MARYLAND TRANSPORTATION AUTHORITY
Baltimore, Maryland

Invitation for Bids

FORT MCHENRY TUNNEL

Maryland Transportation Authority

Contract No. FT 710-000-002R

UPGRADE AND REPLACE EXISTING SIGNING WITH BRIDGE MODIFICATIONS NORTH OF THE FORT MCHENRY TUNNEL

Baltimore County and Baltimore City

June, 2009

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NOTICE TO BIDDERS

A "Pre-Bidding Session" for the purpose of answering or obtaining answers to questions of parties interested in constructing the work relative to Right-of-Way, Utilities, Design, and Construction Details will be conducted at **9:30 am** on **June 26th, 2009**, in the Conference Room, at the Maryland Transportation Authority, 300 Authority Drive, 2nd Floor, Baltimore, Maryland 21222. While attendance at the Pre-Bid conference is not mandatory, this is the offeror's opportunity to raise questions and/or issues of concern regarding the project.

NOTICE TO BIDDERS

Please review the checklist prior to submitting your bid on this Contract.

- When submitting your completed bid, do not separate the book. Submit the whole book including all addenda acknowledgment pages.
- Make sure that all addenda letters are attached outside of the front cover of the bid book.
- If the addendum has revised the Schedule of Prices, make sure that you have included the revised pages in your bid. Your price should reflect any and all changes.
- Prices must be written numerically and in words, unless approved substitute forms are used (Refer to GP-2.06). Don't leave any items blank.
- When tabulating your final price, make sure all your calculations are correct.
- Minority Business Enterprise Attachments A and B must be completed and submitted with your bid. If either of these attachments is missing your bid is non-responsive. Attachments C and D **should not** be submitted at time of bid. **For additional information on how to complete the MBE Attachments, please see the insert named "Important Information regarding MBE Utilization and Bidding Requirements" located in the IFB.**
- The Bid/Proposal Affidavit must be completely filled out and signed by all the parties as indicated.
- If Escrow is being offered in a contract, the contractor must indicate whether or not they wish to utilize an Escrow Account for Retained Funds on the provided form.
- A bid bond must accompany all bids of One Hundred Thousand Dollars ($100,000.00) or more. The bid bond document must be completely filled out and have an original Power of Attorney form attached.
- If the document is too large for the envelope that we have provided, you can place the document in another form of packaging that can be sealed and submitted. If the document is too large for the bid box, you should alert the receptionist.
- Make sure that your company's name, address, the contract number and the bid date appears on the front of the packaging.

- When submitting bid packages via US Mail, Federal Express, DHL, UPS or any other delivery service it is your responsibility to make sure that the bid reaches the bid box before the time deadline. It may be in your best interest to send the package 24 hours in advance of the deadline. Also, when sending packages this way, make sure that the labeling specifies that it is a bid submission.

MPORTANT INFORMATION REGARDING MBE UTILIZATION AND BIDDING REQUIREMENTS

The Maryland Transportation Authority (the "Authority") has been forced to reject many recent bids/proposals due to bid submissions that were not in strict compliance with the stipulated MBE rules and regulations. The following checklist has been developed to highlight certain critical components of the MBE program requirements. This listing is not all-inclusive and the bidder **must** comply with all MBE rules and regulations listed throughout this entire proposal book.

Please read all of the instruction provided on Attachment A, B, C & D in its entirety before completing the forms.

Attachment A (Certified MBE Utilization and Fair Solicitation Affidavit) & Attachment B (MBE Participation Schedule) must be included with the submittal of the bid or offer. If the bidder or offeror fails to submit these forms with the bid/offer as required, the Procurement Officer **shall deem the bid non-responsive** or shall determine that the **offer is not reasonably susceptible** of being selected for award. MBE Prime Contractors must achieve the established MBE goal with other certified MBE contractors. A Prime MBE Contractor **can not** count itself as an MBE to obtain the goal.

ATTACHMENT A

When filling out Attachment A, make sure you complete the following:

- If the Prime Contractor can achieve the established overall goal and sub goals, you must check the appropriate box.
- If after making good faith efforts, you determine you can not achieve the established overall goal or subgoals, you must request a waiver by checking the appropriate box.
- If you do not request the waiver at time of bid and you **are not** meeting the established goal(s), your bid/offer will be considered **non-responsive or not reasonably susceptible of being selected for award.**
- Attachment A must be signed and dated.

ATTACHMENT B Part 2

When filling out Attachment B, make sure you have included the following:

- Prime Contractor's name, address and phone number.
- Project description.
- Project number/Solicitation Number.
- List the minority firm name(Column 1), certification number and MBE Classification (Column 2), Total sub contract dollar amount (Column 3) and NAICS Codes of the services to be performed or products to be supplied (Column 4)

- Clarify for each sub-contractor if it will provide services, is a supplier or will supply and install (Column 5)

- It is the Contractor's responsibility to ensure that the proposed subcontractors are certified to perform the proposed work. All Contractors are to submit an approvable MBE plan at time of bid. Approvable means, the subcontractors are certified in the applicable NAICS Codes through MDOT and can perform the proposed services for the required participation goal. Contractors pending MBE certification at time of bid are **not** eligible for participation. If you submit a firm that is not certified to perform the proposed services and your contract falls short of the established MBE goal, your firm will be considered **non-responsive or not reasonably susceptible of being selected for award.**
- Prime Contractors are strongly encouraged to check the MDOT database at www.mbe.mdot.state.md.us to see if the subcontractor is certified to perform the services and to make sure the subcontractor has not graduated from the listed NAICS codes. If you have questions after checking the data base, you may contact the Authority MBE Office at 410-537-1048 for further assistance.

  If you are using a supplier, the 60% rule applies. Please refer to the MBE Manual for the description of the 60% rule.

  Please provide details on how you arrived at the 60% on Attachment B (Column 5) (i.e. – $150,000.00 X 60% = $90,000.00).

- If you are requesting a third tier relationship, you must state that request on the Attachment B form (Column 1). Please note: Third Tier MBE/DBE subcontracting will be approved by the Authority only when

the Authority is satisfied that there is no way except by Third Tier contracting that an MBE/DBE goal can be achieved. Specifics as to why a Third Tier contracting agreement must be included.

- Attachment B must be signed and dated.

- If you are the apparent low bidder, you will receive a letter from the Authority requesting your MBE Attachment C (Outreach Efforts Compliance Statement) and Attachment D (Subcontractor Project Participation Affidavit). You will have ten (10) working days to submit the attachments to the Authority. If you requested a waiver at time of bid, all of the back up documentation that complies with COMAR 21.11.03.11, must be submitted within the ten working days with Attachments C & D.

- If the apparent low bidder fails to return the required documentation within the allotted ten (10) days, the Procurement Officer may determine that the apparent low bidder is not responsible and therefore not eligible for contract award.

Notice to Bidders/Offerors

eMaryland Marketplace

In order to take advantage of Maryland State and Local government contracting opportunities, vendors/contractors are encouraged to register with eMaryland Marketplace. The free registration provides a means for businesses to receive e-mail notification of upcoming contracting opportunities in their specified areas of interest and expertise.

For registration requirements, visit:
www.eMarylandMarketplace.com

NOTICE TO ALL HOLDERS OF THIS CONTRACT DOCUMENT

NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM (NCHRP) REPORT 350 IMPLEMENTATION SCHEDULE FOR DEVICES USED IN THE MAINTENANCE OF TRAFFIC

Except as otherwise specified in this Section, all items for the maintenance of traffic, including those listed under the following categories, shall be crashworthy in conformance with Level 3 or other Level as specified by the Engineer in conformance with the safety crash testing and performance criteria published in the National Cooperative Highway Research Program (NCHRP) Report 350, "Recommended Procedures for the Safety Performance Evaluation of Highway Features." When conformance with NCHRP Report 350 is required, the Contractor shall provide the Engineer with the manufacturers' certifications that the devices comply with the specified criteria.

Unless specifically waived by an attachment to these Contract Provisions, devices must be approved by the S.H.A. Office of Traffic and Safety.

Category 1 Devices

These devices are cones, tubular markers, flexible delineator posts, and drums, all without any accessories or attachments, which are used for channelization and delineation.

Category 2 Devices

These devices are Type I, II, and III barricades; portable sign supports with signs; intrusion alarms; and drums, vertical panels, and cones, all with accessories or attachments.

Category 3 Devices

(a) Truck Mounted Attenuators (TMAs).

(b) Temporary Barrier.

(1) Concrete Barrier.

(2) Traffic Barrier W Beam and Water Filled Barrier.

(c) Temporary End Treatments.

Category 4 Devices

These devices are area lighting supports, arrow panels, and portable variable message signs that are usually portable or trailer-mounted.

WORK ZONE DEVICES	IMPLEMENTATION SCHEDULE TO CONFORM TO NCHRP REPORT 350 CRITERIA
CATEGORY 1 Cones, tubular markers, flexible delineator posts, and drums (all without any accessories or attachments)	All devices shall conform to NCHRP Report 350 criteria.
CATEGORY 2 Type I, II, and III barricades; portable signs supports with signs; intrusion alarms; and drums, vertical panels, and cones (all with accessories or attachments)	All devices shall conform to NCHRP Report 350 criteria.
CATEGORY 3 (a) Truck Mounted Attenuators (TMAs) (b) Temporary Barriers (1) Concrete Barrier (2) Traffic Barrier W Beam and Water Filled Barrier (c) Temporary End Treatments	All devices shall conform to NCHRP Report 350 criteria.
CATEGORY 4 Portable trailer mounted devices including area lighting supports, arrow panels, and changeable message signs	The Contractor may use devices that do not conform to NCHRP Report 350 criteria, until compliance dates are established. Use of these devices shall comply with the provisions of Part 6 of the MUTCD.

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SP 1-1 PROJECT DESCRIPTION

CONTRACT NO.:	FT 710-000-002R
TITLE:	Upgrade and Replace Existing Signing with Bridge Modifications North of the Fort McHenry Tunnel
FACILITY:	Fort McHenry Tunnel (I-95)
LOCATION:	Baltimore County and Baltimore City
ADVERTISED:	**June 16, 2009**
PRE-BID MEETING:	9:30 a.m. on June 26, 2009 in the Conference Room at the Maryland Transportation Authority, 300 Authority Drive, 2nd Floor, Engineering Building, Baltimore, MD 21222
PROJECT CONTACT:	Project Manager: Ms. Roxane Y. Mukai (410)-537-7848 Contract Administration: Ms. Maggie Johnson (410)-537-7807 MBE Contact: Ms. Meshelle Howard (410)-537-1051
BIDS DUE:	**12:00 Noon on July 16, 2009** in the Bid Box on the 1st floor of the Maryland Transportation Authority, Engineering Building, 300 Authority Drive, Baltimore, MD 21222
CLASSIFICATION:	Class G ($10,000,001 – $15,000,000)
CONTRACT TIME:	Six Hundred Ten (610) Calendar Days
LIQUIDATED DAMAGES:	**$800.00 per Calendar Day**
MINIMUM MBE GOALS:	Overall **19%** Women owned businesses **6%** African-American owned businesses **8%**
BID DOCUMENTS:	**$60.00** - Bid documents can be purchased between 7:30 a.m. and 3:30 p.m., Mondays, Wednesdays, Thursdays and Fridays and between 10:00 a.m. and 4:00 p.m. on Tuesdays at the Ticket Office located at the Francis Scott Key Bridge, Maryland Transportation Authority, Administration Building, 303 Authority Drive, Baltimore, MD 21222.

This project is located along I-95 north of the Fort McHenry Tunnel in Baltimore County and Baltimore City, Maryland.

