



Illinois Department of Transportation

2300 South Dirksen Parkway / Springfield, Illinois / 62764

February 28, 2005

SUBJECT: FAI Route 90/94
Project ACIM-943(369)55
Section 2003-311
Cook County
Contract No. 62583
Item No. 99, March 11, 2005 Letting
Addendum A

NOTICE TO PROSPECTIVE BIDDERS:

Attached is an addendum to the plans or proposal. This addendum involves revised and/or added material.

1. Revised pages 38 – 49, 114 – 115, 181 – 188, 223 – 255 and 276 of the Special Provisions.
2. Add pages 456 - 458 to the Special Provisions.
3. Revised pages i – v of the Table of Contents of the Special Provisions.
4. Revised pages 1, 2, 4, 5, 7, 8, 9, 13, 14, 15, 16 and 17 of the Schedule of Prices.
5. Revised sheets 2, 4-10, 44, 610, 611, 660-666, 714, 719, 723, 726, 727, 729, 731-733, 735-737, 742-747, 750, 752-757, 759, 761-766, 784, 785, 797, 799, 809, 810, 821, 825-835, 841, 843, 846, 848, 851, 853, 876, 877, 879-882, 884-888, 890-891, 896-901, 902, 938-940, 966 and 967 of the Plans.
6. Added sheets 901A and 901B to the Plans.

Prime contractors must utilize the enclosed material when preparing their bid and must include any Schedule of Prices changes in their bidding proposal.

Bidders using computer-generated bids are cautioned to reflect any and all Schedule of Prices changes, if involved, into their computer programs.

Very truly yours,

Michael L. Hine
Engineer of Design
and Environment

A handwritten signature in black ink, appearing to read 'Ted B. Walschleger' followed by a small 'P.E.' to the right.

By: Ted B. Walschleger, P. E.
Engineer of Project Management

cc: Diane O'Keefe; N. R. Stoner; Roger Driskell; Jim White; Design &
Environment File
TBW:TK:jc

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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

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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

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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

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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.

Wiring Methods. Wire and cable in equipment, panels, enclosures and shelters shall be installed in a trim, neat and professional manner in accordance with National Electrical Contractors Association (NECA) Standards. The wire and cable shall be trained in straight horizontal and vertical directions and be parallel, next to, and adjacent to other wires and cables whenever possible. Wires and cables shall be routed in such a manner as to not obstruct the installation or removal of components.

(CTE - 2/11/05)

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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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FAI ROUTE 90/94
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CONTRACT #62583

Controller Name	Station Number	Approximate Service Location	New or Existing Feed	Voltage	Circuit Breaker Size	Month/Year Service is Required	Equipment
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	2281+10	84th St. East of State St.	New	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	September/2005	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	30 Amp	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-03L&E/44	2455+60	57th Place East of Wentworth	Existing	120/240	200 Amp	September/2006	DMS-03L&E,DET-33,DET-35
DMS-UPS-31L&E	1476+45	South of 55th Street, West of Wells Street	Existing	120/240	200 Amp	September/2006	DMS-31L&E
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

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35A	1552+10	45th Place West of Wentworth	Existing	120/240	30 Amp	December/2006	RM-17A
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-32L&E	1584+75	37th Street, West of Wentworth	Existing	120/240	200 Amp	September/2006	DMS-32L&E
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
30	2599+00			120/240	30 Amp	September/2005	DET-49
DMS-UPS-04L&E	2605+75			120/240	200 Amp	September/2005	DMS-04L&E
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	June/2005	DMS-08
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.

(CTE – 2/11/2005)

Revised 02-28-2005

Deleted 02-28-2005

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

Deleted 02-28-2005

Deleted 02-28-2005

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 or meter pedestal cabinet as required for 120 volt and 120/240 volt services as shown on the Plans and as directed by the Engineer. The electric service box and meter pedestal cabinet shall be included in this pay item.

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

Temporary installation of electric utility meter on wood pole in locations serving dynamic message signs as shown on the plans shall be included in this pay item.

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 – 2/11/2005)

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.

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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 and dynamic message signs 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. The Contractor shall be responsible for the proper operation and maintenance of the new dynamic message signs until they have been installed in their permanent configurations and accepted by IDOT.

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.

