	4/
Rescue 911 Hard Fescue	0	97	82	0.10	105 (3)	-
Timothy	-	92	84	0.50	175 (5)	4/
Vetch, Crown	30	92	67	1.00	211 (6)	3/ & 6/
Vetch, Spring	30	92	88	1.00	70 (2)	4/
Vetch, Winter	15	92	83	1.00	105 (3)	4/
Wheat, hard Red Winter	-	92	89	0.50	70 (2)	4/

SELF-CONSOLIDATING CONCRETE FOR PRECAST PRODUCTS (BDE)

Effective: July 1, 2004

Definition. Self-consolidating concrete is a flowable mixture that does not require mechanical vibration for consolidation.

Usage. Self-consolidating concrete may be used for precast concrete products. The design and testing of a self-consolidating concrete mixture shall be according to Section 1020 of the Standard Specifications except as modified herein.

Materials. Materials shall conform to the following requirements:

- (a) Self-Consolidating Admixtures. The self-consolidating admixture system shall consist of either a high range water-reducing admixture only or a high range water-reducing admixture combined with a separate viscosity modifying admixture. The one or two component admixture system shall be capable of producing a flowable concrete that does not require mechanical vibration.

The high range water-reducing admixture shall comply with the requirements of AASHTO M 194, Type F.

The viscosity modifying admixture will be evaluated according to the test methods and mix design proportions referenced in AASHTO M 194, except the following physical requirements shall be met:

- (1) For initial and final set times, the allowable deviation of the test concrete from the reference concrete shall not be more than 1.0 hour earlier or 1.5 hours later.
 - (2) For compressive and flexural strengths, the test concrete shall be a minimum of 90 percent of the reference concrete at 3, 7 and 28 days.
 - (3) The length change of the test concrete shall be a maximum 135 percent of the reference concrete. However, if the length change of the reference concrete is less than 0.030 percent, the length change of the test concrete shall be a maximum 0.010 percentage units greater than the reference concrete.
 - (4) The relative durability factor of the test concrete shall be a minimum 80 percent.
- (b) Fine Aggregate. A fine aggregate used alone in the mix design shall not have an expansion greater than 0.30 percent per ASTM C 1260. For a blend of two or more fine aggregates, the resulting blend shall not have an expansion greater than 0.30 percent.

The aggregate blend expansion will be calculated as follows:

$$\text{Aggregate Blend Expansion} = (a/100 \times A) + (b/100 \times B) + (c/100 \times C) + \dots \text{etc.}$$

Where: a, b, c, ... = percent of aggregate blend

A, B, C, ... = aggregate expansion according to ASTM C 1260

Mix Design Criteria. The slump requirements of Article 1020.04 of the Standard Specifications shall not apply. In addition, the allowable coarse aggregate gradations shall be CA 11, CA 13, CA 14, CA 16, or a blend of these gradations. The fine aggregate proportion shall be a maximum 50 percent by mass (weight) of the total aggregate used.

Trail Batch. A minimum 1 cu m (1 cu yd) trial batch shall be produced. The mixture will be evaluated for air content, slump flow, visual stability index, compressive strength, passing ability, and static/dynamic segregation resistance.

The trial batch shall be scheduled and performed in the presence of the Engineer. Testing shall be performed per the Department's test method or as approved by the Engineer.

For the trial batch, the air content shall be within the top half of the allowable specification range. The slump flow range shall be 510 mm (20 in.) minimum to 710 mm (28 in.) maximum. The visual stability index shall be a maximum of 1. Strength shall be determined at 28 days. At the Contractor's option, strength may be determined for additional days.

Passing ability and static/dynamic segregation resistance shall be determined by tests selected by the Contractor and approved by the Engineer. The visual stability index shall not be used as the sole criteria for evaluating static segregation resistance.

After an acceptable mixture has been batched and tested, the mixture shall also be evaluated for robustness. Robustness shall be evaluated by varying the dosage of the self-consolidating admixture system and water separately. Additional trial batches may be necessary to accomplish this.

When necessary, the trial batches shall be disposed of according to Article 202.03 of the Standard Specifications.

Quality Control. Once testing is completed and acceptable results have been attained, production test frequencies and allowable test ranges for slump flow, visual stability index, passing ability, and static/dynamic segregation resistance shall be proposed. The production test frequencies and allowable test ranges will be approved by the Engineer.

The slump flow range shall be ± 50 mm (± 2 in.) of the target value, and within the overall range of 510 mm (20 in.) minimum to 710 mm (28 in.) maximum. The visual stability index shall be a maximum of 1. The approved test ranges for passing ability and static/dynamic segregation resistance will be based on recommended guidelines determined by the Engineer.

STABILIZED SUBBASE AND BITUMINOUS SHOULDERS SUPERPAVE (BDE)

Effective: April 1, 2002

Revised: July 1, 2004

Description. This work shall consist of constructing stabilized subbase and bituminous shoulders Superpave according to Sections 312 and 482 respectively, of the Standard Specifications and the special provision, "Quality Control/Quality Assurance of Bituminous Concrete Mixtures" except as modified herein.

Revise Article 312.03(b) of the Standard Specifications to read:

"(b) RAP Material (Note 3)"

Revise Note 2 of Article 312.03 of the Standard Specifications to read:

"Note 2. Gradation CA 6, CA 10, or CA 12 shall be used."

Revise Note 3 of Article 312.03 of the Standard Specifications to read:

"Note 3. RAP shall meet the requirements of the special provision "RAP for Use in Bituminous Concrete Mixtures". RAP containing steel slag shall be permitted for use in top-lift surface mixtures only."

Revise Note 4 of Article 312.03 of the Standard Specifications to read:

"Note 4. Unless otherwise specified on the plans, the bituminous material shall be performance graded asphalt cement, PG58-22. When more than 15 percent RAP is used, a softer PG binder may be required as determined by the Engineer."