The project includes fabricating, installing, removing and/or replacing overhead, cantilever, bridge mounted and ground mounted signs and sign structures. The work includes both static and dynamic message signs. Work also involves modifications to bridge structures necessary to perform the signing and sign structures work.

SP 1-2 SPECIFICATIONS

All work on this project shall conform to the Maryland Department of Transportation, State Highway Administration's Specifications entitled, "Standard Specifications for Construction and Materials" dated July 2008, revisions thereof, or additions thereto, and the Special Provisions included in this Invitation for Bids.

SP 1-3 ORIGINAL FACILITY PLANS AND SITE VISITS

The original facility plans are on file at the Engineering/Finance Building of the Francis Scott Key Bridge and will be made available for inspection to prospective bidders. Parties interested in viewing the plans should contact Ms. Roxane Y. Mukai, Traffic Manager, at (410) 537-7848. Parties interested in visiting the site should contact Mr. Dave Roehmer, Tunnel Administrator, at (410) 537-1310.

SP 1-4 PROMPT PAYMENT TO SUBCONTRACTORS

The Prime Contractor is responsible for making timely payments to all Subcontractors and Suppliers and providing written certification as required in Section 17-106 of the State Finance and Procurement Article of the Annotated Code of Maryland, as amended.

This contract requires the Contractor to make payment to all Subcontractors within ten (10) days of receiving payment from the Maryland Transportation Authority (“Authority”).

Each month, the Project Engineer will review the current pay items with the Prime Contractor and all involved Subcontractors to ensure that all work satisfactorily completed within specifications is included in the monthly progress payment. For payment purposes, the same quantity totals used to compute the payment to the Prime Contractor will be the basis for payment to the Subcontractor.

If the Subcontractor does not receive payment within the required ten (10) days, the Subcontractor shall notify the Project Engineer in writing of the amount in dispute including the item numbers and payment quantity for each. The Project Engineer will then notify the Director of Construction of the dispute. The Director of Construction or his representative will verbally contact the Prime Contractor within 48 hours to ascertain whether or not a performance dispute exists which necessitates non-payment to the subcontractor. If a performance dispute exists, the Prime Contractor must demonstrate that there is a valid basis to withhold payment from the Subcontractor. If the Contractor withholds payment from a Subcontractor, the Contractor shall provide to the Subcontractor written notice of the withholding of payment. The notice shall detail the reasons for withholding payment as well as the amount. A copy of the notice shall be provided to the Surety and the Authority. If no valid dispute exists, the Prime Contractor will be directed to make immediate payment to the Subcontractor. The Subcontractor will be responsible for notifying the Director of Construction if this payment is not made. Upon receipt of notification, the Director of Construction will schedule a meeting with the Contractor and Subcontractor to verify and discuss the non-payment issue. This meeting will be held at the Authority's offices within (2) working days of the Authority's contact with the subcontractor. If it is determined that the Prime Contractor has withheld payment to the Subcontractor without cause, further progress payments to the Prime Contractor will be withheld until the Subcontractor is paid. In addition, the Authority may order a suspension of work or other administrative actions as it sees fit.

If an action is taken as stated above the Contractor shall notify the Authority's Project Engineer when payment is made. After the Project Engineer verifies that payment has been made to the Subcontractor the Authority shall release withheld progress payments.

Nothing in this Special Provision shall be construed to prevent the Subcontractor from pursing a claim with the surety under the Prime Contractor's payment bond at any time.

SP 1-5 WORK HOURS

Except as noted in Section 104 - Maintenance of Traffic, the Contractor is permitted to work twenty-four (24) hours a day, seven (7) days a week.

SP 1-6 INSURANCE

TC-5.01 INSURANCE

Section TC 5.01 of the Standard Specifications is supplemented as follows:

1. The Contractor shall not commence work under this contract until he has obtained all of the minimum amounts of insurance required by these Special Provisions and the insurance has been

approved by the Project Engineer. The Contractor shall furnish to the Maryland Transportation Authority ("Authority") duly executed certification of all required insurance on forms satisfactory to the Authority. The certificates of insurance shall state that it is in force and cannot be cancelled, released or non-renewed except upon thirty (30) days prior written notice, registered mail to the Authority. All Contractors' insurance policies, with the exception of the Worker's Compensation and Employer's Liability shall be endorsed to provide as additional insureds the Maryland Transportation Authority and the State of Maryland.

2. The Contractor shall purchase and maintain such insurance as is specified herein which will provide the Authority, its members, employees and agents, as well as the Contractor from claims which may arise out of or as a result of the Contractor's operations under this contract, whether such operations be by the Contractor, by any Subcontractor, by anyone directly or indirectly employed by any of them or by anyone whose acts any of them may be liable. This insurance shall be maintained in full force until the Contract has been accepted by the Authority and final payment is made.

3. The Authority requires the following minimum levels of insurance coverage for this contract:

   a) Worker's Compensation and Employer's Liability

      The Contractor shall, at all times, maintain and keep in force such insurance as will protect him from claims under the Worker's Compensation Act of the State of Maryland and maintain and keep Employer's Liability Insurance at a limit of One Hundred Thousand Dollars ($100,000.00). The Contractor shall also maintain United States Long Shore and Harbors Act coverage, if such exposure exists.

   b) Comprehensive General Liability Insurance

      The Contractor shall maintain Comprehensive General Liability Insurance in the amount of at least One Million Dollars ($1,000,000.00) Combined Single Limit for Bodily Injury Liability and Property Damage Liability Insurance per occurrence and in the aggregate. Such insurance shall specifically include the Comprehensive General Liability Broad Form Endorsement and indicate explosion, collapse, and underground damage coverage.

   c) Comprehensive Automobile Liability Insurance

      The Contractor shall maintain Comprehensive Automobile Liability Insurance (including all automotive equipment owned, operated, rented, or leased), in the amount of at least Five Hundred Thousand Dollars ($500,000.00) Combined Single Limit for bodily injury and property damage.

d) Additional Insurance

The Contractor shall also procure and keep in effect:

Excess liability (umbrella coverage) in excess of and applicable to the coverage in the Comprehensive General Public Liability and Property Damage Insurance, "X, C, U" and Comprehensive Automobile Insurance in the amount of at least Two Million Dollars ($2,000,000.00) for each occurrence.

4. Accident Notification - The Contractor shall send a written report to the Engineer and to the Maryland Transportation Authority within twenty-four (24) hours of any accident or other event arising in any manner from the performance of the contract which results in or might result in personal injury or property damage.

5. Failure to comply with these Special Provisions may lead to termination for default or convenience.

6. There will be no special payment for the insurance as required by this contract and all costs incidental thereto shall be included in the Lump Sum for "Mobilization", (refer to Section 108), or if the Contract does not include such an item, the insurance costs are to be included in pay items for the Proposal.

SP 1-7 MINORITY BUSINESS ENTERPRISE REGULATIONS GOVERNING CONSTRUCTION CONTRACTS IN EXCESS OF $50,000 EFFECTIVE JULY 1, 2001

GP – 7.29 of the General Provisions is supplemented as follows:

MBE participation goal for this contract is as indicated in these Special Provisions.

The Contractor shall:

1. Identify specific work categories appropriate for subcontracting;

2. At least ten (10) days before bid opening, solicit Minority Business Enterprises, through written notice that:

a) Describe the categories of work and,

b) Provide information regarding the type of work being solicited and specific instructions on how to submit a bid.

3. Attempt to make personal contact with Minority Business firms.

4. Assist Minority Business Enterprises to fulfill bonding requirements or to obtain a waiver of these requirements.

5. Upon acceptance of a bid, provide the Authority with a list of Minority Businesses with whom the Contractor negotiated, including price quotes from Minority and Non-minority firms.

Third Tier Subcontracting:

Third Tier MBE/DBE Subcontracting will be approved by the Authority only when the Authority is satisfied that there is no way except by Third Tier contracting that an MBE/DBE goal can be achieved. The Contractor's written request must be submitted prior to contract award and contain specifics as to why a Third Tier contracting agreement is being requested.

Waivers:

If for any reason the bidder/offeror is unable to achieve the specified overall contract goal or subgoals for each certified MBE classification, the bidder/offeror must request, in writing, on Attachment A, (Certified MBE Utilization and Fair Solicitation Affidavit), a waiver at the time of bid.

Strict adherence regarding documentation of the rationale for the waiver request and documentation of "Good Faith Efforts" of the Contractor are required for consideration of any waiver. For additional information on waivers, please see **COMAR 21.11.03.11**.

Criminal Fraud Provisions:

All Contractors are reminded that Criminal Fraud Provision and Administrative Sanctions may be imposed for failure to achieve and maintain established MBE/DBE goals.

SP 1-8 PROGRESS SCHEDULE REQUIREMENTS

Refer to Section 109 of the Standard Specifications.

SP 1-9 CORPORATE REGISTRATION

A foreign corporation is any corporation not incorporated under the Laws of the State of Maryland. All foreign corporations, prior to performing any services for the Authority, must register with the Maryland State Department of Assessment and Taxation in compliance with Subtitle 2, Title 7, of the Corporations and Associations Article of the Annotated Code of Maryland . Compliance is required of the successful vendor as well as the proposed subcontractors.

To accomplish the required registration, a foreign corporation must request and complete "Qualification Application Forms" which can be obtained from the Department of Assessment and Taxation, State Office Building, Room 803, 301 West Preston Street, Baltimore, Maryland 21201. Forms can be obtained via the Maryland Department of Assessments and Taxation website at www.dat.state.md.us. The Contractor will be responsible for documenting compliance with the aforesaid. This documentation will be required prior to the execution of a contract with the successful bidder.

SP 1-10 CONTRACTOR'S EMPLOYEE IDENTIFICATION

The Contractor shall provide to the Authority, a list containing the following for the Contractor and all Subcontractors that would be working at the site. This shall include trucking companies who would come to the site on a repetitive basis for supply or to remove materials:

Name of Company
Name and Title of Contact Person
Address of the Company
Phone Number
Facsimile number
E-Mail Address of Contact Person (if any)

All Contractor's employees, including employees of Subcontractors, on this project, present at the site, shall be in possession of a valid employee identification card provided by the Employer, which shall contain a photograph and identify the employee by name and job title. The employee must produce the said identification if required by the Project Engineer or the Authority Police.

When working in or around the Authority's buildings, said employees' identification shall be displayed at all times.

While working on the transportation facility projects of the Authority, Contractor's personnel shall have an ID decal displayed on their hardhat. These decals will be provided by the Authority. All Contractor's vehicles shall have a parking decal, attached to the rear view mirror. These parking decals will also be provided by the Authority and a distribution list will be maintained. At the time of project completion these decals shall be returned to the Authority. Request for hardhat and rearview mirror

decals shall be made to the Construction Division before the beginning of construction and should include the number required of each type.

All costs associated with identification cards will not be paid for separately and shall be incorporated under other items of payment in the Contract.

GENERAL PROVISIONS
GP-SECTION 1

DEFINITIONS AND TERMS

GP 1.03 – ORGANIZATIONAL DEFINITIONS

Revise the definitions of Administration to read as follows:

Administration – The word "Administration" shall mean "Maryland Transportation Authority."

Except for Office of Materials and Research, all references to the Maryland State Highway Administration's offices and positions shall mean the Authority's corresponding offices and positions.

GENERAL PROVISIONS
GP-SECTION 2

BIDDING REQUIREMENTS AND CONDITIONS

GP-2.06 PREPARATION OF THE BID

ADD: After paragraph (a), the following.