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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, detection loops, and dynamic message signs. The Contractor shall act to correct system deficiencies within 12 hours of notification by the Engineer or by the IDOT Traffic Systems Center.

In addition to repair of damaged or malfunctioning signs, the dynamic message signs shall also require periodic cleaning as part of this maintenance pay item. Regular monthly cleaning of the sign face shall be performed in accordance with IDOT's current maintenance schedule and procedures for existing dynamic message signs installed in IDOT District 1.

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 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, Revised CTE – 2/11/2005)

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CLOSED CIRCUIT DOME VIDEO CAMERA, MATERIAL ONLY

Effective Date: February 25, 2005

Description. This item shall consist of furnishing an integrated Closed-Circuit Television (CCTV) Dome Camera Assembly as described herein and as indicated in the Plans.

Definitions:

CCTV Dome Camera	The complete camera assembly including the camera, PTZ mechanism, upper and lower dome housings, and any mounts.
Dome, lower dome, dome bubble	Clear dome (bubble) on the lower portion of the CCTV dome camera which the camera views through
Dome housing, upper dome	The upper portion of the CCTV dome cameras which houses the camera and PTZ Mechanism.
PTZ	The motorized Pan, Tilt and Zoom mechanism
Camera	The color camera

Materials.

General. The CCTV Dome Color Camera shall be a rugged, non-pressurized, outdoor surveillance domed camera system. The CCTV Dome Camera shall be designed to perform over a wide range of environmental and lighting conditions and automatically switches from color daytime to monochrome nighttime operation.

All equipment and materials used shall be standard components that are regularly manufactured and utilized in the manufacturer's system.

The manufacturer shall be ISO 14001 Certified. The manufacturer's quality system shall be in compliance with the I.S./ISO 9001/EN 29001, QUALITY SYSTEM. The manufacturer shall provide a three year (3) warranty. The manufacturer shall pay inbound and outbound shipping charges during the warranty period for products returned as warranty claims. The manufacturer shall also provide an advance exchange program for warranty claims.

The warranty period shall begin on the date of final acceptance of the video distribution system. This warranty shall include repair or replacement of all failed components via a factory authorized repair facility. All items sent to the repair facility for repair shall be returned within two weeks of the date of receipt at the facility. The repair facility location shall be in the United States. Any extended warranty coverage required to comply with the specified warranty period shall be provided as a part of this pay item at no additional cost to the State.

Physical Construction. The CCTV Dome Camera shall be provided in a NEMA 4X or IP66 certified, rugged, weather-resistant package. The CCTV Dome Camera shall also comply with the following requirements:

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Environmental	Requirement
IP Rating	IP 66
Weight (max.)	14 lbs
Overall Dimensions	10" dia. x 14"
Humidity	0 to 100%
Operating temperature	-40°C to 50°C
Mount	1 ½" NPT

The CCTV dome camera shall be equipped with a fan and heater controlled by a thermostat. The heater shall prevent internal fogging of the lower dome throughout the operating temperature range of the camera.

An optional rugged clear dome bubble shall be available from the CCTV camera manufacturer. The rugged dome shall be made from 3mm thick polycarbonate, designed to meet stringent strength standards without compromising optical clarity. The dome, by itself, shall withstand a 100 foot-pound impact. This energy is equivalent to that of a 10 lb sledgehammer being dropped from a height of 10 feet. The dome, when installed in the CCTV camera, shall exceed the UL 1598 horizontal impact standard for lighting fixtures, by a factor of 10. The submittal needs to indicate compliance with this requirement.

Power. The CCTV Dome Camera shall be designed to operate from a 120v power source. The appropriate power supply, if required for the CCTV Dome Camera to operate, shall be included as a part of this item. The power requirements for the camera shall comply with the following:

Electrical	Requirement
Voltage	18 to 30 VAC
Load	25 VA
Heater Load	45 VA
Listing	UL Listed
FCC	Class B
Surge & Lighting Protection	Yes

Camera. The CCTV Dome Camera shall incorporate a solid state CDD imaging camera with the following requirements.

The camera shall automatically switch from daylight color operation to a higher sensitivity nighttime monochrome mode when light levels fall below a user adjustable threshold level.