Revise Article 312.06 of the Standard Specifications to read:

"312.06 Mixture Design. The Contractor shall submit mix designs for approval, for each required mixture. Mix designs shall be developed by Level III personnel who have completed the course, "Superpave Mix Design Upgrade". The mixtures shall be designed according to the respective Illinois Modified AASHTO references listed below:

- AASHTO MP 2 Standard Specification for Superpave Volumetric Mix Design
- AASHTO R 30 Standard Practice for Mixture Conditioning of Hot-Mix Asphalt (HMA)
- AASHTO PP 28 Standard Practice for Designing Superpave HMA
- AASHTO T 209 Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
- AASHTO T 312 Preparing and Determining the Density of Hot Mix Asphalt (HMA) Specimens by Means of the Superpave Gyratory Compactor
- AASHTO T 308 Determining the Asphalt Content of Hot Mix Asphalt (HMA) by the Ignition Method

(a) Job Mix Formula (JMF). The JMF shall be according to the following limits:

<u>Ingredient</u>	<u>Percent by Dry Weight</u>
Aggregate.....	94.0 to 96.0
Asphalt Cement.....	4.0 to 6.0*
Dust/AC Ratio	1.4

*Upper limit may be raised for the lower or top lifts if the Contractor elects to use a highly absorptive coarse and/or fine aggregate requiring more than six percent asphalt. The additional asphalt shall be furnished at no cost to the Department.

When RAP material is being used, the JMF shall be according to the following limits:

<u>Ingredient</u>	<u>Percent by Dry Weight</u>
Virgin Aggregate(s)	46.0 to 96.0
RAP Material(s) (Note 1).....	0 to 50
Mineral Filler (if required)	0 to 5.0
Asphalt Cement.....	4.0 to 7.0
Dust/AC Ratio	1.4

Note 1. If specified on the plans, the maximum percentage of RAP shall be as specified therein.

It is recommended that the selected combined aggregate gradation not pass through the restricted zones specified in Illinois Modified AASHTO MP 2.

(b) Volumetric Requirements.

Design Compactive Effort	Design Air Voids Target (%)
$N_{DES} = 30$	2.0

- (c) Determination of Need for Anti-Stripping Additive. The mixture designer shall determine if an additive is needed in the mix to prevent stripping. The determination will be made on the basis of tests performed according to Illinois Modified AASHTO T 283 using 4 in. Marshall bricks. To be considered acceptable by the Engineer as a mixture not susceptible to stripping, the ratio of conditioned to unconditioned split tensile strengths (TSR) shall be equal to or greater than 0.75. Mixtures, either with or without an additive, with TSR values less than 0.75 will be considered unacceptable.

If it is determined that an additive is required, the additive may be hydrated lime, slaked quicklime, or a liquid additive, at the Contractor's option. The liquid additive shall be selected from the Department's list of approved additives and may be limited to those which have exhibited satisfactory performance in similar mixes.

Dry hydrated lime shall be added at a rate of 1.0 to 1.5 percent by weight of total dry aggregate. Slurry shall be added in such quantity as to provide the required amount of hydrated lime solids by weight of total dry aggregate. The exact rate of application for all anti-stripping additives will be determined by the Engineer. The method of application shall be according to Article 406.12 of the Standard Specifications."

Revise Article 312.08 of the Standard Specifications to read:

"312.08 Mixture Production. When a hot-mix plant conforming to Article 1102.01 is used, the aggregate shall be dried and heated in the revolving dryer to a temperature of 120 °C (250 °F) to 175 °C (350 °F).

The aggregate and bituminous material used in the bituminous aggregate mixture shall be measured separately and accurately by weight or by volume. When the aggregate is in the mixer, the bituminous material shall be added and mixing continued for a minimum of 35 seconds and until a homogeneous mixture is produced in which all particles of the aggregate are coated. The mixing period, size of the batch and the production rate shall be approved by the Engineer.

The ingredients shall be heated and combined in such a manner as to produce a mixture which, when discharged from the mixer, shall be workable and vary not more 10 °C (20 °F) from the temperature set by the Engineer.

When RAP material(s) is used in the bituminous aggregate mixture, the virgin aggregate(s) shall be dried and heated in the dryer to a temperature that will produce the specified resultant mix temperature when combined with the RAP material.

The heated virgin aggregates and mineral filler shall be combined with RAP material in such a manner as to produce a bituminous mixture which when discharged from the mixer shall not vary more than 15 °C (30 °F) from the temperature set by the Engineer. The combined

ingredients shall be mixed for a minimum of 35 seconds and until a homogeneous mixture as to composition and temperature is obtained. The total mixing time shall be a minimum of 45 seconds consisting of dry and wet mixing. Variation in wet and dry mixing times may be permitted, depending on the moisture content and amount of salvaged material used. The mix temperature shall not exceed 175 °C (350 °F). Wide variations in the mixture temperature will be cause for rejection of the mix.

- (a) Personnel. The QC Manager and Level I Technician shall have successfully completed the Department's "Superpave Field Control Course".
- (b) Required Tests. Testing for stabilized subbase and bituminous shoulders shall be conducted to control the production of the bituminous mixture using the test methods identified and performed at a frequency not less than indicated in the following table.

Parameter	Frequency of Tests Non-Class I Mixtures	Test Method
Aggregate Gradation Hot bins for batch and continuous plants. Individual cold-feeds or combined belt-feed for drier-drum plants. (% passing sieves: 12.5 mm (1/2 In.), 4.75 mm (No. 4), 75 µm (No. 200))	1 gradation per day of production. The first day of production shall be washed ignition oven test on the mix. Thereafter, the testing shall alternate between dry gradation and washed ignition oven test on the mix. The dry gradation and the washed ignition oven test results shall be plotted on the same control chart.	Illinois Procedure (See Manual of Test Procedures for Materials).
Asphalt Content by ignition oven (Note 1.)	1 per day	Illinois-Modified AASHTO T 308
Air Voids		
Bulk Specific Gravity of Gyratory Sample	1 per day	Illinois-Modified AASHTO T 312
Maximum Specific Gravity of Mixture	1 per day	Illinois-Modified AASHTO T 209

Note 1. The Engineer may waive the ignition oven requirement for AC content if the aggregates to be used are known to have ignition AC content calibration factors which exceed 1.5 percent. If the ignition oven requirement is waived, other Department approved methods shall be used to determine the AC content.

During production, the ratio of minus 75 µm (#200) sieve material to total asphalt cement shall be not less than 0.6 nor more than 1.6, and the moisture content of the mixture at discharge from the mixer shall not exceed 0.5 percent. If at any time the ratio of minus 75 µm (#200) material to asphalt or moisture content of the mixture falls outside the stated limits, production of the mix shall cease. The cause shall be determined and corrective action satisfactory to the Engineer shall be initiated prior to resumption of production.

During production, mixture containing an anti-stripping additive will be tested by the Engineer for stripping according to Illinois Modified AASHTO T 283. If the mixture fails to meet the TSR criteria for acceptance, no further mixture will be accepted until the Contractor takes such action as is necessary to furnish a mixture meeting the criteria.