The Contractor may elect to submit its bid on forms it has generated in the development of its bid. These may be submitted in lieu of the schedule of prices bid forms furnished by the Administration in the Invitation for Bids. These forms shall emulate the forms currently furnished by the Administration and, of a minimum, contain the following information:

(1) State Contract No.;
(2) State Item Nos.;
(3) State's Proposed Quantities;
(4) Description of Items;
(5) Unit Price;
(6) Total Cost of Each Item; and
(7) Total Bid Amount.

The document shall be 8-1/2 x 11 inches, and oriented in a landscape format. The font size shall be no less than 10 point with horizontal lines dividing each item. Any addendum which revised items or quantities shall be noted on all affected schedule of prices sheets. Any special bid requirements that are noted in the schedule of prices shall also be listed on the form.

Should the Contractor elect to submit bids on the Contractor's own forms, the Contractor shall submit a sample of the form to the Administration at least two (2) weeks prior to the scheduled opening of bids. The use of Contractor generated forms shall be approved, in writing, prior to their use. If the Contractor's forms were previously approved in writing on another Administration project and have not changed, they need not be resubmitted for this project.

Sample forms shall be submitted to:

Ms. Linda McGill
Chief Procurement Officer
Maryland Transportation Authority
300 Authority Drive
Baltimore, MD 21222

GENERAL PROVISIONS
GP-SECTION 2
BIDDING REQUIREMENTS AND CONDITIONS

GP 2.23 - BID PROTESTS

Section GP 2.23 of the General Provisions is supplemented as follows:

The Board of Public Works does not have the jurisdiction to consider protests relating to this solicitation or an award of this contract under this solicitation.

All protests relating to this solicitation, the selection, and/or award must be filed in writing with the Authority's Procurement Officer; within the time limitations set forth in COMAR 21.10.07 and 21.10.02. Bid protests shall be filed not later than 7 days after the basis for protest is known, or should have been known, whichever is earlier. Oral protests will not be considered.

The specific details of the protest procedures shall be followed by aggrieved actual or prospective bidders or offerors are contained in COMAR 21.10.

GENERAL PROVISIONS
GP SECTION 4
SCOPE OF WORK

GP 4.10 - WARRANTY OF CONSTRUCTION

GP 4.10 of the Standard Specifications is revised to read as follows:

Delete: The first paragraph in its entirety.

Insert: The following:

The Warranty as defined under paragraphs A through G in GP 4.10 “Warranty of Construction” shall apply to this Maryland Transportation Authority Contract unless specified elsewhere in this Invitation for Bids.

GENERAL PROVISIONS
GP SECTION 5
CONTROL OF WORK

GP 5.12 - FAILURE TO MAINTAIN ENTIRE PROJECT

Delete: Section GP 5.12 in its entirety

Insert: Revise the paragraph to read as follows:

Failure on the part of the Contractor, at any time, to RESPOND TO the provisions of GP 5.11 above, will result in the procurement officer immediately notifying the Contractor to comply with the required maintenance provisions. In the event that the Contractor fails to PROCEED WITH CORRECTIONS TO UNSATISFACTORY MAINTENANCE SO AS TO CONFORM TO THE PROVISIONS OF GP 5.11 within four (4) hours of receipt of such notice, the procurement officer MAY NOTIFY THE CONTRACTOR TO SUSPEND ALL OTHER WORK ON THE CONTRACT UNTIL SUCH TIME AS THE UNSATISFACTORY MAINTENANCE IS CORRECTED. In the event that the Contractor fails to RESPOND TO unsatisfactory maintenance within four (4) hours after receipt of such notice, the procurement officer will immediately proceed with adequate forces and equipment to maintain the project, and the entire cost of this maintenance will be deducted from monies due the Contractor ON THE NEXT MONTHLY ESTIMATE.

GENERAL PROVISIONS
GP SECTION 8
PROSECUTION AND PROGRESS

GP 8.09 - LIQUIDATED DAMAGES

Delete: Section GP 8.09 in its entirety

Insert: Time is an essential element of the Contract and it is important that the work be vigorously prosecuted until completion.

For every calendar day that the contract remains uncompleted after the expiration of the contract time specified herein, or amended by extra work authorization, change orders or supplemental agreements, the Contractor will be liable for Liquidated Damages. The amount of Liquidated Damages shall be as specified in Contract Time and Bonding. This amount shall be deducted from any money due the Contractor, not as a penalty, but as Liquidated Damages. Damages in excess of any retained percentage shall be paid to the Authority by the Contractor.

Refer to Contract time and Bonding sheet contained elsewhere herein. See Table of Contents.

GENERAL PROVISIONS
GP SECTION 9

PAYMENT

GP 9.05 LATE PAYMENTS

ADD the following:

(e) Payments will be made within thirty (30) days of the date when the Contract amount becomes due and payable or the date of receipt of a proper invoice, whichever is later. The State's failure to remit payment within forty-five (45) days from that date may entitle the Contractor to interest at the rate of 10 percent per annum beginning on the 31st day.

TERMS AND CONDITIONS
TC SECTION 4
CONTROL OF WORK

TC 4.01 - SHOP PLANS AND WORKING DRAWINGS

Section TC 4.01 of the Specifications is amended to add:

All shop plans and working drawings for this project shall be submitted to:

Maryland Transportation Authority
Engineering Division
300 Authority Drive
Baltimore, Maryland 21222-2200
ATTN: Ms. Roxane Y. Mukai

The Contractor shall allow a minimum of four (4) weeks turn around time on all drawings from the date they are received by the Authority. All shop plans and working drawings shall be reviewed and approved by the Contractor prior to submitting for approval to the Maryland Transportation Authority and shall be submitted by the General Contractor only. No drawings sent to the Authority directly by subcontractors, fabricators, etc. will be accepted. Ten (10) sets of drawings shall be submitted for approval.

Acceptance of a material source by the Project Engineer does not constitute approval of the material as a substitute as an "or equal." Submission of a material as an "or equal" must be done in accordance with the following paragraphs:

All shop drawings, regardless if "Submitted as Specified" or "Submitted as Equal to Specified," shall be furnished with complete, specific, detailed information from the manufacturer or supplier or the material or equipment the Contractor proposes to furnish, in which the requirements of the Specifications are clearly shown to be met. This shall include a point by point comparison with the detail requirements of the Specifications.

When any article is specified by trade name of manufacturer with or without the clause "or equal," it is intended to establish the quality of the article. If the Contractor proposes to use material or equipment of another manufacturer as an "or equal" to material or equipment specified, all shop drawings shall conform to the following requirements, conditions, and procedure:

1. Substitution of equipment or materials other than those specified will be considered, providing, in the opinion of the Engineer, such equipment or material is equal to, or better than specified. The decision of the Engineer with respect to approval or disapproval of any material or equipment proposed to be substituted as an "or equal" is final. The Contractor shall have no claim of any sort by reason of such decision.

2. If the Contractor proposes to substitute materials or equipment as "or equal" to those specified, it shall be his responsibility to furnish, in addition to the information discussed above, a point by point comparison of the material or equipment specified under the Contract and that proposed to be substituted. The burden of responsibility in furnishing this information is with the Contractor.

If incomplete or irrelevant data is submitted as evidence of compliance with this section of the Specifications, the data will be returned and the request for approval will be denied.

TERMS AND CONDITIONS
TC SECTION 4

CONTROL OF WORK

TC-4.02 FAILURE TO ADEQUATELY MAINTAIN PROJECT.

ADD: To the existing paragraph.

Additionally, an appropriate deduction will be made from the Contractor's next progress estimate for each day or portion thereof that Maintenance of Traffic deficiencies exist, and will continue until the deficiencies are satisfactorily corrected and accepted by the Engineer. Any portion of a day will be assessed a full day deduction. The deduction will be equal to a pro-rata share of the lump sum price bid for Maintenance of Traffic or an amount prorated from the Engineer's estimate, whichever is more. The amount prorated will be the per diem amount established by using the working days (based upon calendar dates when required) divided into the total value of the bid item or the Engineer's estimate of that item, whichever is more.

The above noted deduction will be assessed on the next progress estimate if:

> The Contractor does not take action to correct the deficiencies and properly assume the responsibilities of maintaining the project (as determined by the Engineer) within four hours of receiving a notice to comply with the required maintenance provisions.

The deduction will be equal to the daily prorated share of the lump sum price bid for Maintenance of Traffic or $ **500.00** per day, whichever is more for each day or portion thereof that the deficiencies exist, and will continue until the deficiencies and proper assumption of the required maintenance provisions are satisfactorily corrected and accepted by the Engineer. The amount of monies deducted will be a permanent deduction and are not recoverable. Upon satisfactory correction of the deficiencies, payment of the Maintenance of Traffic lump sum item will resume.

TERMS AND CONDITIONS
TC SECTION 5
LEGAL RELATIONS AND PROGRESS

TC-5.01 INSURANCE.

DELETE: The first three paragraphs under TC-5.01 in their entireties.

INSERT: The following.

The requirement of GP-7.14 "Liability Insurance" to submit Certificate of Insurance prior to starting work is modified for Administration Contracts to require the certificate of insurance to be submitted prior to the execution of the Contract.

The Contractor shall maintain in full force and effect third party legal liability insurance necessary to cover claims arising from the Contractor's operations under this agreement which cause damage to the person or property of third parties. The insurance shall be under a standard commercial general liability ("CGL") form endorsed as necessary to comply with the above requirements; or other liability insurance form deemed acceptable by the State. The State of Maryland shall be listed as an additional named insured on the policy. The limit of liability shall be no less than One Million Dollars ($1,000,000.00) per occurrence/Two Million Dollars ($2,000,000.00) general aggregate. The insurance shall be kept in full force and effect until all work has been satisfactorily completed and accepted. The policies shall be endorsed to provide thirty (30) days notice of cancellation or non-renewal to:

Director of Construction
Maryland Transportation Authority
304 Authority Drive
Baltimore, Maryland 21222

TERMS AND CONDITIONS
TC SECTION 7

PAYMENT

TC-7.03 FORCE ACCOUNT WORK.

DELETE: TC-7.05 PROGRESS PAYMENTS Subsection (a) (3) Variable Retainage

INSERT: The following.

(3) **VARIABLE RETAINAGE.** The Contract will be subject to a variable retainage based upon the Authority's performance evaluations of the Contractor.

Those qualifying may have retainage reduced upon request of the Contractor with consent of surety. This request must be processed through the Construction Manager. If at any time during the performance of the project, the evaluation of the Contractor changes, retainage reduction may be reconsidered.

Contractors with "A" evaluations for the last two years may be reduced from 5.0 percent to 2.0 percent upon request after 15 percent project completion. Project completion percentage will be based upon actual work completed (excluding monies paid for stored materials). An interim evaluation of the current project must be completed and must be an "A." Contractors with "A" evaluations for the last two years may petition to have all retainage at that point released upon completion of a significant milestone. Retainage will continue at 2.0 percent until the next milestone of completion of the Contract.

Contractors with "B" evaluations or any combination of "A" and "B" evaluations for the last two years may be reduced from 5 percent to 2.5 percent at 50 percent project completion and remain at that level until released upon final payment. Project completion percentage will be based upon actual work completed (excluding monies paid for stored materials). An interim evaluation of the current project shall be completed and shall be an "A" or "B".

Contractors with "C" evaluations or any combination of "C" and "D" evaluations for the last two years will begin and remain at 5 percent for the life of the project. An interim evaluation of the current project shall be completed and shall be a "C" or better rating.

Contractors with a "D" evaluation for the last two years will begin at 5 percent. Project performance will be evaluated monthly. Should the contractor performance remain at the "D" level, to protect the State's interest 10 percent of the progress payment will be withheld until performance improves to a "C".