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 also comply with the following requirements:

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Camera	Requirement
Imager	1/4" CCD or smaller
Effective Pixels	724H x 494V
Zoom Lens Power (without digital enhancement)	25x
Aperture	f1.6 to f2.7
Focus	Auto / Manual
Iris	Auto / Manual
Maximum Field of View Horizontal	45°
Video Output	1.0v +/- 0.07v
Gain Control	Auto / off
Synchronization	Internal / AC line lock, phase adj. via remote control, V-Sync
Digital Zoom	10x
Horizontal Resolution	>470 lines
Signal – Noise Ratio	>50dB
White Balance	Auto / Manual
Shutter Speed	½ to 1/30,000

Min Illumination		Values in lux
Color	Fast Shut	2.00
	Slow Shut	0.15
B&W	Fast Shut	0.3
	Slow Shut	0.017

PTZ Mechanical. The CCTV dome camera shall have an integrated motorized PTZ mechanism as specified herein and shall be compatible and coordinated with the control system described elsewhere herein. 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.

Mechanical (Dome Drive)		Requirement
Pan		360°
Tilt		+2° to -92°
Continuous PTZ Operation		Yes
Pre-position speed	Pan	360°/sec
	Tilt	200°/sec
Accuracy	Pan	+/- 0.5°
Variable speed	Pan	80°/sec or 150°/sec
	Tilt	40°/sec

Functionality.

Camera Commands. The camera shall allow the storage of 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 for a programmed dwell time. Any or all of the presets may be included or excluded from the tour.

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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 programmable options: 1) return to preset #1 or 2) return to the automated tour previously executed or 3) do nothing and remain at the present position.

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

Visual Effects	Requirement
Sectors/Zones	8
Titling	20 characters
Max Presets	99
Motion Detection	Yes
Password Protection	Yes
On Screen Configuration Menus	Yes
Image Stabilization	Yes

Preset Tour / max presets	
Recorded Variable PTZ Tour	2
Auto Flip	Yes
Auto Return to preset after operator inactivity	Yes
Window Blanking	
Quantity	6
Grey out	Yes
Alarms	Yes

The manufacturer shall fully document and provide to the Department the communication protocol implemented by the CCTV dome camera. This protocol shall be open and allow third-party development of control software. If the current protocol is not NTCIP compliant, the manufacturer shall supply upgrades to make the software compliant in the future at no cost to the Department.

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Diagnostic software shall be provided with each CCTV camera which shall allow all camera functions accessible via a Windows XP based PC. A RS232 cable, or a USB cable if available, shall be provided to connect to CCTV dome camera assembly. A copy of the diagnostic software shall be supplied for each CCTV camera. The program shall be capable of configuring and controlling the 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.

Interface.

Control System. Camera commands shall be transmitted over twisted pair, RS 232, RS 422 and RS 485. The method of transmission shall be user selectable.

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.

Testing. The Contractor shall test each CCTV Dome Camera Assembly as required and described under Shop Floor Testing within the CCTV Distribution System special provision contained elsewhere herein. Upon successful completion of the testing, the CCTV camera may be counted for payment.

Product Support. 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.

Method of Measurement. Closed-Circuit Television (CCTV) Dome Cameras shall be counted as each upon successful completion of the testing describer herein for payment.

Basis of Payment. This item will be paid for at the contract unit price each for CLOSED CIRCUIT TELEVISION DOME CAMERA, which shall be payment in full for all material and work as specified herein.

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.

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Materials. The CCTV dome camera to be mounted on the high mast tower ring is furnished separately under the CLOSED CIRCUIT TELEVISION DOME CAMERA 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 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 CABINET EQUIPMENT. 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,

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equipment, tools and all incidentals necessary for the completion of this work as described herein and elsewhere in the Contract documents.
(E&K - 02/25/2005)

CCTV CAMERA DOME CAMERA, SIGN TRUSS INSTALLATION

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
Closed Circuit Television Dome Camera (Supplied under separate pay item, same title)

Composite Cable. The Contractor shall provide composite cabling that includes power conductors, coaxial video feed, and RS-422 control wires to connect the integrated CCTV dome camera assembly to the equipment cabinet designated on the Plans from which the camera shall be powered. Compatible connectors shall be supplied to mate with the integrated CCTV dome camera assembly. In addition, the other end of the cable, to be terminated in the equipment cabinet, shall be terminated with an RS-422 connector compatible with the communications equipment supplied under other bid items, a BNC connector to terminate the NTSC video feed, and lugs to terminate the AC power feed.