- (c) Control Charts/Limits. Control charts/limits shall be according to QC/QA requirements for Non-Class I Mixtures except air voids shall be plotted on the control charts within the following control limits:

Air Void Control Limits	
Mixture	Individual Test
Shoulders	± 1.2 %
Others	± 1.2 %”

Replace the first paragraph of Article 312.10 of the Standard Specifications with the following:

“312.10 Placing and Compacting. After the subgrade has been compacted and is acceptable to the Engineer, the bituminous aggregate mixture shall be spread upon it with a mechanical spreader. The maximum compacted thickness of each lift shall be 150 mm (6 in.) provided the required density is obtained. The minimum compacted thickness of each lift shall be according to the following table:

Nominal Maximum Aggregate Size of Mixture	Minimum Compacted Lift Thickness
CA 12 – 12.5 mm (1/2 in.)	38 mm (1 1/2 in.)
CA 10 - 19 mm (3/4 in.)	57 mm (2 1/4 in.)
CA 6 – 25 mm (1 in.)	76 mm (3 in.)

The surface of each lift shall be clean and dry before succeeding lifts are placed.”

Revise Article 482.02 of the Standard Specifications to read:

“482.02 Materials. Materials shall meet the requirements of Article 312.03. For the top lift, the aggregate used shall meet the gradation requirements for a CA 10 or CA 12. Blending of aggregates to meet these gradation requirements will be permitted.”

Revise the first paragraph of Article 482.04 of the Standard Specifications to read:

“482.04 General. For pavement and shoulder resurfacing projects, Superpave binder and surface course mixtures may be used in lieu of bituminous aggregate mixture for the resurfacing of shoulders, at the option of the Contractor, or shall be used when specified on the plans.”

Revise Article 482.04(c) of the Standard Specifications to read:

“(c) Mixture Production312.08”

Revise Article 482.05 of the Standard Specifications to read:

“482.05 Composition of Bituminous Aggregate Mixture. The composition of the mixture shall be according to Article 312.06, except that the amount of asphalt cement used in the top lift shall be increased up to 0.5 percent more than that required in the lower lifts. For resurfacing projects when the Superpave binder and surface course mixtures option is used, the asphalt cement used in the top lift shall not be increased. Superpave mixtures used on the top lift of such shoulders shall meet the gradation requirements of the special provision “Superpave Bituminous Concrete Mixtures”.

For shoulder and strip construction, the composition of the Superpave binder and surface course shall be the same as that specified for the mainline pavement.”

In the following locations of Section 482 of the Standard Specifications, change “Class I” to “Superpave”:

the second paragraph of Article 482.04

the first sentence of the second paragraph of Article 482.06

the first sentence of the fourth paragraph of Article 482.06

the second sentence of the fourth paragraph of Article 482.06

the first sentence of the third paragraph of Article 482.08(b)

Revise the first paragraph of Article 482.06 of the Standard Specifications to read:

“482.06 Placing and Compacting. This work shall be according to Article 312.10. The mechanical spreader for the top lift of shoulders shall meet the requirements of Article 1102.03 when the shoulder width is 3 m (10 ft) or greater.”

Revise Article 482.09 of the Standard Specifications to read:

“482.09 Basis of Payment. When bituminous shoulders are constructed along the edges of the completed pavement structure, this work will be paid for at the contract unit price per square meter (square yard) for BITUMINOUS SHOULDERS SUPERPAVE of the thickness specified. The specified thickness shall be the thickness shown on the plans at the edge of the pavement.

On pavement and shoulder resurfacing projects, the shoulder resurfacing will be paid for at the contract unit price per metric ton (ton) for BITUMINOUS SHOULDERS SUPERPAVE.

The construction of shoulder strips for resurfacing pavements will be paid according to the special provision, “Superpave Bituminous Concrete Mixtures”.

SUPERPAVE BITUMINOUS CONCRETE MIXTURES (BDE)

Effective: January 1, 2000

Revised: April 1, 2004

Description. This work shall consist of designing, producing and constructing Superpave bituminous concrete mixtures using Illinois Modified Strategic Highway Research Program (SHRP) Superpave criteria. This work shall be according to Sections 406 and 407 of the Standard Specifications and the special provision, “Quality Control/Quality Assurance of Bituminous Concrete Mixtures”, except as follows.

Materials.

- (a) Fine Aggregate Blend Requirement. The Contractor may be required to provide FA 20 manufactured sand to meet the design requirements. For mixtures with $N_{design} \geq 90$, at least 50 percent of the required fine aggregate fraction shall consist of either stone sand, slag sand, or steel slag sand meeting the FA/FM 20 gradation.
- (b) Reclaimed Asphalt Pavement (RAP). If the Contractor is allowed to use more than 15 percent RAP, as specified in the plans, a softer performance-graded binder may be required as determined by the Engineer.

RAP shall meet the requirements of the special provision, "RAP for Use in Bituminous Concrete Mixtures".

RAP will not be permitted in mixtures containing polymer modifiers.

RAP containing steel slag will be permitted for use in top-lift surface mixtures only.

- (c) Bituminous Material. The asphalt cement (AC) shall be performance-graded (PG) or polymer modified performance-graded (SBS-PG or SBR-PG) meeting the requirements of Article 1009.05 of the Standard Specifications for the grade specified on the plans.

The following additional guidelines shall be used if a polymer modified asphalt is specified:

- (1) The polymer modified asphalt cement shall be shipped, maintained, and stored at the mix plant according to the manufacturer's requirements. Polymer modified asphalt cement shall be placed in an empty tank and shall not be blended with other asphalt cements.
- (2) The mixture shall be designed using a mixing temperature of 163 ± 3 °C (325 ± 5 °F) and a gyratory compaction temperature of 152 ± 3 °C (305 ± 5 °F).
- (3) Pneumatic-tired rollers will not be allowed unless otherwise specified by the Engineer. A vibratory roller meeting the requirements of Article 406.16 of the Standard Specifications shall be required in the absence of the pneumatic-tired roller.

Laboratory Equipment.

- (a) Superpave Gyratory Compactor. The superpave gyratory compactor (SGC) shall be used for all QC/QA testing.
- (b) Ignition Oven. The ignition oven shall be used to determine the AC content. The ignition oven shall also be used to recover aggregates for all required washed gradations.