New Bidders. Contractors who have not been previously rated by the Authority may be eligible for a reduction in retainage. To be eligible, their past performance on highway and bridge work shall be documented by the government agency with whom they had a contract and their performance shall be documented on Authority forms.

All other Contractors who do not fit into the above criteria would require a 5 percent retainage throughout the life of the Contract.

CATEGORY 100
PRELIMINARY

SECTION 100-01 MAINTENANCE OF RAILROAD TRAFFIC

100-01.01 DESCRIPTION. This work shall consist of the maintenance of railroad traffic in accordance with the requirements specified herein for work performed in or near Railroad property. For the purposes of these Special Provisions, CSX Transportation, Inc. (“CSXT”), Norfolk Southern Corporation, and Canton Railroad Company will hereinafter be referred to as the "Railroad". Appendices A and B contain requirements for CSXT and Norfolk Southern, respectively. In the event that there is any discrepancy between this Special Provision and the information contained in the Appendices, the Appendices shall govern.

100-01.02 MATERIALS. None.

100-01.03 CONSTRUCTION. Railroad traffic shall be maintained at all times with safety and continuity within the limitations stated below, and the Contractor shall conduct all operations on, over, and adjacent to the Railroad's property fully within the rules, regulations, and requirements of the Railroad. The Contractor shall be responsible for acquainting himself with such requirements as the Railroad may demand.

Before proceeding with any construction work on, over, or adjacent to the Railroad's property, the Contractor shall submit plans and a detailed description of the method of procedure which will be followed for work in these areas for the approval of the Engineer and the Railroad; however, such approval shall not serve in any way to relieve the Contractor's responsibility for the adequacy and safety of the method of procedure. The construction procedures to be submitted as required by CSXT are included in Appendix A of these Special Provisions. The construction procedures to be submitted as required by Norfolk Southern Corporation are included in Appendix B of these Special Provisions.

Since the work in the field will not be permitted to proceed until the plans and method of procedure have been approved by the Engineer and the Railroad, it shall be the responsibility of the Contractor to submit his plans and method of procedure promptly so that unnecessary delays in construction operations will be avoided.

The Contractor shall be required to submit to the Railroad a written safety program prepared by the Contractor for the education and protection of his employees. This program shall address the hazards and safety considerations in working in the vicinity of the Railroad's property and operation.

No work shall be performed on these portions of the project until such times as all Insurance policies, and other requirements of the Railroad have been complied with and their approval, in writing, has been obtained by the Engineer.

All construction related correspondence shall be coordinated with the following:

CSX TRANSPORTATION, INC.

Mr. Brian Harrison
Manager, Construction Services
DMJM Harris
260 South Broad Street, Suite 1500
Philadelphia, Pennsylvania 19102
(215) 966-4846

NORFOLK SOUTHERN CORPORATION

Mr. Tom Bracey
Senior Engineer, Public Improvements
Norfolk Southern Corporation
1200 Peachtree Street
Atlanta, Georgia 30309
(404) 527-2536

CANTON RAILROAD COMPANY

Mr. Mark Lauer
General Manager
Canton Railroad Company
1841 S. Newkirk Street
Baltimore, Maryland 21224
(410) 633-9192

Except in emergencies, contact shall be made with the above specified official through the Engineer.

All construction performed on, under, adjacent to, or over Railroad property will be subject to the inspection and approval of the Railroad.

At least thirty (30) days advance notice shall be given, through the Engineer, to the Railroad, prior to entering upon or commencing any work on Railroad property.

Scheduling of the Contractor's operations that may affect the Railroad shall be coordinated through the Railroad. Scheduling or permission to occupy the track shall be made through the appropriate flagman for the respective Railroad.

All work herein provided to be done on, over, and adjacent to the Railroad's property shall be performed by the Contractor in a manner satisfactory to the Railroad, and shall be performed at such times, and in such a manner, as not to interfere with the movements of trains or traffic upon the tracks of the Railroad. The Contractor shall use all reasonable care and precaution in order to avoid accidents, damage, delay, or interference with the Railroad's trains or other property.

The Contractor shall consult the Railroad in order to determine the type of protection to ensure safety and continuity of Railroad traffic incident to the particular methods of operation and equipment to be used on the work.

The Railroad will furnish such qualified flagmen, signalmen, or protection men other than crossing watchmen, as may be required, to ensure complete protection of train operations and Railroad facilities. The need for this type of service will be determined on the basis of Railroad regulations and the Contractor's approved construction schedule. No work shall proceed without proper protection on the site. The providing of watchmen and guards, or any other precautionary and protective services by the Railroad, shall not relieve the Contractor from liability for payment of damages caused by or in consequence of the Contractor's operations.

All expenses incurred in connection with protection of Railroad facilities by Railroad employees will be borne by the Maryland Transportation Authority (“Authority”). Billings for such services or expense will be made directly to the Authority by the Railroad.

It shall be expressly understood that this Contract includes no work for which the Railroad is to be billed by the Contractor, and it shall be further understood that the Contractor is not to bill the Railroad for any work which he may perform, unless the Railroad gives written permission that such work be performed at the Railroad's expense.

Any work performed by the Railroad at the Contractor's request, other than protective services and work specifically designated in these Special Provisions, shall be paid for by the Contractor immediately upon presentation of the bills by the Railroad. Final settlement by the Authority with the Contractor shall be contingent upon: (a) the Contractor showing proof that the Railroad's property has been cleared of all machinery, equipment, surplus materials, false work, rubbish, temporary buildings, and other property in a condition satisfactory to the Railroad; (b) the Contractor showing proof that no bills are owed by the Contractor to the Railroad in connection with the work performed on this project.

The Contractor shall secure permission from the Railroad Engineer, listed above, in writing, for the erection of any temporary structures, scaffolding, rigging on, over, or adjacent to the Railroad's property. Forms for concrete, false work, and bracing on, or over the Railroad's property shall be approved by the Railroad with respect to any reduction of existing clearance. All work on or over the Railroad's property

shall be approved by the Railroad with respect to any reduction of existing clearance. All work on or over the Railroad's property shall be performed under the supervision of both the Engineer and the Railroad.

Approved minimum temporary construction clearances from the Railroad tracks are 23.00 ft. vertically from the top of the rail (or maintain existing), and 18.00 ft. horizontally from the centerline of the track. Approval for clearances less than noted must be obtained by the Contractor through the Engineer from the Railroad and from the regulatory agency having jurisdiction over Railroad clearances in the State of Maryland before beginning any work involving such clearances.

The Contractor shall be held responsible to see that his employees enter upon Railroad or other property through points of access designated by the property owner. Operations within these properties shall be confined to the areas designated by the Engineer.

Should the Contractor require a temporary grade crossing of the Railroad tracks, the Contractor shall be required to apply for and execute the standard private grade crossing agreement for each crossing required. Application for the crossing shall be made to the Railroad at least six weeks before the crossing is required. A letter size plan showing location and size of crossing should accompany the letter of application. The letter should state the purpose for which the crossing is needed and the expected life of the crossing. The Contractor shall pay all construction, maintenance, removal, protection, and other costs. The roadbed shall be restored to its original condition.

The Contractor shall conduct his operations both on and off the Railroad right-of-way so that no earth, mud, silt, or other foreign matter will be deposited on the Railroad ballast or cause flooding or saturation of the subgrade. In order to accomplish this, it may be necessary for the Contractor to construct temporary drainage facilities, temporary sheeting or take other precautionary action, such as nailing canvas or other similar materials to the ties to cover the ballast. The protective measures shall be performed by the Contractor at the Contractor's own expense in a manner satisfactory to the Railroad.

However, in addition to the aforementioned protective measures, if the Railroad track ballast does become fouled due to the Contractor's operations, the Railroad, with its own forces, will remove the fouled ballast and replace it with clean ballast. The charges for this work will be billed against the Contractor by the Railroad.

The Contractor shall furnish and maintain during all construction work, such watchmen, lights, barricades, fences, and other appropriate protection as, in the opinion of the Railroad, shall be necessary for the protection of all persons having access to property and facilities of the Railroad.

Every bidder is required to ascertain from the Railroad its rules, regulations, and requirements and what, if any, delays that he shall be subjected to, or scheduled days when work would be permitted, in

connection with the supporting of tracks, and in connection with other Railroad operations, and every bidder will be assumed to have included in his bid price, all costs and expenses and all risks of loss and damage to him, due to such delays, rules, regulations, and requirements. The CSXT Special Provisions for work over, under, on and adjacent to its right-of-way are included in Appendix A of these Special Provisions. The Norfolk Southern Corporation Special Provisions for work over, under, on and adjacent to its right-of-way are included in Appendix B of these Special Provisions.

Should any damage occur to Railroad property as a result of the Contractor's operations, the Railroad may repair such damage and perform any work for protection of its property it may deem necessary and the actual cost for such work shall be borne by the Contractor.

The Contractor will not be permitted to use Railroad personnel for the Contractor's purposes when such personnel are required at the immediate site of project construction by the Railroad solely for the safe operations of the Railroad.

Any approvals given by the Railroad will not be considered as a release from responsibility for any damage to the Railroad by the acts of the Contractor, its subcontractors, or those of the Contractor's or subcontractor's employees.

100-01.03.01 Shop and Working Drawings for Railroad Approval. Where the Contract Documents require that shop and/or working drawings are to be submitted for the Railroad’s review and approval, such submission shall be as required above and modified herein.

Six (6) copies of shop and/or working drawings shall be submitted through the Engineer to the Railroad. Up to thirty (30) days will be required for the review of all construction submittals. Up to an additional thirty (30) days will be required for the review of subsequent submissions returned not approved. All working drawings submitted for the Railroad’s approval shall be certified by a Professional Engineer registered in the State of Maryland with expertise in the area of work to be performed.

No work shall be performed until the working drawings are approved by the Engineer and the Railroad. Approval of the working drawings by the Engineer and the Railroad shall not relieve the Contractor's responsibility for errors in dimensions, elevations, or design calculations and for performance of the work in a safe manner without endangering the safety of the Railroad personnel, equipment, or the Contractor's workmen.

The working drawings shall clearly show all dimensions, sizes of members, types of materials, and all other pertinent information as may be required by the Engineer and the Railroad to permit proper checking for such working drawings. The Contractor shall also submit along with the working drawings, copies of the design calculations.

Where required, working drawings shall be prepared and submitted for the Railroad's approval indicating the location of all cranes with respect to the tracks, capacity of cranes, boom length and the estimated lifting loads. All cranes and associated hardware used in the individual picks shall be rated for 150 percent of the service weight of the pick (i.e., F.S. = 1.5).

100-01.03.02 Insurance. The Contractor shall purchase and maintain for the length of the project the following insurance policies in addition to those required in the Specifications and in other sections of these Special Provisions for work over, under, on and adjacent to Railroad property.

Appendices A and B of these Special Provisions include insurance requirements for CSXT and Norfolk Southern, respectively. The insurance requirements listed below for work over, under, on and adjacent to the Railroad right-of-way are the maximum limits required for this project as listed by any one railroad. The insurance limits listed below shall be obtained unless otherwise indicated in Appendices A and B.

1. Commercial General Liability Insurance: Limits not less than Five Million Dollars ($5,000,000.00) in combined single limits for bodily injury and property damage per occurrence naming each railroad as the insured.

2. Commercial General Liability Insurance: If any part of the work is to be performed by a Subcontractor, the Prime Contractor shall carry in the Contractor's own behalf, insurance of same limits as set forth in paragraph 1, above.