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.

The Contractor shall install a camera supplied under CLOSED CIRCUIT TELEVISION DOME CAMERA on the sign truss as indicated in the plans. The Contractor shall install and terminate the composite cable between CCTV cabinet and the CCTV dome camera.

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.

Configuration and Testing. The operation of the CCTV dome camera shall be tested as part of the testing required under CLOSED CIRCUIT TELEVISION CABINET EQUIPMENT. All

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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. This item shall be measured in units of each for CLOSED CIRCUIT TELEVISION DOME CAMERA, SIGN TRUSS INSTALLATION installed and tested.

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, composite cable, connectors, and any other component incidental to the installation of a CCTV on a sign truss.

(E&K – 02/25/2005)

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.

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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-03L & DMS-03E: NB Dan Ryan Expressway near 57th St.
4. DMS-31L & DMS-31E: SB Dan Ryan Expressway near Garfield Blvd.
5. DMS-32L & DMS-32E: SB Dan Ryan Expressway near Pershing Rd.
6. DMS-04L & DMS-04E: 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.

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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 $+149^{\circ}\text{F}$ 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.

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Sign Housing Construction. The size of the sign including housing and mounting brackets shall be 26'-1" Wide, 8'6" High, and 45 1/4" 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.

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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 Facia 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 facia perimeter panels shall be a minimum of 12 inches wide.

The external facia 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

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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

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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.

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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.

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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.

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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

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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.

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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 AllnGaP, 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 \pm 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.

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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.

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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.

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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. One sign controller shall be furnished with each of the seven sign locations except for the signs located at 55th Street. Signs DMS-31L and DMS-31E located at 55th Street shall each contain a single dedicated sign controller, and the controller shall be mounted in the sign housing. Where a single controller cabinet is used to control both a local and an express lane sign, a single sign controller shall be used and it shall be configured for dual sign operation.

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.

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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

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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

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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.

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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.

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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

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- 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
- (d) Multi-drop Modem. Modem shall only be furnished with signs DMS-03E, DMS-31E, DMS-32E, and DMS-04E, and shall be installed in the sign housings at these locations. 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.
- (e) Fiber Optic Data Transceiver. One fiber optic data transceiver (FODT) shall be furnished with sign DMS-31L and installed in the sign housing. The 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.
- (f) Ground Control Box. The ground control box shall be installed only on signs DMS-31L and DMS-31E. The box shall be mounted to the sign support leg on the median barrier wall. The ground control box 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
 - 120 VAC GFI outlet

The cabinet dimensions shall be approximately 15 inches high by 15 inches wide by nine inches deep.

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There shall be a hinged shelf which folds from inside the cabinet and is suitable for the laptop computer to rest on.

The cabinet shall be a NEMA 3R single-door enclosure.

The cabinet shall be constructed using unpainted sheet aluminum with a minimum thickness of 0.125 inch. Material used in the cabinet shall meet NEMA standards.

The cabinet shall be completely weatherproofed to prevent the entry of water. All exterior seams for cabinets and doors shall be continuously welded. All exterior welds shall be smooth.

The cabinet shall be provided with one full size door to provide access to the cabinet. The door shall be provided with a full length stainless steel piano hinge, with a stainless steel pin spot welded at the top. The hinge shall be mounted so that it is not possible to remove it from the door or cabinet without first opening the door.

The door and hinges shall be braced to withstand a 100 pound per vertical foot of door height load applied vertically to the outer edge of the door when standing open. There shall be no permanent deformation or impairment of any part of the door or cabinet body when the load is removed.

The cabinet door shall be fitted with a number 2 Corbin lock. Two keys shall be provided for each cabinet.

The door opening shall be double flanged on all four sides.

A gasket shall be provided to act as a permanent dust and weather resistant seal at the cabinet door facing. The gasket material shall be closed-cell neoprene and shall maintain its resiliency after exposure to the outdoor environment. The gasket must show no sign of rolling or sagging and must insure a uniform dust and weather resistant seal around the entire door facing.

The voice / data / control cable shall be terminated with a single CHAMP type IDC connector on each end.