The Engineer may waive the ignition oven requirement for AC content if the aggregates to be used are known to have ignition AC content calibration factors which exceed 1.5 percent. If the ignition oven requirement is waived, other Department approved methods shall be used to determine the AC content.

Mixture Design. The Contractor shall submit mix designs, for approval, for each required mixture. Mix designs shall be developed by Level III personnel who have successfully completed the course, "Superpave Mix Design Upgrade". Articles 406.10 and 406.13 of the Standard Specifications shall not apply. The mixtures shall be designed according to the respective Illinois Modified AASHTO references listed below.

AASHTO MP 2	Standard Specification for Superpave Volumetric Mix Design
AASHTO R 30	Standard Practice for Mixture Conditioning of Hot-Mix Asphalt (HMA)
AASHTO PP 28	Standard Practice for Designing Superpave HMA
AASHTO T 209	Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
AASHTO T 312	Preparing and Determining the Density of Hot Mix Asphalt (HMA) Specimens by Means of the Superpave Gyratory Compactor
AASHTO T 308	Determining the Asphalt Content of Hot Mix Asphalt (HMA) by the Ignition Method

- (a) Mixture Composition. The ingredients of the bituminous mixture shall be combined in such proportions as to produce a mixture conforming to the composition limits by weight. The gradation mixture specified on the plans shall produce a mixture falling within the limits specified in Table 1.

Sieve Size	IL-25.0 mm		IL-19.0 mm		IL-12.5 mm ^{4/}		IL-9.5 mm ^{4/}	
	min	max	min	max	Min	max	min	max
37.5 mm (1 1/2 in.)		100						
25 mm (1 in.)	90	100		100				
19 mm (3/4 in.)		90	82	100		100		
12.5 mm (1/2 in.)	45	75	50	85	90	100		100
9.5 mm (3/8 in.)						89	90	100
4.75 mm (#4)	24	42 ^{2/}	24	50 ^{2/}	28	65	28	65
2.36 mm (#8)	16	31	20	36	28	48 ^{3/}	28	48 ^{3/}
1.18 mm (#16)	10	22	10	25	10	32	10	32
600 μm (#30)								
300 μm (#50)	4	12	4	12	4	15	4	15
150 μm (#100)	3	9	3	9	3	10	3	10
75 μm (#200)	3	6	3	6	4	6	4	6

- 1/ Based on percent of total aggregate weight.
- 2/ The mixture composition shall not exceed 40 percent passing the 4.75 mm (#4) sieve for binder courses with Ndesign ≥ 90.
- 3/ The mixture composition shall not exceed 40 percent passing the 2.36 mm (#8) sieve for surface courses with Ndesign ≥ 90.
- 4/ The mixture composition for surface courses shall be according to IL-12.5 mm or IL-9.5 mm, unless otherwise specified by the Engineer.

One of the above gradations shall be used for leveling binder as specified in the plans and according to Article 406.04 of the Standard Specifications.

It is recommended that the selected combined aggregate gradation not pass through the restricted zones specified in Illinois Modified AASHTO MP 2.

- (b) Dust/AC Ratio for Superpave. The ratio of material passing the 75 μm (#200) sieve to total asphalt cement shall not exceed 1.0 for mixture design (based on total weight of mixture).
- (c) Volumetric Requirements. The target value for the air voids of the hot mix asphalt (HMA) shall be 4.0 percent at the design number of gyrations. The VMA and VFA of the HMA design shall be based on the nominal maximum size of the aggregate in the mix and shall conform to the requirements listed in Table 2.

TABLE 2. VOLUMETRIC REQUIREMENTS					
Ndesign	Voids in the Mineral Aggregate (VMA), % minimum				Voids Filled with Asphalt (VFA), %
	IL-25.0	IL-19.0	IL-12.5	IL-9.5	
50	12.0	13.0	14.0	15	65 - 78
70					65 - 75
90					
105					

- (d) Determination of Need for Anti-Stripping Additive. The mixture designer shall determine if an additive is needed in the mix to prevent stripping. The determination will be made on the basis of tests performed according to Illinois Modified T 283 using 4 in. Marshall bricks. To be considered acceptable by the Department as a mixture not susceptible to stripping, the ratio of conditioned to unconditioned split tensile strengths (TSRs) shall be equal to or greater than 0.75. Mixtures, either with or without an additive, with TSRs less than 0.75 will be considered unacceptable.

If it is determined that an additive is required, the additive may be hydrated lime, slaked quicklime, or a liquid additive, at the Contractor's option. The liquid additive shall be selected from the Department's list of approved additives and may be limited to those which have exhibited satisfactory performance in similar mixes.

Dry hydrated lime shall be added at a rate of 1.0 to 1.5 percent by weight of total dry aggregate. Slurry shall be added in such quantity as to provide the required amount of hydrated lime solids by weight of total dry aggregate. The exact rate of application for all anti-stripping additives will be determined by the Department. The method of application shall be according to Article 406.12 of the Standard Specifications.

Personnel. The QC Manager and Level I Technician shall have successfully completed the Department's "Superpave Field Control Course".

Required Plant Tests. Testing shall be conducted to control the production of the bituminous mixture. The Contractor shall use the test methods identified to perform the following mixture tests at a frequency not less than that indicated in Table 3.

TABLE 3. REQUIRED PLANT TESTS for SUPERPAVE

Parameter		Frequency of Tests	Test Method
Aggregate Gradation Hot bins for batch and continuous plants Individual cold-feeds or combined belt-feed for drier drum plants. (% passing sieves: 12.5 mm (1/2 in.), 4.75 mm (No. 4), 2.36 mm (No. 8), 600 µm (No. 30), 75 µm (No. 200))		1 dry gradation per day of production (either morning or afternoon sample). And 1 washed ignition oven test on the mix per day of production (conduct in afternoon if dry gradation is conducted in the morning or vice versa). NOTE. The order in which the above tests are conducted shall alternate from the previous production day (example: a dry gradation conducted in the morning will be conducted in the afternoon on the next production day and so forth). The dry gradation and washed ignition oven test results shall be plotted on the same control chart.	Illinois Procedure (See Manual of Test Procedures for Materials).
Asphalt Content by Ignition Oven (Note 1.)		1 per half day of production	Illinois Modified AASHTO T 308
Air Voids	Bulk Specific Gravity of Gyratory Sample	1 per half day of production for first 2 days and 1 per day thereafter (first sample of the day)	Illinois Modified AASHTO T 312
	Maximum Specific Gravity of Mixture		Illinois Modified AASHTO T 209

Note 1. The Engineer may waive the ignition oven requirement for AC content if the aggregates to be used are known to have ignition AC content calibration factors which exceed 1.5 percent. If the ignition oven requirement is waived, other Department approved methods shall be used to determine the AC content.