3. Statutory Worker's Compensation and Employers Liability Insurance with limits of not less than One Million Dollars ($1,000,000.00), which insurance must contain a waiver of subrogation against the Railroad and its affiliates.

4. Commercial automobile liability insurance with limits of not less than Five Hundred Thousand Dollars ($500,000.00) combined single limit for bodily injury and/or property damage per occurrence, and such policies shall name the Railroad as an additional named insured.

5. Railroad Protective Public Liability and Property Damage Insurance:

   This policy shall name the respective "Railroad" as "The Insured" and shall be written on the form prescribed by the United States Department of Transportation, Federal Highway Administration, in the Federal Air Highway Program Manual, Volume 6, Chapter 6, Section 2, Subsection 2 Railroad-Highway Insurance Protection Required for Contractors.

   Limits of liability shall be in the amount of Five Million Dollars ($5,000,000.00) for bodily injury and property damage per occurrence with an aggregate of Ten Million Dollars ($10,000,000.00) per annual policy period.

The limits stated herein have been established after reviewing the work listed in the Contract. Should the Contractor be otherwise using Railroad property (e.g., temporary grade crossing) it may be subject to other requirements. The Contractor is required to communicate with the Railroad and provide for complying with all their requirements.

The original of policy (5) must be furnished to and approved by the Railroad.

For (1) and (2), Certifications are to be furnished to the Maryland Transportation Authority ("Authority") and to the Railroad on request. In all instances, the Contractor must furnish evidence to the Authority and the Railroad that the insurance has been purchased and is in force until the Contract is completed and accepted. The Contractor will not be permitted on Railroad property until Insurance Policy(s) have been approved.

Policies, notices of cancellation or change, etc., are to be sent by the Contractor directly to the Railroad's Engineer listed above. The Contractor and the Contractor's insurance representatives must reconcile all policy requirements to the satisfaction of the Railroad and the Engineer.

100-01.04 MEASUREMENT AND PAYMENT. Work on Railroad property during the life of the Contract and all incidental costs imposed on the Contractor due to the operations of the Railroad will not be measured for payment, but the cost thereof shall be included in the Contract unit prices for the various construction items affected by these requirements.

An allowance of Seventy Five Thousand Dollars ($75,000.00) has been established for this item in the Schedule of Prices. This item, Maintenance of Railroad Traffic, will provide compensation to the Contractor for the costs of railroad insurance and permits. Copies of invoices of costs of insurance and permits shall be submitted by the Contractor to be paid for the same under this item. The costs of the Contractor's time utilized to secure the permits and insurance will not be paid under this item, but costs thereof will be incidental to other items in the Contract. There is no guarantee that this item will be used during the term of the Contract.

CATEGORY 100
PRELIMINARY

SECTION 103 — ENGINEERS OFFICE

103.03 CONSTRUCTION.

DELETE: 103.03.06 Microcomputer System for all Offices in its entirety.

INSERT: The following.

103.03.06 Microcomputer System for all Offices.

(a) Desktop Unit.

(1) IBM compatible with an Intel Pentium 4 or AMD processor.

(2) Minimum microprocessor speed of 3.4 GHz.

(3) Minimum hard drive storage of 80 GB (gigabyte).

(4) Minimum of 2.0 GB RAM (Random Access Memory).

(5) Enhanced 101 key keyboard with wrist rest.

(6) Super Video Graphics Accelerator ("SVGA") with 16MB memory.

(7) Modem 56K BPS, ITU V.92 compliant – required for remote dial-in to the computer to provide MCMS system administration.

(8) Full Duplex Sound Card (Sound Blaster Pro & Windows Compatible).

(9) Audio Speakers.

(10) Mouse with mouse pad.

(11) One CDRW/DVDRW combo drive. Min Speed = 48X.

(12) One Parallel Port, One Serial Port, Two USB Ports.

(b) Operating System. Minimum Microsoft® Windows XP.

(c) Video Monitor. Color Super VGA monitor conforming to Energy Star requirements with a minimum screen size of 17-inch flat panel.

(d) Printer/Scanner. HP (Hewlett-Packard) Photosmart C6180 All-in-One Inkjet Printer, 32 PPM, 4800x1200 DP, Color, 64MB, PC/Mac. Office jets and Bubble jets will not be accepted.

(e) Software.

(1) Microsoft® Office 2000/XP Professional for Windows™ or later.

(2) Antivirus software shall be installed and configured to perform an automatic update when the microcomputer system connects to the Internet.

(f) Internet Access. The microcomputer system shall be provided with unlimited DSL/Broadband or better Internet access approved by the Engineer.

(g) Accessories.

(1) Uninterruptible power supply ("UPS").

(2) Standard computer workstation with minimum desk space of 60 X 30 in. and a swivel type office chair, padded with arm rests.

(3) 8-1/2 X 11 in. xerographic paper to be supplied as needed.

(4) Toner or ink as needed for printer.

(5) Maintenance agreement to provide for possible down time.

(6) Physical security system to deter theft of computer components.

(7) Blank recordable CD-R media for re-writable CD-ROM drive to be supplied as needed.

(8) One – USB 2.0 Flash Drive (1GB of Memory).

(h) Notes.

(1) The microcomputer system shall be completely set up ready for use on or before the day the Engineer's Office is to be occupied.

(2) All software stated above shall be supplied on original disks with manuals and be retained in the construction field office for the duration of the Contract.

(3) If for any reason the system fails to operate, the system shall be replaced or repaired within 48 hours.

(4) When the microcomputer system is no longer required, the Construction Management software system including original user/operator guide manuals, program disks, and all data files will be removed by the Engineer and delivered to the Area Engineer and become the property of the Authority. The remaining microcomputer system shall remain the property of the Contractor.

(5) Type 'C' and Type 'D' Engineer's Office shall have two (2) complete microcomputer systems.

CATEGORY 100
PRELIMINARY

SECTION 104 — MAINTENANCE OF TRAFFIC

104.01 TRAFFIC CONTROL PLAN (TCP).

104.01.01 DESCRIPTION.

149 **DELETE:** The fourth paragraph sentence "Refer to contract Documents for Work Restrictions." in its entirety.

INSERT: The following.

Agency Contacts

CONTACT	TITLE / JURISDICTION	PHONE NUMBER
Dave Roehmer	Tunnel Administrator	410-537-1310
Don Smith	Tunnel Manager of Maintenance	410-537-1285
Abey Tamrat	Project Engineer, Structures	410-537-7822
Roxane Y. Mukai	Traffic Manager	410-537-7848
Frank Murphy	Baltimore City	410-396-6874

Work Restrictions. On Monday of each week, the Contractor shall provide the Engineer with a complete list of anticipated lane and shoulder closures for the following two weeks, allowing the Authority a minimum of fourteen (14) calendar days or ten (10) working days notification. The Engineer shall then notify the affected facilities, the Engineering Division's Traffic Section and other appropriate offices. No lane closures shall be made without prior written approval of the Engineer in the form of an Authority lane/shoulder closure permit. The Authority is not responsible for lost workdays resulting from the Contractor failing to submit schedules or providing notification of maintenance of traffic requirements in a timely manner. Other contractors may be actively working in or around the vicinity of this project. The Contractor shall cooperate with and coordinate work activities with contractors in adjoining or overlapping work areas.

The Contractor is responsible for obtaining lane/shoulder closure or other Permits from all affected agencies that require permits for work on their right of way, including those listed in this Special Provision. The Contractor shall make contact with the representative from the affected agency, through the Project Engineer and provide a copy of all coordination correspondence to

the Authority. Sufficient time shall be allowed for review and approval of the permit application.

ALLOWABLE LANE CLOSURE SCHEDULES
FORT MCHENRY TUNNEL

April 1 through September 30:

TIME OF DAY	DAYS OF THE WEEK	ALLOWED CLOSURES
9:00 AM – 2:00 PM	Monday – Thursday	Single Lane Closure
7:00 PM – 5:00 AM	Monday – Thursday	Single Lane Closure
9:00 AM – 12:00 Noon	Friday	Single Lane Closure
9:00 PM – 9:00 AM	Friday & Saturday	Single Lane Closure
9:00 PM – 5:00 AM	Sunday	Single Lane Closure
10:00 PM – 5:00 AM	Monday – Thursday	Double Lane Closure*

October 1 through March 31:

TIME OF DAY	DAYS OF THE WEEK	ALLOWED CLOSURES
9:00 AM – 3:00 PM	Monday – Thursday	Single Lane Closure
7:00 PM – 5:00 AM	Monday – Thursday	Single Lane Closure
9:00 AM – 12:00 Noon	Friday	Single Lane Closure
7:00 PM – 9:00 AM	Friday & Saturday	Single Lane Closure
7:00 PM – 5:00 AM	Sunday	Single Lane Closure
10:00 PM – 5:00 AM	Sunday– Thursday	Double Lane Closure *

* Double lane closures on Sundays, in areas with only three lanes, must be coordinate with and approved by the Administrator.

ALLOWABLE LANE CLOSURE SCHEDULES
FORT MCHENRY TUNNEL
(Tunnel Bore Closure)

TIME OF DAY	DAYS OF THE WEEK	ALLOWED CLOSURES
8:00 PM – 5:00 AM	Monday – Thursday	North or Southbound

Maintenance of Traffic for Fort McHenry Tunnel Bore Closures are furnished and installed by the Fort McHenry Tunnel Maintenance staff. Only one bore/tube in each direction may be closed at any given time.

No lane or shoulder closures are permitted 2 hours before, during or 2 hours after major traffic generating events in downtown Baltimore or during stadium events.

Work is not permitted on the holidays, or work day preceding and following holidays indicated below with an "X":

- ☒ New Year's Day, January 1
- ☒ Martin Luther King's Birthday, the third Monday in January
- ☐ President's Day, the third Monday in February
- ☒ Good Friday
- ☒ Easter Weekend
- ☒ Memorial Day, the last Monday in May
- ☒ Independence Day, July 4
- ☒ Labor Day, the first Monday in September
- ☐ Columbus Day, the second Monday in October
- ☐ Veteran's Day, November 11
- ☒ Thanksgiving Day, the fourth Thursday in November
- ☒ Christmas Day, December 25

If a holiday happens to fall on a Thursday, Friday or Monday, no closures will be permitted during that weekend. No lane closures are permitted two days prior to and following the Thanksgiving and Christmas Day holidays.

The Engineer reserves the right to modify or expand the methods of traffic control or working hours as specified in the Contract Documents. Any request from the Contractor to modify the work restrictions shall require written approval from the Engineer at least 72 hours prior to implementing the change. The Contractor shall submit a copy of the original work restrictions with the written request.

As directed by the Engineer, temporary lane and shoulder closures will not be permitted during periods of falling precipitation, in heavy fog or otherwise poor visibility, or in the event of emergencies such as serious traffic accidents or unusually severe traffic congestion. In the event that a temporary lane or shoulder must be reopened as directed by the Engineer or authorized Authority staff, the Contractor shall evacuate all equipment, materials and personnel from the lane within thirty (30) minutes.

149 **ADD:** The following after the last paragraph, "Any monetary savings...and the Administration."

When closing or opening a lane on freeways, expressways, and roadways with posted speed ≥ 45 mph, a work vehicle shall be closely followed by a protection vehicle (PV) during installation and removal of temporary traffic control devices. The PV shall consist of a work vehicle with

approved flashing lights, a truck-mounted attenuator (TMA) with support structure designed for attaching the system to the work vehicle, and arrow panel (arrow mode for multilane roadways and caution mode on two-lane, two-way roadways) The work vehicle size and method of attachment shall be as specified in the TMA manufacture's specification as tested under NCHRP Test Level 3.