The power-on indicator shall show when the display system interface circuits are energized.

All shop drawings of the cabinet, as described in this specification and the plans, shall be submitted to the Engineer for approval before installation.

All markings and identification shall be silk screened on the panel and sealed with a clear sealer or as approved by the Engineer.

The Contractor shall be responsible for all phone, data, control and confirmation connections between the sign and ground control box and for any required wiring harnesses and connectors.

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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.

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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.

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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-03L, Contract 62301
4. DMS-03E, Contract 62300
5. DMS-31L, Contract 62303
6. DMS-31E, Contract 62302
7. DMS-32L, Contract 62303
8. DMS-32E, Contract 62302
9. DMS-04L, Contract 62301
10. DMS-04E, Contract 62300

The Contractor shall be solely responsible for the entire installation of the new sign on the existing truss. This includes any temporary removal of the truss and/or sign, 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.

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.

Signs DMS-30, DMS-02, DMS-03E, DMS-31E, DMS-32E, and DMS-04E 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.

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Signs DMS-03E, DMS-32E, and DMS-04E shall be installed in a temporary configuration with the sign controller mounted in the sign housing. All re-wiring and re-configuration of the sign and its components required to move the controllers from the sign housings to their permanent location in the ground mounted cabinets shall be included in the cost of this pay item. A maximum downtime of 48 hours shall be allowed for the conversion of signs from temporary to permanent configuration. After this time has expired, liquidated damages of \$3,000 per day shall be assessed to the Contractor.

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.

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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.

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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.

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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

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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

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- 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.

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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 – 2/11/2005)

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:

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(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 cabinets and DMS-02 and DMS-30. 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.

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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 – 2/11/2005)

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

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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 leased communication line connections to each of the dynamic message signs, DMS-30, DMS-02, DMS-03E, DMS-31E, DMS-32E, DMS-04E, and DMS-08.

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 Siacor CAC 3000, or equal, plastic telephone network interface junction box shall be mounted within the sign controller cabinets or sign housing. 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 or ELECTRIC CABLE IN CONDUIT NO. 19, 6/C.

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 and ELECTRIC CABLE IN CONDUIT NO. 19, 6/C. After installation the Illinois Department of Transportation shall be responsible for SBC hookup and service charges.

(CTE – 2/11/2005)

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.

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ENGINEER'S FIELD OFFICE TYPE A (SPECIAL)

This item shall consist of furnishing all utilities and maintaining in good condition the existing office space, located at 900 South Des Plaines Street, Chicago, for the exclusive use of the Engineer or Authorized Representative. The Office shall meet the requirements of Article 670.02 of the Standard Specifications with the following modifications:

1. The following equipment and furnishing shall be provided by the Contractor for the rear portion of the building that has been previously subdivided, as approved by the Engineer.
 - A. Twenty (20) desks with minimum working surface (1.1m x 750mm) each and Twenty (20) non-folding office chairs with upholstered seats and backs.
 - B. Three (3) 4-post drafting tables with minimum top size of (950mm x 1.2m). The top shall be basswood or equivalent and capable of being tilted through an angle of 50 degrees. Three (3) adjustable height drafting stools with upholstered seats and backs shall also be provided.
 - C. Five (5) freestanding file cabinets with locks legal size, four drawers with an Underwriter's Laboratories insulated file device 350 degrees one hour rating.
 - D. One (1) office-style refrigerator with a minimum size of 0.3 cubic meters with a freezer unit.
 - E.. Three (3) electric desk type tape printing calculators.
 - F. Ten (10) telephones and one (1) telephone answering machine (for exclusive use by the Engineer). Eight (8) telephone lines should be provided including one (1) telefax line and two (2) modem lines.
 - G. Two (2) electric water cooler dispenser.
 - H. One (1) telecommunications fax machine, including maintenance and operating supplies. The fax machine shall use plain paper.
 - I. One (1) first aid cabinet fully equipped and replenished at least once a month.
 - J. One (1) desktop dry process office copier (including maintenance and operating supplies capable of copying field books). Supply paper and trays for 215mm x 280mm; 215mm x 355mm; and 280mm x 430mm sizes. The copier shall be complete with automatic feeder and sorter.