During production, the ratio of minus 75 µm (#200) sieve material to total asphalt cement shall be not less than 0.6 nor more than 1.2 and the moisture content of the mixture at discharge from the mixer shall not exceed 0.5 percent. If at any time the ratio of minus 75 µm (#200) material to asphalt or moisture content of the mixture falls outside the stated limits, production of the mix shall cease. The cause shall be determined and corrective action satisfactory to the Engineer shall be initiated prior to resuming production.

During production, mixtures containing an anti-stripping additive will be tested by the Department for stripping according to Illinois Modified T 283. If the mixture fails to meet the TSR criteria for acceptance, no further mixture will be accepted until the Contractor takes such action as is necessary to furnish a mixture meeting the criteria.

Construction Requirements

Lift Thickness.

- (a) Binder and Surface Courses. The minimum compacted lift thickness for constructing bituminous concrete binder and surface courses shall be according to Table 4:

TABLE 4 – MINIMUM COMPACTED LIFT THICKNESS	
Mixture	Thickness, mm (in.)
IL-9.5	32 (1 1/4)
IL-12.5	38 (1 1/2)
IL-19.0	57 (2 1/4)
IL-25.0	76 (3)

- (b) Leveling Binder. Mixtures used for leveling binder shall be as follows:

TABLE 5 – LEVELING BINDER	
Nominal, Compacted, Leveling Binder Thickness, mm (in.)	Mixture
≤ 32 (1 1/4)	IL-9.5
32 (1 1/4) to 50 (2)	IL 9.5 or IL-12.5

Density requirements shall apply for leveling binder when the nominal, compacted thickness is 32 mm (1 1/4 in.) or greater for IL-9.5 mixtures and 38 mm (1 1/2 in.) or greater for IL-12.5 mixtures.

- (c) Full-Depth Pavement. The compacted thickness of the initial lift of binder course shall be 100 mm (4 in.). The compacted thickness of succeeding lifts shall meet the minimums specified in Table 4 but not exceed 100 mm (4 in.).

If a vibratory roller is used for breakdown, the compacted thickness of the binder lifts, excluding the top lift, may be increased to 150 mm (6 in.) provided the required density is obtained.

- (d) Bituminous Patching. The minimum compacted lift thickness for constructing bituminous patches shall be according to Table 4.

Control Charts/Limits. Control charts/limits shall be according to QC/QA Class I requirements, except density shall be plotted on the control charts within the following control limits:

TABLE 6. DENSITY CONTROL LIMITS		
Mixture	Parameter	Individual Test
12.5 mm / 9.5 mm	Ndesign ≥ 90	92.0 – 96.0%
12.5 mm / 9.5 mm	Ndesign < 90	92.5 – 97.4%
19.0 mm / 25.0 mm	Ndesign ≥ 90	93.0 – 96.0%
19.0 mm / 25.0 mm	Ndesign < 90	93.0 – 97.4%

Basis of Payment. On resurfacing projects, this work will be paid for at the contract unit price per metric ton (ton) for BITUMINOUS CONCRETE SURFACE COURSE, SUPERPAVE, of the friction aggregate mixture and Ndesign specified, LEVELING BINDER (HAND METHOD), SUPERPAVE, of the Ndesign specified, LEVELING BINDER (MACHINE METHOD),

SUPERPAVE, of the Ndesign specified, and BITUMINOUS CONCRETE BINDER COURSE, SUPERPAVE, of the mixture composition and Ndesign specified.

On resurfacing projects in which polymer modifiers are required, this work will be paid for at the contract unit price per metric ton (ton) for POLYMERIZED BITUMINOUS CONCRETE SURFACE COURSE, SUPERPAVE, of the friction aggregate mixture and Ndesign specified, POLYMERIZED LEVELING BINDER (HAND METHOD), SUPERPAVE, of the Ndesign specified, POLYMERIZED LEVELING BINDER (MACHINE METHOD), SUPERPAVE, of the Ndesign specified, and POLYMERIZED BITUMINOUS CONCRETE BINDER COURSE, SUPERPAVE, of the mixture composition and Ndesign specified.

On full-depth pavement projects, this work will be paid for at the contract unit price per square meter (square yard) for BITUMINOUS CONCRETE PAVEMENT, (FULL-DEPTH), SUPERPAVE, of the thickness specified.

On projects where widening is constructed and the entire pavement is then resurfaced, the binder for the widening will be paid for at the contract unit price per square meter (square yard) for BITUMINOUS CONCRETE BINDER COURSE, SUPERPAVE, of the mixture composition, Ndesign, and thickness specified. The surface and binder used to resurface the entire pavement will be paid for according to the paragraphs above for resurfacing projects.

TRAFFIC BARRIER TERMINALS (BDE)

Effective: January 1, 2003

Revise Article 631.05 of the Standard Specifications to read:

“631.05 Traffic Barrier Terminal, Type 5 and Type 5A. The face of the guardrail shall be installed flush with the face of the bridge rail or parapet.”

Revise Article 631.06 of the Standard Specifications to read:

“631.06 Traffic Barrier Terminal, Type 6. When attaching the end shoe to concrete constructed with forms and with a thickness of 300 mm (12 in.) or less, the holes may be formed, core drilled or an approved 20 mm (3/4 in.) cast-in-place insert may be used.

When attaching the end shoe to concrete constructed with forms and with a thickness greater than 300 mm (12 in.), an approved M20 (3/4 in.) bolt with an approved expansion device may be used in lieu of formed or core drilled holes.

When attaching the end shoe to concrete constructed by slipforming, the holes shall be core drilled.

The tapered, parapet, wood block out shall be used on all appurtenances with a sloped face.

When no bridge approach curb is present, Type B concrete curb shall be constructed as shown on the plans according to Section 606.”

Revise Article 631.07 of the Standard Specifications to read:

“631.07 Traffic Barrier Terminal, Type 6B. Attachment of the end shoe to concrete shall be according to Article 631.06 except the tapered, parapet, wood block out will not be required.”

Delete the third and fourth paragraphs of Article 631.11 of the Standard Specifications.

Add the following paragraph to the end of Article 631.11 of the Standard Specifications:

“Construction of the Type B concrete curb for TRAFFIC BARRIER TERMINAL, TYPE 6 will be paid for according to Article 606.14.”