When a temporary lane or shoulder closure is in effect, work shall begin within one hour after the lane is closed. Any delay greater than one hour with no work in progress shall require the Contractor to remove the lane closure at no additional cost to the Administration. The Contractor's Traffic Manager shall attend Pre-Construction and shall discuss traffic control and the Traffic Control Plan including procedures to be implemented for lane closures.

All closures shall be in conformance with the approved TCP and under the direction of the Contractor's Certified Traffic Manager and the Engineer.

Workers and equipment, including temporary traffic control devices needed for setting up a lane closure or restriction, are prohibited in the lane or shoulder to be closed or restricted before the time permitted in the Contract work restrictions unless otherwise noted below or as approved by the Engineer.

Temporary traffic control devices to be used for lane/shoulder closure may be placed on the shoulder of the roadway by workers no earlier than 15 minutes prior to actual time lane/shoulder closure or restriction is permitted. Temporary traffic signs may be displayed to traffic at this time.

Workers shall not enter a lane open to traffic. Workers may be present on shoulders to prepare for lane closure setup no earlier than 15 minutes prior to actual time lane/ shoulder closure or restriction is permitted.

All temporary lane or shoulder closures shall be restored at the end of the closure period and no travel lane shall be reduced to less than 11 ft. Prior to opening the closed lane or shoulder, the Contractor shall clear the lane or shoulder of all material, equipment, and debris.

Failure to restore full traffic capacity within the time specified will result in a deduction being assessed on the next progress estimate in conformance with the following. This is in addition to the requirements specified in TC-4.02.

ELAPSED TIME, MINUTES	DEDUCTION
1 - 5	$ 75.00
Over 5	$ 75.00 per Minute (In addition to the Original 5 minutes)

104.01.04 MEASUREMENT AND PAYMENT.

ADD: the following:

Maintenance of Traffic will not be measured but will be paid for at the Contract lump sum price. The payment will be full compensation for all labor (including Traffic Manager), material and equipment (for which a bid item has not been established), and any incidentals necessary to complete the work.

The cost shall include all required equipment and set ups shown on the maintenance of traffic standards, as well as removal of all traffic control set ups.

CATEGORY 100
PRELIMINARY

SECTION 104 — MAINTENANCE OF TRAFFIC

166 **DELETE**: Section 104.11 TEMPORARY PAVEMENT MARKINGS. in its entirety.

INSERT: The following.

104.11 TEMPORARY PAVEMENT MARKINGS.

104.11.01 DESCRIPTION. Furnish, install, and remove temporary pavement markings as specified in the Contract Documents or as directed by the Engineer. These markings shall include lines, letters, numbers, arrows, and symbols.

104.11.02 MATERIALS.

Removable Preformed Pavement Marking Material	Refer to the
Nontoxic Lead Free Waterborne Pavement Markings	Contract Documents
Black Out Tape	QPL

104.11.03 CONSTRUCTION.

104.11.03.01 Quality Assurance/Quality Control. Quality control testing shall be completed by the Contractor's Administration certified technicians. The Engineer will complete the quality assurance checks in conformance with MSMT 729 by performing the Nighttime Visibility Evaluations.

104.11.03.02 Warranty Period. The Contractor shall maintain and be responsible for any defects in the pavement markings for a period of 180 days from the date of application. The Contractor shall replace the pavement markings as necessary within this period as directed by the Engineer at no additional cost to the Administration. Refer to GP-5.11.

104.11.03.02 Application and Removal. The pavement markings shall be applied in conformance with the manufacturer's recommendations and the Contract Documents. Markings shall be applied in the same direction as the flow of traffic. The markings shall be located as specified in the Contract Documents or as directed by the Engineer.

Pavement markings may be applied to either new or existing paved surfaces. When applied to newly paved surfaces, the markings shall be placed before traffic is allowed on the pavement. Nontoxic lead free waterborne pavement markings shall be used for all temporary pavement markings except for the final surface. However, the Contractor may use removable preformed pavement markings at no additional cost to the Administration.

When at the "end of season", the temperatures are too low to allow the placement of removable tape on the final surface, a written exception request may be submitted to the Engineer to allow the use of nontoxic lead free waterborne paint in lieu of removable tape until the following striping season.

When it is appropriate to shift lanes, all non-applicable pavement markings within the travel way and adjacent to the travel way as directed by the Engineer shall be completely removed.

Surface Condition. Prior to application of pavement markings, the pavement surface shall be clean, dry, and free of all contaminants, including curing compound, dirt, and loose particles. Residual pavement markings shall be removed. Loose or poorly constructed markings shall also be removed.

Pavement Marking Removal. All removable preformed pavement markings shall be completely removed prior to application of the permanent markings. On stage construction or final surfaces of portland cement concrete pavements, any objectionable adhesive residue shall be removed by water blasting or other methods as may be approved by the Engineer. Open flame is prohibited to remove adhesive residue, or any pavement markings. The Contractor shall remove all nonapplicable pavement markings so that there is no damage to the existing or final surface.

Retroreflectance. The initial retroreflectance readings for temporary pavement markings shall be a minimum of 250 and 150 millicandellas/lux/square meter for white and yellow, respectively. The Engineer will monitor the pavement markings in conformance with MSMT 729 during the Contractor's 180 day period of responsibility.

104.11.04 MEASUREMENT AND PAYMENT. Payment for Removable Preformed Pavement Markings, Removal of Removable Preformed Pavement Markings, Nontoxic Lead Free Waterborne Pavement Marking Paint, and the Removal of Existing Pavement Markings will be measured and paid for using one or more of the items listed below and as specified in the Contract Documents.

The payment will be full compensation for furnishing, placing, complete removal of lines, letters, numbers, arrows, symbols, and the removal of all residue. In addition, payment will cover maintenance and replacement during the 180 day period, and for all material, labor, equipment, tools, and incidentals necessary to complete the work. Removal and replacement of temporary pavement markings required beyond the 180 day period will be measured and paid for at the Contract unit price for the pertinent temporary pavement marking item.

Temporary markings replaced during the 180 day period as a result of plowing (as determined by the Engineer) will be paid for at the Contract unit price for the pertinent temporary marking item.

(a) Nontoxic Lead Free Waterborne Pavement Marking Paint-in width specified-per linear foot.

(b) Removable Preformed Pavement Line Markings-in width specified-per linear foot.

(c) Removable Preformed Letters, Symbols, Arrows, and Numbers per each.

(d) Removal of Removable Preformed Pavement Markings-any width-per linear foot.

(e) Removal of Removable Preformed Letters, Symbols, Arrows and Numbers per each.

(f) Removal of Existing Pavement Line Markings-any width per linear foot.

(g) Removal of Existing Letters, Symbols, Arrows, and Numbers per each.

(h) Black Out Tape Lines-in width specified-per linear foot.

(i) Removal of Black Out Tape Lines-any width-per linear foot.

CATEGORY 100
PRELIMINARY

SECTION 113 — DIGITAL CAMERA

113.01 DESCRIPTION. Furnish a new or like new digital camera with a Color Inkjet Printer for use by Administration personnel. The digital camera and printer shall be delivered to the Engineer at the time of the Notice to Proceed. They shall remain operational and not be returned to the Contractor until final acceptance of the entire project, in conformance with GP-5.13.

113.02 MATERIALS.

(a) Digital Camera. The digital camera shall meet the following requirements and be furnished with the specified accessories.

(1) Windows 2000, ME, XP compatible operating system

(2) Photo Suite, Photo Deluxe, Picture Works, Photo Shop, or similar Photo Managing Software

(3) 4.0 megapixel image resolution (minimum)

(4) 3X optical zoom (minimum)

(5) Two (2) sets of rechargeable batteries

(6) SmartMedia Card or memory stick (512 MB minimum)

(7) Pop-up or built-in flash modes

(8) All items required for quick downloading

(9) Auto-quick focus

(10) Lens Cover, Shoulder Strap, and Carrying Case

(11) AC adapter and Battery Charger

(b) Color Inkjet Printer. The printer shall conform to the following minimum requirements;

(1) Resolution of 2400 x 1200 DPI (dots per inch).

(2) Print speed of 17 PPM (pages per minute) for black and white and 13 PPM for color.

(3) Memory 8 MB.

(4) Duty cycle of 5,000 pages/month.

Office-jets and Bubble-jets will not be accepted.

113.03 CONSTRUCTION. Not applicable.

113.04 MEASUREMENT AND PAYMENT. The digital camera will not be measured but the cost will be incidental to the Contract price for Maintenance of Traffic unless otherwise specified in the Contract Documents. If the digital camera or printer becomes defective, is stolen, or for any other reason does not function as intended, it shall be replaced with an approved camera or printer at no additional cost to the Administration. A nonfunctioning or stolen camera or printer shall be replaced within eight hours after the Engineer notifies the Contractor.

Ownership of the camera and printer will remain with the Contractor. The Administration assumes neither responsibility nor liability for the condition of the camera when returned.

CATEGORY 300
DRAINAGE

SECTION 308 — EROSION AND SEDIMENT CONTROL

DELETE: 308.01.03 Quality Assurance Ratings in its entirety.

INSERT: The following.

308.01.03 Quality Assurance Ratings. A Quality Assurance Inspector will inspect each project every 2 weeks to ensure compliance with the approved Erosion and Sediment Control Plan. The scores will be reported on Form No. ESC1, Erosion and Sediment Control Field Investigation Report. The Quality Assurance Inspector will use the scores to determine the following ratings:

SCORE	RATING
≥ 90	A
80 - 89.9	B
70 - 79.9	C
60 - 69.9	D
< 60	F

Rating A. The project is in compliance. Minor corrective action may be necessary.

Rating B. The project is in compliance; however, corrective action is necessary.

Rating C. The project is in compliance; however, deficiencies noted require corrections. Shutdown conditions described elsewhere herein could arise quickly. Project will be re-inspected within 72 hours.

Rating D. The project is in non-compliance. The Administration will shut down all earthwork operations. All work efforts shall focus on correcting erosion and sediment control deficiencies. The project will be re-inspected within 72 hours. All required corrective actions shall be completed within the 72 hour period for the project to be upgraded to a 'B' rating. Failure to upgrade the project from a 'D' to a 'B' or better rating will result in the project being rated an 'F'. Noncompliance penalty will be imposed for each day the project has a 'D' rating. Refer to Shutdown elsewhere in this Specification for additional requirements.

Rating F. The project is in non-compliance. An 'F' rating indicates a score less than 60 or the appropriate permits and approvals have not been obtained; or that the limit of disturbance has been exceeded, or that wetlands, wetland buffers, Waters of the United States (WUS), floodplains, and tree preservation areas as specified in Section 107 have been encroached upon;

or that work is not proceeding according to the approved Erosion and Sediment Control Plan and schedules. The Administration will shut down the entire project until the project receives a 'B' or better rating. All work efforts shall focus on correcting erosion and sediment control deficiencies. Noncompliance penalties will be imposed for each day the project has an 'F' rating.

Shutdowns. If a project is rated 'C', correct all deficiencies within 72 hours. The project will be re-inspected at the end of this period. If the deficiencies have not been satisfactorily corrected, the project will be rated 'D' and all earthwork operations will be shut down until the project is rated 'B' or better.

If consecutive 'C' ratings are received, the Contractor will be alerted that their overall effort is marginal and a shut down of all earthwork operations is imminent if erosion and sediment control efforts do not substantially improve within the next 72 hours. The project will be re-inspected at the end of this period. If the deficiencies are not satisfactorily corrected or other deficiencies are identified that result in a score of less than 80 and not below 60 on Form No. ESC1, a 'D' rating will be given and all earthwork operations will be shut down.