Added 02-28-2005

2. The front portion of the space has also been previously subdivided and the following furnishings shall be provided by the Contractor as approved by the Engineer.
 - A. One (1) desktop dry process office copier (including maintenance and operating supplies capable of copying field books). Supply paper and trays for 215mm x 280mm; 215mm x 355mm; and 280mm x 430mm sizes. The copier shall be complete with automatic feeder and sorter.
 - B. One (1) electric water cooler dispenser.
 - C. Two (2) blackboards 1.2m by 1.8m.
 - D. One (1) microwave oven.
 - E. One (1) telephone answering machine.
 - F. Four (4) electric tape printing calculators.
 - G. One (1) office-style refrigerator with a minimum size of 0.3 cubic meters with a freezer unit.
 - H. One (1) first-aid cabinet, fully equipped.
3. The office space shall be maintained and kept in a clean condition at all times. The Contractor shall provide janitorial and/or cleaning service for a minimum of three times a week. Windows and window blinds shall be cleaned as directed by the Engineer. Maintenance shall include, but not limited to, paper towels, soap, toilet paper, and other necessary supplies. No additional compensation will be allowed for providing this service.
4. The rear office interior walls may require one (1) coat of paint, as directed by the Engineer, at no additional cost.
5. The Contractor shall be responsible for security of the field office building and is liable for damages incurred as a result of vandalism, theft, and other criminal activities. Broken windows shall be replaced at no additional cost.
6. The Contractor will be responsible for systems maintenance repairs which shall include the heating, cooling, sanitary and water distribution systems and light bulb replacements. One existing rooftop air conditioning and/or rooftop heating unit is to be replaced.
7. The (10) fire extinguishers meeting City of Chicago requirements shall be provided.

Added 02-28-2005

8. The Contractor will be responsible for snow removal from parking areas and sidewalks surrounding the building. Repair aggregate parking area as directed by the Engineer, at no additional cost.
9. The Contractor shall pay the cost of any building or equipment inspections by the City of Chicago. The Contractor shall also pay all costs to comply with the maintenance types inspection findings.
10. The contractor shall pay for the removal and replacement of the sidewalk along the length of the building with provision for handicap accessibility at the main entrance of the building. The gate located at the back parking lot will be removed and replaced with a locking gate. Also included is the repair of chain link fence around the property
11. The Contractor shall pay for the repair of the rear bathroom located in the rear office which also includes updating the electrical and plumbing fixtures.
12. The Contractor shall pay the cost for the inspection of the building composite roof and repair of roof leaks.

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

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

Added 02-28-2005

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 - 2003-311

Project Number
 ACIM-0943/369/055

Route
 FAI 90/94

Item Number	Pay Item Description	Unit of Measure	Quantity	x	Unit Price	=	Total Price
* XX004046	AERIAL CABLE REMOVAL	FOOT	56,143.000				
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	147,009.000				
* X0323360	WOOD POLE REMOVAL	EACH	297.000				
* X0323363	ELCBL C 12 3/C	FOOT	5,134.000				
* X0323364	ELCBL C 19 6/C	FOOT	2,926.000				
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	206.000				
* X0323907	COMMUNICATIONS VAULT	EACH	28.000				
* X0323914	FOC SPLICE - LATERAL	EACH	53.000				

* REVISED : MARCH 2, 2005

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Route
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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 LTGRM WIRE	EACH	51.000				
X0324190	REMSALV 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	3.000				
* X0324254	E S INST 200A 120/240	EACH	7.000				
X0324280	LTG CT RCD C-TY SCNP	EACH	6.000				
X0324292	MAIN EX TRAFFIC SURV	GAL 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	571.000				
X0324592	2070 CONTROLLER	EACH	45.000				

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Route
 FAI 90/94

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	12,562.000				
* X0324798	ELCBL C 2C#4 & 1C#6G	FOOT	19,819.000				
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	27.000				
* X0324803	CAB 334EQ RAMP METER	EACH	14.000				
* X0324804	CAB 334EQ DMS/SYS DET	EACH	1.000				
X0324805	CAB 334EQ DYN MES SGN	EACH	5.000				
X0324806	CAB 334EQ UNINTER PS	EACH	11.000				
X0324807	CCTV CABINET EQUIPMNT	EACH	16.000				