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.

TRAINING SPECIAL PROVISIONS

This Training Special Provision supersedes Section 7b of the Special Provision entitled “Specific Equal Employment Opportunity Responsibilities,” and is in implementation of 23 U.S.C. 140(a).

As part of the contractor's equal employment opportunity affirmative action program, training shall be provided as follows:

The contractor shall provide on-the-job training aimed at developing full journeyman in the type of trade or job classification involved. The number of trainees to be trained under this contract will be 10. In the event the contractor subcontracts a portion of the contract work, he shall determine how many, if any, of the trainees are to be trained by the subcontractor, provided however, that the contractor shall retain the primary responsibility for meeting the training requirements imposed by this special provision. The contractor shall also insure that this Training Special Provision is made applicable to such subcontract. Where feasible, 25 percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training.

The number of trainees shall be distributed among the work classifications on the basis of the contractor's needs and the availability of journeymen in the various classifications within the reasonable area of recruitment. Prior to commencing construction, the contractor shall submit to the Illinois Department of Transportation for approval the number of trainees to be trained in each selected classification and training program to be used. Furthermore, the contractor shall specify the starting time for training in each of the classifications. The contractor will be credited for each trainee employed by him on the contract work who is currently enrolled or becomes enrolled in an approved program and will be reimbursed for such trainees as provided hereinafter.

Training and upgrading of minorities and women toward journeyman status is a primary objective of this Training Special Provision. Accordingly, the contractor shall make every effort to enroll minority trainees and women (e.g. by conducting systematic and direct recruitment through public and private sources likely to yield minority and women trainees) to the extent such persons are available within a reasonable area of recruitment. The contractor will be responsible for demonstrating the steps that he has taken in pursuance thereof, prior to a determination as to whether the contractor is in compliance with this Training Special Provision. This training commitment is not intended, and shall not be used, to discriminate against any applicant for training, whether a member of a minority group or not.

No employee shall be employed as a trainee in any classification in which he has successfully completed a training course leading to journeyman status or in which he has been employed as a journeyman. The contractor should satisfy this requirement by including appropriate questions in the employee application or by other suitable means. Regardless of the method used the contractor's records should document the findings in each case.

The minimum length and type of training for each classification will be as established in the training program selected by the contractor and approved by the Illinois Department of Transportation and the Federal Highway Administration. The Illinois Department of Transportation and the Federal Highway Administration shall approve a program, if it is reasonably calculated to meet the equal employment opportunity obligations of the contractor and to qualify the average trainee for journeyman status in the classification concerned by the end of the training period. Furthermore, apprenticeship programs registered with the U.S. Department of Labor, Bureau of Apprenticeship and Training, or with a State apprenticeship agency recognized by the Bureau and training programs approved by not necessarily sponsored by the U.S. Department of Labor, Manpower Administration, Bureau of Apprenticeship and Training shall also be considered acceptable provided it is being administered in a manner consistent with the equal employment obligations of Federal-aid highway construction contracts. Approval or acceptance of a training program shall be obtained from the State prior to commencing work on the classification covered by the program. It is the

intention of these provisions that training is to be provided in the construction crafts rather than clerk-typists or secretarial-type positions. Training is permissible in lower level management positions such as office engineers, estimators, timekeepers, etc., where the training is oriented toward construction applications. Training in the laborer classification may be permitted provided that significant and meaningful training is provided and approved by the Illinois Department of Transportation and the Federal Highway Administration. Some offsite training is permissible as long as the training is an integral part of an approved training program and does not comprise a significant part of the overall training.

Except as otherwise noted below, the contractor will be reimbursed 80 cents per hour of training given an employee on this contract in accordance with an approved training program. As approved by the Engineer, reimbursement will be made for training of persons in excess of the number specified herein. This reimbursement will be made even though the contractor receives additional training program funds from other sources, provided such other source does not specifically prohibit the contractor from receiving other reimbursement. Reimbursement for offsite training indicated above may only be made to the contractor where he does one or more of the following and the trainees are concurrently employed on a Federal-aid project; contributes to the cost of the training, provides the instruction to the trainee or pays the trainee's wages during the offsite training period.

No payment shall be made to the contractor if either the failure to provide the required training, or the failure to hire the trainee as a journeyman, is caused by the contractor and evidences a lack of good faith on the part of the contractor in meeting the requirement of this Training Special Provision. It is normally expected that a trainee will begin his training on the project as soon as feasible after start of work utilizing the skill involved and remain on the project as long as training opportunities exist in his work classification or until he has completed his training program.

It is not required that all trainees be on board for the entire length of the contract. A contractor will have fulfilled his responsibilities under this Training Special Provision if he has provided acceptable training to the number of trainees specified. The number trained shall be determined on the basis of the total number enrolled on the contract for a significant period.

Trainees will be paid at least 60 percent of the appropriate minimum journeyman's rate specified in the contract for the first half of the training period, 75 percent for the third quarter of the training period, and 90 percent for the last quarter of the training period, unless apprentices or trainees in an approved existing program are enrolled as trainees on this project. In that case, the appropriate rates approved by the Departments of Labor or Transportation in connection with the existing program shall apply to all trainees being trained for the same classification who are covered by this Training Special Provision.

The contractor shall furnish the trainee a copy of the program he will follow in providing the training. The contractor shall provide each trainee with a certification showing the type and length of training satisfactorily complete.

The contractor will provide for the maintenance of records and furnish periodic reports documenting his performance under this Training Special Provision.

METHOD OF MEASUREMENT The unit of measurement is in hours.

BASIS OF PAYMENT This work will be paid for at the contract unit price of 80 cents per hour for TRAINEES. The estimated total number of hours, unit price and total price have been included in the schedule of prices.

TRUCK BED RELEASE AGENT (BDE)

Effective: April 1, 2004

Add the following sentence after the third sentence of the first paragraph of Article 406.14 of the Standard Specifications.

“In addition to the release agent, the Contractor may use a light scatter of manufactured sand (FA 20 or FA 21) evenly distributed over the bed of the vehicle.”

WEIGHT CONTROL DEFICIENCY DEDUCTION

Effective: April 1, 2001

Revised: August 1, 2002

The Contractor shall provide accurate weights of materials delivered to the contract for incorporation into the work (whether temporary or permanent) and for which the basis of payment is by weight. These weights shall be documented on delivery tickets which shall identify the source of the material, type of material, the date and time the material was loaded, the contract number, the net weight, the tare weight when applicable and the identification of the transporting vehicle. For aggregates, the Contractor shall have the driver of the vehicle furnish or establish an acceptable alternative to provide the contract number and a copy of the material order to the source for each load. The source is defined as that facility that produces the final material product that is to be incorporated into the contract pay items.