If disregard for correcting these deficiencies is evident, an 'F' rating will be given and the entire project will be shut down until the project receives a 'B' or better rating. When degradation to a resource could occur, or if the Contractor is unresponsive, the Administration may elect to have these corrective actions performed by another contractor or by Administration maintenance staff. All costs associated with this work will be billed to the original Contractor in addition to noncompliance penalties.

Noncompliance Penalty. Whenever a project is rated 'D' or 'F', the Administration will assess Noncompliance Penalties. Noncompliance Penalties shall be paid within 30 days from the date of notification to the Contractor. Payments will not be allowed to accrue for consideration at final project closeout.

The second time that a project is rated 'F', the Erosion and Sediment Control Training Certificate issued by the State Highway Administration will be immediately revoked from the project superintendent and the Erosion and Sediment Control Manager for at least a six month period and until successful completion of the State Highway Administration's Erosion and Sediment Control Certification Program. Neither the project superintendent nor the Erosion and Sediment Control Manager will be allowed to oversee the installation and maintenance of erosion and sediment controls during the period the certification is revoked on any project of the Authority. Replace the project superintendent and the Erosion and Sediment Control Manager with certified personnel. Work may not commence until the certified personnel are in place.

308.01.04 Noncompliance Penalty Payments. For each day that the project has a 'D' rating, the Contractor and/or his surety shall be liable for noncompliance penalties in the amount of $1,000.00 per day. Failure to upgrade the project to a minimum of a 'B' rating within 72 hours will result in the project being rated 'F'.

For each day that the project has an 'F' rating, the Contractor and/or his surety shall be liable for noncompliance penalties in the amount of $ 2,000.00 per day.

308.03 CONSTRUCTION.

DELETE: 308.03.01 Contractor Responsibilities in its entirety.

INSERT: The following.

Prior to beginning any earth disturbance activity,

(a) Determine extent of area only which can be disturbed and stabilized within a complete working day.

(b) Determine extent of excavation from which the waste material can be disposed properly, or stabilize per approved Erosion and Sediment Control approach, within a complete working day.

Construction activities conducted per day are limited to the extent defined in (a) and (b) above.

DELETE: 308.03.02 references to Erosion and Sediment Control Plan (E & S Plan)

DELETE: 308.03.04 Schedule in its entirety.

INSERT: The following.

Within 14 days after the Notice of Award, submit an Erosion and Sediment Control approach schedule which indicates the sequence of construction, implementation and maintenance controls, temporary and permanent stabilization, and the various stages of earth disturbance. Any changes to the MDE approved Erosion and Sediment Control approach require concurrence from MDE in addition to the Engineer's approval. At a minimum the following shall be included:

(a) Clearing and grubbing of areas necessary for excavation and construction activities specified in the Contract Documents.

(b) Implementation of same day stabilization controls specified in the Contract Documents.

(c) Roadway or other re-grading (including off-site work).
(d) If applicable, utility installation and whether storm drains will be used or blocked after construction.

(e) Final grading, landscaping, and stabilization.

Work is prohibited on-site and off-site until the Erosion and Sediment Control schedules and

methods of operation have been accepted by the Engineer and MDE.

308.03.08 Stabilization Requirements.

INSERT: The following as the last paragraph.

Any disturbed area not draining to an MDE approved sediment trapping device must be stabilized at the end of each working day. Suitable stabilization methods include, but not limited to: Seed and mulch, stone, impervious sheeting properly secured by sandbags or stones.

308.04 MEASUREMENT AND PAYMENT.

DELETE: 308.04 in its entirety.

INSERT: The following.

308.04 MEASUREMENT AND PAYMENT. Erosion and Sediment Control, when required by MDE and Engineer, is incidental to the cost of excavation, grading and final stabilization practices. All material, labor, equipment, tools, installation, maintenance, repair, resetting, any temporary stabilization and final removal of all erosion and sediment control devices and shall also be incidental to the cost of excavation, grading and final stabilization practices.

CATEGORY 400
STRUCTURES

SECTION 400-01 REMOVAL OF EXISTING SIGN STRUCTURE SUPPORT BRACKETS

400-01.01 DESCRIPTION. This work shall consist of the removal and proper disposal of existing steel sign structure support brackets to the limits as shown on the Plans, in accordance with the requirements of these Special Provisions and as may be directed by the Engineer. This work shall also consist of providing safe access and inspecting the existing girders for weld and base metal cracks at intermediate transverse connection plate locations adjacent to the existing bracket to be removed.

400-01.02 MATERIALS.

High Strength Bolts, Nuts and Washers	A325 Type 3

400-01.03 CONSTRUCTION. Before removal operations commence, the Contractor shall prepare and submit to the Engineer for review and approval a complete list of all equipment to be utilized in the removal of each steel sign structure support bracket including the proposed method of removal as an official shop drawing submittal. Materials obtained from the removal operations shall become the property of the Contractor and shall be removed off site.

If any damage results to portions of the existing structure to remain as a result of the Contractor's operations, the areas damaged shall be repaired or replaced as required by the Engineer in an acceptable manner at no additional cost to the Authority. If the damage is a result of the Contractor's method of removal, the Contractor shall submit a revised method of removal to the Engineer for review and approval. In this event, all removal operations may be temporarily discontinued until such approval of the alternate method is submitted and approved. No extension in Contract time will be given to the Contractor for delays caused by the repair of damage to the existing structure to remain or during a temporary work stoppage resulting from unacceptable removal methods and/or the required submittal of an alternate removal method.

Following the removal of each steel sign structure support bracket, the Contractor, in the presence of the Engineer, shall perform a hands-on inspection of the portions of the existing structure to remain, focusing on welded connections and those areas adjacent locally to the remaining connection plates. The Contractor shall provide safe access to the areas via bucket truck, snooper, scaffolding, etc. All inspection observations will be documented by the Engineer. If any defects (cracking, section loss, etc.) are observed, the Engineer will provide subsequent direction on any necessary repairs.

High strength bolts placed in open bolt holes remaining after the removal of the steel sign structure support bracket shall be installed in conformance with 430.03.17

A plasma cutter or approved equal shall be used to cut the structural steel of the existing sign structure support bracket as shown on the Plans. The finished edge resulting from cutting the structural steel shall be relatively smooth and free of sharp, jagged edges.

The Contractor is hereby notified that portions of this work may be located adjacent to or over active railroad tracks. Depending on the sign location, these tracks may be owned by the Canton Railroad Co, CSX Transportation, Inc. (CSXT) or Norfolk Southern Corp. (NS). The Contractor shall coordinate with the appropriate railroad to ensure that all requirements are met when working adjacent to or over any track. Any temporary scaffolding or demolition shields required for this work shall be prepared as a working drawing and submitted to the appropriate railroad for review in accordance with the Special Provisions included elsewhere herein.

400-01.04 MEASUREMENT AND PAYMENT. The Removal of Existing Sign Structure Support Brackets will be measured and paid for at the Contract unit price per each for the pertinent Removal of Existing Sign Structure Support Bracket item specified in the Contract. The payment will be full compensation for preparing, submitting and revising shop drawings, removing and disposing the specified existing steel sign structure support brackets to the Plan limits shown, furnishing and installing high strength bolts, cutting the existing structural steel as shown on the Plans, coordinating with the railroad(s) and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

The removal and disposal of existing overhead sign structures will be paid for under the Remove Existing Cantilever Structure and Signs and Supports and Remove Existing Overhead Sign Structure and Signs and Supports items as specified in the Contract.

Furnishing and operating the access equipment necessary to perform the inspection of existing portions of steel members to remain will be incidental to the pertinent Removal of Existing Sign Structure Support Brackets item.

Any delays to the Contractor’s operations caused by coordination efforts with the railroad(s) will not be cause for a delay claim to the Authority.

An allowance of One Hundred Thousand Dollars ($100,000.00) has been established under the Miscellaneous Structural Repairs item in the Schedule of Prices. This item, Miscellaneous Structural Repairs, will provide compensation to the Contractor for the cost of performing repairs to defects observed in the existing structure identified by the hands-on inspection. This item will include materials, labor and equipment necessary to perform the specified repairs, non-destructive testing on the repair area, follow-up hands-on inspection, access to perform the repairs and non-destructive testing, and follow-up repairs, testing, hands-on inspection, and access that may be required. Prior to the commencement of any repair work, the Contractor shall submit the price to perform the repairs specified by the Engineer to the Authority for review. There is no guarantee that this item will be used during the term of the Contract.

CATEGORY 400
STRUCTURES

SECTION 400-02 REMOVAL OF PORTIONS OF EXISTING BRIDGE STRUCTURES

400-02.01 DESCRIPTION. This work shall consist of the removal and disposal or removal and salvage of portions of existing bridge structures and related features to the limits indicated on the Plans, in accordance with the requirements of these Special Provisions and as may be directed by the Engineer. This work also includes the maintenance of utilities located in the existing parapet or attached to the existing superstructure and/or substructure as specified in Section 400-04.

400-02.02 MATERIALS.

Steel Reinforcement Bars	908.01
Steel Shear Studs	909.05

400-02.03 CONSTRUCTION. Before removal operations commence, the Contractor shall prepare and submit to the Engineer for review and approval a complete list of all equipment to be utilized in the removal of portions of existing structures including the proposed method of removal as an official shop drawing submittal. Materials obtained from the removal operations shall become the property of the Contractor and shall be removed promptly off site, unless noted otherwise.

If any damage results to portions of the existing structure to remain as a result of the Contractor's operations, areas damaged shall be repaired or replaced as required by the Engineer in an acceptable manner at no additional cost to the Authority. If the damage is a result of the Contractor's method of removal, the Contractor shall submit a revised method of removal to the Engineer for review and approval. In this event, all removal operations may be temporarily discontinued until such approval of his alternate method is submitted and approved. No extension in Contract time will be given to the Contractor for delays caused by the repair of damage to existing portions of the structure to remain or during a temporary work stoppage resulting from unacceptable removal methods and/or the required submittal of an alternate removal method.

400-02.03.01 Removal of Portions of Bridge Deck Slab and Parapet. The Contractor shall protect the public against injury and damage from demolition operations when removing portions of the existing bridge deck slabs and parapets. When deck and/or parapet removal is performed over or near trails, roadways, railroads or waterways, the Contractor shall furnish and erect temporary protective shields to prevent any material or debris from entering these areas. The Contractor shall adhere to the applicable underclearance restrictions specified in TC-6.12.

Working drawings for the protective shields shall be submitted in conformance with TC-4.01(b). Flooring and siding shall have no cracks or openings through which material particles may pass. The shields shall be able to support over their entire area 150 lb/ft^2 in addition to their own dead weight. The

150 lb/ft^2 requirement for protective shields will be waived when the portion to be removed is not over any of the following, or within range of rolling debris reaching any of the following:

(a) Roadway, pedestrian walkway, bikeway, parking areas, buildings, navigable water, railroads and railroad property, or other traveled way.

(b) Exposed utilities that are either aerial utilities crossing under the span or utilities located between stringers.

When the 150 lb/ft^2 in addition to its own dead weight requirement is waived and the Contractor elects to remove the existing bridge deck slab by saw cutting sections and removing them by lifting from above, then the Contractor shall provide protection to prevent any loose particles from reaching the ground or waterway below. In addition, a temporary construction fence shall be placed under the area of demolition to prohibit accidental access by employees and possible pedestrians.

After the Engineer determines that the protective shields have served their purpose, they shall be removed and become the property of the Contractor.