* REVISED : MARCH 2, 2005

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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	30.000				
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 REMISALV	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 180@SL	L SUM	1.000				
X0324821	CCTV DIS SBSY 157@294	L SUM	1.000				
X0324822	CCTV DIS SBSY 157@194	L SUM	1.000				

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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 GH LK FENCE	FOOT	1,755.000				
* X6700410	ENGR FLD OFF A SPL	CAL MO	33.000				
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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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 EPRRHW1.25	FOOT	5,648.000				
X8160160	UD 2#4#4G EPRRHW 1.25	FOOT	17,149.000				
X8160370	UD 3#4 #6G EPRRHW1.25	FOOT	31,141.000				
X8160380	UD 3#2 #4G EPRRHW1.25	FOOT	106,543.000				
* X8180050	A CBL 3-1C4/0 A MES W	FOOT	2,557.000				
* X8180080	A CBL 1-6C 19 A MES W	FOOT	2,904.000				
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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Item Number	Pay Item Description	Unit of Measure	Quantity	x	Unit Price	=	Total Price
* X8700200	ECA C EPRTC 3C 2/0 6G	FOOT	1,816.000				
* X8700210	ECA C EPRTC 3C 4/0 4G	FOOT	2,321.000				
X8700220	ECA C EPRTC 3C 4/0 2G	FOOT	782.000				
* X8700230	ECA C EPRTC 3C 350 3G	FOOT	2,516.000				
X8700550	ECA C TC 3C 350MCM	FOOT	715.000				
* X8710028	FIB OPT CBL 6F SM	FOOT	353,847.000				
* X8710030	FIB OPT CBL 48F SM	FOOT	92,537.000				
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	2,290.000				
* X8710052	FO TERM PANEL 12F	EACH	52.000				
* X8730248	ELCBL C 18 4PR TW SH	FOOT	1,976.000				
X8801200	SH P LED 1F 2S BM	EACH	2.000				
* X8801210	SH P LED 1F 2S PM	EACH	26.000				
X8950112	MOD EX SURVEL CAB	EACH	5.000				
Z0013798	CONSTRUCTION LAYOUT	L SUM	1.000				

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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 DISPOS	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	266.000				
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				
* DELETED							
* 80800400	TEMP WP50 CL4	EACH	187.000				
80800500	TEMP WP60 CL4	EACH	43.000				
80800520	TEMP WP60 CL4 8MA	EACH	2.000				
80800850	TEMP WP90 CL4 15MA	EACH	22.000				
* 80802600	W POLE 50 CL 2	EACH	1.000				
* DELETED							
* 81000600	CON T 2 GALVS	FOOT	93,080.000				
* 81000800	CON T 3 GALVS	FOOT	12,087.000				
81001000	CON T 4 GALVS	FOOT	1,794.000				
* 81016400	CON T 1 1/4 HDP COIL	FOOT	518,025.000				
81016800	CON T 3 HDP COIL	FOOT	600.000				
81017000	CON T 4 HDP COIL	FOOT	80.000				
* 81018500	CON P 2 GALVS	FOOT	11,843.000				
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	924.000				
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	118.000				

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* 81500200	TR & BKFIL F ELECT WK	FOOT	221,558.000				
81700110	EC C EPR RHW 1C 10	FOOT	62,629.000				
81800100	A CBL 3-1C3/0 A MESS W	FOOT	1,400.000				
* 81800700	A CBL 3-1C2 AL MESS W	FOOT	63,948.000				
82102310	LUM SV HOR MT 310W	EACH	42.000				
82106100	LUM SV HMMH 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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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	2,300.000				
87000214	ECA C EPRTC 3C 2 #4G	FOOT	2,207.000				
* DELETED							
* 875002100	TS POST PS 2 1/2	EACH	7.000				
875002207	TS POST PS 5	EACH	20.000				
875002210	TS POST PS 7	EACH	9.000				
* 87800100	CONC FDN TY A	FOOT	12.000				
87800200	CONC FDN TY D	FOOT	9.000				
87900200	DRILL EX HANDHOLE	EACH	18.000				
* 88600300	DET LOOP T3	FOOT	1,809.000				
* 895002300	REM ELCLB FR CON	FOOT	3,886.000				
895002350	REM & RE ELCLB FR CON	FOOT	3,605.000				

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