The Department will conduct random, independent vehicle weight checks for material sources according to the procedures outlined in the Documentation Section Policy Statement of the Department's Construction Manual and hereby incorporated by reference. The results of the independent weight checks shall be applicable to all contracts containing this Special Provision. Should the vehicle weight check for a source result in the net weight of material on the vehicle exceeding the net weight of material shown on the delivery ticket by 0.50% (0.70% for aggregates) or more, the Engineer will document the independent vehicle weight check and immediately furnish a copy of the results to the Contractor. No adjustment in pay quantity will be made. Should the vehicle weight check for a source result in the net weight of material shown on the delivery ticket exceeding the net weight of material on the vehicle by 0.50% (0.70% for aggregates) or more, the Engineer will document the independent vehicle weight check and immediately furnish a copy of the results to the Contractor. The Engineer will adjust the net weight shown on the delivery ticket to the checked delivered net weight as determined by the independent vehicle weight check.

The Engineer will also adjust the method of measurement for all contracts for subsequent deliveries of all materials from the source based on the independent weight check. The net weight of all materials delivered to all contracts containing this Special Provision from this source, for which the basis of payment is by weight, will be adjusted by applying a correction factor "A" as determined by the following formula:

$$A = 1.0 - \left(\frac{B - C}{B} \right); \text{ Where } A \leq 1.0; \left(\frac{B - C}{C} \right) > 0.50\% \text{ (0.70\% for aggregates)}$$

Where A = Adjustment factor
B = Net weight shown on delivery ticket
C = Net weight determined from independent weight check

The adjustment factor will be applied as follows:

$$\text{Adjusted Net Weight} = A \times \text{Delivery Ticket Net Weight}$$

The adjustment factor will be imposed until the cause of the deficient weight is identified and corrected by the Contractor to the satisfaction of the Engineer. If the cause of the deficient weight is not identified and corrected within seven (7) calendar days, the source shall cease delivery of all materials to all contracts containing this Special Provision for which the basis of payment is by weight.

Should the Contractor elect to challenge the results of the independent weight check, the Engineer will continue to document the weight of material for which the adjustment factor would be applied. However, provided the Contractor furnishes the Engineer with written documentation that the source scale has been calibrated within seven (7) calendar days after the date of the independent weight check, adjustments in the weight of material paid for will not be applied unless the scale calibration demonstrates that the source scale was not within the specified Department of Agriculture tolerance.

At the Contractor's option, the vehicle may be weighed on a second independent Department of Agriculture certified scale to verify the accuracy of the scale used for the independent weight check.

WORK ZONE PUBLIC INFORMATION SIGNS (BDE)

Effective: September 1, 2002

Revised: January 1, 2005

Description. This work shall consist of furnishing, erecting, maintaining, and removing work zone public information signs.

Camera-ready artwork for the signs will be provided to sign manufacturing companies upon request by contacting the Central Bureau of Operations at 217-782-2076. The sign number is W21-1116-6048.

Freeways/Expressways. These signs are required on freeways and expressways. The signs shall be erected as shown on Highway Standard 701400 and according to Article 702.05(a) of the Standard Specifications.

All Other Routes. These signs shall be used on other routes when specified on the plans. They shall be erected in pairs midway between the first and second warning signs.

Basis of Payment. This work will not be paid for separately but shall be considered as included in the cost of the Standard.

WORK ZONE SPEED LIMIT SIGNS (BDE)

Effective: April 2, 2004

Revised: April 15, 2004

Delete Article 702.05(c).

Revise Article 702.05(d) to read:

“(d) Work Zone Speed Limit Signs. Work zone speed limit sign assemblies shall be provided and located as shown on the plans. Two additional assemblies shall be placed 150 m (500 ft) beyond the last entrance ramp for each interchange. The individual signs that make up an assembly may be combined on a single panel. The sheeting for the signs shall be reflective and conform to the requirements of Article 1084.02.

All permanent “SPEED LIMIT” signs located within the work zone shall be removed or covered. This work shall be coordinated with the lane closure(s) by promptly establishing a reduced posted speed zone when the lane closure(s) are put into effect and promptly reinstating the posted speed zone when the lane closure(s) are removed.

The work zone speed limit signs and end work zone speed limit signs shown in advance of and at the end of the lane closure(s) shall be used for the entire duration of the closure(s).

The work zone speed limit signs shown within the lane closure(s) shall only be used when workers are present in the closed lane adjacent to traffic; at all other times, the signs shall be promptly removed or covered. The sign assemblies shown within the lane closure(s) will not be required when the worker(s) are located behind a concrete barrier wall.

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.

CONDUIT ENCASED, CONCRETE, 3" DIA., PVC

Description. This work shall consist of furnishing and installing 3 inch schedule 80 PVC conduits, fittings and accessories, encased in concrete. This specification describes the minimum design, operational, functional and installation requirements for a non-invasive, magneto-inductive vehicle sensor conduit as described herein and as shown in the Plans.

Materials.

Conduit:

The 3-inch Schedule 80 rigid electrical plastic duct shall be manufactured to meet or exceed Section 1088.01 of the Standard Specifications for Road and Bridge Construction and comply with the American Society for Testing and Materials Standards (latest edition) Designation F 512-95, and to the standards of NEMA Publication No. TC-2, for EPC-80.

The duct shall be manufactured from virgin polyvinyl chloride complying with ASTM Designation D 1784 as specified in ASTM F 512-95 (Latest Edition). with the following exception:

1. The Outside Diameter and wall thickness shall be as follows:

Nominal Size inches	Outside Diameter inches	Minimum Wall Thickness inches
3"	3.500 ± 0.012"	0.300 ± 0.036"

The duct shall be permanently marked at regular intervals on the outside with the manufacturer's name or trademark.

Couplings shall be PVC or acetyl butyl styrene drive-on pipe fittings.

Concrete:

Concrete shall be Class SI complying with Section 503 of the Standard Specifications for Road and Bridge Construction.

Construction Requirements. The 3-inch Schedule 80, PVC conduit shall meet or exceed Section 810 of the Standard Specifications for Road and Bridge Construction, which apply to rigid non-metallic conduit with the following additions and modifications:

1. The centerline of the conduit shall not deviate horizontally or vertically more than 0.25 inches per foot.
2. At least one end of the conduit shall terminate at a standard size handhole or standard special size handhole and extend three inches into the handhole.

3. The conduit shall be sloped to drain into the handhole.
4. The far end of the conduit shall be capped when terminating or not terminating in a handhole.
5. The conduit encasement shall not be reinforced.

Straightness verification: Each 3-inch conduit for the installation of non-invasive sensors shall be verified for straightness prior to pavement being placed over the conduit. The Contractor shall provide the presence of the noninvasive sensor manufacturer's authorized representative during the testing of the first detection location. The Contractor shall insert non-invasive sensor carriers the full length of the conduit and demonstrate to the satisfaction of the Engineer and the non-invasive sensor manufacturer's authorized representative that the carriers move freely in the conduit without sticking or binding. If sticking or binding is observed, the non-invasive sensor conduit shall be removed, replaced, and retested. Damaged conduit shall not be re-used. Once the straightness of the non-invasive sensor conduit in the first location has been verified, the Contractor shall notify the Engineer not less than one working day in advance of verifying the straightness of subsequent non-invasive sensor conduits. The Contractor shall verify the straightness, correct any deficiencies, and re-test as described for the first installation to the satisfaction of the Engineer. The Contractor or Engineer may request that the non-invasive sensor manufacturer's authorized representative inspect any subsequent location. Verification of subsequent locations by the non-invasive sensor manufacturer's authorized representative will be at no additional cost to the State.

Underground concrete-encased conduit shall be supported on interlocking plastic spacers specifically designed for the purpose, spaced along the length of the run as recommended by the manufacturer. Spacing between raceways within a common duct bank shall be not less than 2 in. The interlocking spacers shall be used at a minimum interval of 8 ft.

Concrete cover overall shall not be less than 3.5 in above the conduit, 3.0 in below the conduit, and a 10 in by 10 in square. Space below the conduit, and concrete fill shall be assured. Care shall be exercised during concrete placement to assure that there are no voids, so that spacers are undisturbed, and so that conduit joints stay secure and unbroken. Concrete shall be deflected during placement to minimize the possible damage to or movement of the conduits.

The Contractor shall ensure the concrete encasement and conduit remains undamaged during construction. One method for ensuring the concrete encasement and conduit remains undamaged during construction is by providing a granular sub-base mound a minimum of 24" high at the center of the microloop conduit installation and extending 50' on each side of the center of the microloop conduit installation. Other methods may be used, as the Contractor deems appropriate and as approved by the Engineer. Any damage to the concrete encasement and conduit during construction shall become the responsibility of the Contractor to repair or replace, as determined by the Engineer.

The Contractor shall ensure that the conduit is continuous, with no break from one handhole to the end cap as shown on the Plans. The Contractor shall test the integrity of the conduit upon completion of the roadway above each conduit. The Contractor shall install sensor carriers for the entire length of the conduit to demonstrate its suitability and correct installation. These carriers shall be removed upon approval of the Engineer and completion of the demonstration.

Method of Measurement. This item shall be measured for payment in feet for CONDUIT ENCASED, CONCRETE, 3" DIA., PVC. Measurements will be made in straight lines along the centerline of the conduit between ends.

Basis of Payment. This work shall be paid for at the contract unit price per foot for CONDUIT ENCASED, CONCRETE, 3" DIA., PVC, which shall include conduit, labor and miscellaneous materials required to make a complete and operational installation as specified herein and as directed by the Engineer.

COILABLE NON-METALLIC CONDUIT

Description. This work shall consist of furnishing and installing coilable non-metallic raceways, fittings, and accessories either laid in trench or pushed (bored and pulled).

Materials. Materials shall be according to Article 1088.01(c) as modified above.

In order to trace the fiber optic cable after installation, pull tape shall be installed or come pre-fabricated in the conduit for each fiber optic cable run. The pull tape shall clearly indicate English units of length on the apparatus. The pull tape shall have a minimum tensile strength of 1250 lbf. All pull tape splices shall be kept to a minimum and shall incorporate maximum lengths of cable supplied by the manufacturer. Pull tape shall be run continuously from handhole to handhole. Pull tape shall be grounded at handholes and cabinets meeting the requirements of Section 801.14, Equipment Grounding Conductor.

CONSTRUCTION REQUIREMENTS

Coilable Non-metallic Conduit, pushed (bored and pulled) or in trench, shall have a minimum depth of 30" feet below the finished grade as indicated on the plans.

Coilable Non-metallic Conduit, pushed (bored and pulled) or in trench, shall be installed according to Section 810.03(c) of the Standard Specifications.

Method of Measurement. This work will be measured for payment according to section 801.04 of the Standard Specifications.

Basis of Payment. This work will be paid for at the Contract unit price for CONDUIT IN TRENCH, HIGH DENSITY POLYETHYLENE, COILABLE, of the size specified, or CONDUIT PUSHED, HIGH DENSITY POLYETHYLENE, COILABLE of the size specified, which price shall be payment in full for furnishing and installing the coilable nonmetallic conduit and all labor, tools, equipment, and incidentals necessary to complete the work.

(EK/CTE – 01/21/2005)

RAMP CLOSURE SIGNS

Description. Ramp closure signs are temporary information signs erected throughout the project limits which notify a motorist in advance whether a ramp is open or closed.

Materials. Materials shall be as specified in the Special Provision for Temporary Information Signing.

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

All ramp closure signs shall be installed in accordance with Article 702.05 and Article 720.04 at the locations shown on the plans or as directed by the Engineer. The signs shall be 7' above the near edge of the pavement and shall be a minimum of 2' beyond the edge of the paved shoulder. A minimum of 2 posts shall be used.

The signs must be in place within 30 days after award of the contract. The Contractor will be required to coordinate with adjacent contracts to determine the initial configuration of the closed or open symbols, and for the subsequent ramp closure schedule. It will be the Contractor's responsibility to update the ramp closure sign panels to reflect the current status of all ramps within the project limits, in a timely manner. The Contractor shall install the appropriate symbol (open or closed) for each ramp within 24 hours after the ramp is either opened or closed. All ramp closure signs shall be removed at the end of the contract.

Method of Measurement. This work shall be measured for payment as specified in the Special Provision for Temporary Information Signing.

Basis of Payment. This work shall 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 – 01/21/2005)

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.

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

listed on the wage determination unless the Administrator of the

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.