During the removal operations, it is imperative that the existing structure to remain is protected from damage.

At locations where the Contractor elects to support the protective shields from the steel, all connections to the protective shields shall be made by means of clamps or other approved devices. The drilling of holes in the existing steelwork, or welding to the steelwork for this purpose, is prohibited. Protective shields may also be temporarily supported from above by the use of a crane. In this case, the Working Drawing Submittal shall include crane capacity charts and the design loads for review and approval by the Engineer. Crane supported demolition protective shields may not be used when the portion to be removed is over any of the following, or within range of rolling debris reaching any of the following:

(a) Roadway, pedestrian walkway, bikeway, parking areas, buildings, navigable water, railroads and railroad property, or other traveled way.

(b) Exposed utilities that are either aerial utilities crossing under the span or utilities located between stringers:

A temporary protective shield shall be installed on the temporary concrete barrier as described in the Plans. The limits of the temporary protective shield to be mounted on the temporary concrete barrier shall extend a minimum of 5 feet beyond each end of the limits of removal. A temporary orange construction fence that runs from the termini of the temporary protective shield mounted on the concrete barrier to the existing concrete parapet to remain shall be installed during non-working hours once the existing deck and parapet have been removed.

Prior to removing a portion of the existing slabs and parapets, the Contractor shall take survey measurements to include, at a minimum, elevations at locations along the roadway flow line, tops of parapets and at other locations as necessary to ensure that the reconstructed deck slab, parapet and associated new sign support bracket are constructed to the proper elevations. The reconstructed deck slab shall match the existing deck profile and cross slope. At this time survey measurements of the roadway crown shall also be taken to ensure that the proposed sign structure has adequate vertical roadway clearance. All of this information shall be included on the Contractor's pertinent Working Drawing Submittal for the work.

Before any removal equipment is allowed onto the structure, the locations of the existing girder top flanges shall be marked clearly on the bridge deck. The flange locations shall be delineated by drilling 1" diameter pilot holes upwards beginning from the deck underside. Once the flanges are located, their outlines shall be painted on the deck with brightly colored red or orange paint using a roller or brush. The area to be painted includes the location of the top flange plus 6" on either side. Only hand tools or power driven hand tools conforming to 426.03.01(c) and (d) may be used within the painted areas when removing the concrete deck. Where saw cutting is shown on the Plans, only 1" deep saw cuts will be permitted when located within the painted area. The painted areas shall be clearly visible at all times during the removal operation and shall be re-painted when, in the opinion of the Engineer, the markings have sufficiently deteriorated. The Contractor shall ensure that all workers performing removal operations do not encroach on the painted areas with any full-depth saw cuts or heavy equipment during the removal operations.

Upon completion of drilling the 1" diameter pilot holes to delineate the flange locations, the Contractor shall measure the minimum deck thickness present and furnish this information to the Engineering Division of the Authority. A minimum of one measurement shall be taken at each new sign structure support.

A neat 1" deep saw cut shall be made at all removal locations to separate the removal operations from the concrete portions which are to remain. Existing reinforcement steel that is required to be incorporated into the proposed structure shall be protected and conform to 421.03.07.

400-02.03.02 Steel Shear Studs. The existing girders contain steel shear studs that are to remain. Exposed studs shall be cleaned of all concrete as part of this work. Abrasive blast cleaning shall also be used to clean studs; striking the heads of studs for the purpose of removing concrete shall not be used. If any stud is broken off during the removal operations, a new stud of similar size and length shall be installed adjacent to the existing broken stud in accordance with 431.03.

400-02.03.03 Existing Utility Conduits. The Plans indicate the presence of utility conduits located in the existing parapets. Prior to the removal of the parapet concrete, the utilities contained therein shall be temporarily removed, relocated and supported as shown on the Plans and as required by Special Provisions contained elsewhere herein.

400-02.03.04 Existing Drainage System. The limits of scupper downspout pipe removal shall only be to the extent necessary to remove the existing scupper and facilitate re-attachment of new downspout piping. Reference the Special Provisions for New Sign Structure Supports for additional information.

400-02.03.05 Removal and Disposal of Existing Features. In addition to the removal of portions of the existing bridge deck slab and parapets, other associated existing features shall be removed and disposed of as indicated on the Plans including scuppers and associated downspout piping, conduits, junction boxes, barrier delineators, chain link fence posts and mesh, rails and associated hardware, and regulatory and mile post signs. After removal, these features shall become the property of the Contractor and removed promptly off the site and properly disposed, unless noted otherwise. The hardware used to attach these features to the existing structure shall be discarded.

The existing structural steel (i.e. channels, connection plates, etc.) used to support the existing scuppers shall remain. Any bolt holes located in the existing structural steel to remain shall be filled with a high strength bolt conforming to A325, Type 3 having the same diameter of the bolt being removed. The new high strength bolts shall be installed as outlined in 430.03.17.

400-02.03.06 Removal and Salvage of Existing Features. During the removal of portions of the existing bridge deck slab and parapets, other associated existing features shall be removed and salvaged as indicated on the Plans. These features shall be stored safely and protected from damage until ready for reinstallation.

400-02.03.07 Coordination with Railroads. The Contractor is hereby notified that portions of this work may be located adjacent to or over active tracks owned and operated by CSXT Railroad, Norfolk Southern Railroad, and/or Canton Railroad. The Contractor shall coordinate with the pertinent Railroad to ensure that all requirements are met when working adjacent to or over any track. Any temporary scaffolding or demolition shields required for this work shall be prepared as a working drawing and submitted to the pertinent Railroad for review in accordance with the Special Provisions included elsewhere herein.

400-02.03.08 Maintenance of Utilities. Refer to Section 400-04.

400-02.04 MEASUREMENT AND PAYMENT. The Removal of Portions of Existing Structures will be measured and paid for at the contract unit price per each for the various pertinent Removal of Portions of Existing Structure items specified in the Contract. The payment will be full compensation for the removal of portions of existing structure to the limits shown on the Plans including the concrete parapet, deck slab, scupper(s) and associated downspout piping (to the minimum limits necessary to tie the new scupper and downspout piping into the existing), chain link fence, and stay-in-place forms. Also included within the payment for this item is saw cutting, installation and removal of the temporary protective shield mounted on the temporary concrete barrier and any temporary orange construction fence, cleaning and straightening of existing reinforcement bars to remain, cleaning of existing steel shear studs, replacement of damaged steel shear studs, installation of new high strength bolts in existing

structural steel supporting existing scuppers, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

The utility conduits located in the existing parapets or attached to the existing superstructure and/or substructure that are required to be temporarily relocated and supported to complete the work at a particular sign structure location will be incidental to the pertinent Removal of Portions of Existing Structure items specified in the Contract. The payment will be full compensation for preparing, submitting and revising shop drawings, furnishing, fabricating and installing protective ramps, furnishing and installing rigid conduits and associated cables and supporting them off of the temporary barrier, disconnecting/removing the existing cables and conduits, splicing cables, removing the protective ramp, removing/disconnecting the temporary conduits and cables and for all material, labor, equipment, tools, and incidentals necessary to complete the work. The relocation of the utilities back into the reconstructed bridge parapets or reattached to the superstructure and/or substructure will be paid for under other pertinent items specified in the Contract.

The installation of steel reinforcement bars, including installing welded or approved mechanical splices, to replace existing reinforcement exhibiting section loss of 20 percent or more will be measured and paid for at the Contract unit price per each for the Repair Bar for Deck Reinforcement item specified in the Contract. Steel reinforcement bars installed, including installed welded or approved mechanical splices, to replace bars cut off or damaged during the removal operations will not be measured or paid for but the cost for this work will be borne strictly by the Contractor.

The removal and salvage of any existing features will be incidental to the pertinent Removal of Portions of Existing Structure items specified in the Contract. The reinstallation of these features will be incidental to other pertinent items specified in the Contract.

The removal and disposal of regulatory and mile point signs and supports will be measured and paid for under the Remove Existing Bridge Mounted Signs and Supports and Remove Existing Bridge Mounted Sign Supports Only (No Sign) items specified in the Contract.

Securing and tensioning the existing chain link fence to remain will be incidental to the pertinent Removal of Portions of Existing Structure items specified in the Contract.

CATEGORY 400
STRUCTURES

SECTION 400-03 NEW SIGN STRUCTURE SUPPORTS

400-03.01 DESCRIPTION. This work shall consist of the construction of new sign structure supports on existing bridges as detailed on the Plans and in accordance with the requirements of these Special Provisions and as may be directed by the Engineer. This work may also include the installation of new chain link fencing and swing gates, scuppers and associated downspout piping and barrier delineators.

400-03.02 MATERIALS.

Concrete – Mix No. 6	902.10.03 – Table 902 A
Microsilica	902.10.03 – Table 902 B, Option 3
Reinforcement	908.01
Steel Shear Studs	909.05
Fusion Bonded Epoxy	917.02
Preformed Fabric Pads	910.02.03
Steel Plates	A709 Grade 36, Galvanized
Resilient Laminated Fabric Pads and Washers	MIL-C-882E
Preformed Fabric Bearing Pad	910.02.03
Anchor Bolts (sign structures)	F1554, Grade 55, S1, Galvanized
Anchor Bolt Nuts and Washers	909.08
Anchor Studs or Bolts (fencing)	A 276, Type 430 or 304
Epoxy Grout (fencing)	902.11 (d)
Curing Materials	902.07
Form Release Compound	902.08
Cast Iron Scuppers	909.04
Fiberglass Scuppers	921.11
Steel Scuppers	909.02
Steel Shear Stud Developers	909.05
Conduits	921.07.01 ANSI C80.1 and 921.07.02 UL 651
Drains and Downspouts	905, 921.11, A 74, A 888, A 53 Grade B, A 234
Epoxy Bonding Compound	921.04
Steel Forms (to remain in place)	909.11
Water	921.01
Admixtures	420.02.01
Grout	902.11 (c)
Production Plants	915

Barrier Delineators	As approved by the Office of Traffic and Safety

All sign structure anchor bolts and associated hardware shall be galvanized in accordance with A153. All steel plates shall be galvanized in accordance with A123.

All accessories shall meet the requirements as specified under 420.02.02.

Steel reinforcement bars remaining in the existing structure to be incorporated into the New Sign Structure Supports shall not be field epoxy coated or touched-up if originally epoxy coated.

Junction boxes shall be fabricated from Type 304 stainless steel and be watertight. All hardware for the junction boxes shall be Type 304 stainless steel. All hardware attaching the cover to the junction box shall be countersunk so that they are flush with the cover.

400-03.03 CONSTRUCTION. The construction of New Sign Structure Supports shall be in accordance with applicable portions of 420.03 except as noted herein. Slip forming of the parapets will not be allowed.

420.03.03 Anchor Bolt Placement

DELETE: The subsection in its entirety.

INSERT: The following.

Anchor bolts shall be cast into the New Sign Structure Support. Sleeves may be cast into the concrete if approved by the Engineer. The Contractor shall prepare and submit a working drawing submittal detailing his method of installation as well as the size of the proposed sleeves. Either method is acceptable but only one method shall be used at each New Sign Structure Support location. No additional compensation will be made to the Contractor for whichever method is selected and used. If anchor bolts sleeves are used, completely fill the annular space around the inserted anchor bolt with grout. Anchor bolt holes placed in the new concrete via coring or drilling will not be allowed under this Contract.

420.03.04 Concreting.

DELETE: The third paragraph under Subparagraphs (c)(2) in its entirety.

INSERT: The following.

Superstructure concrete shall not be placed when the temperature of the concrete surface is less than 45 °F or greater than 75 °F. Superstructure concrete may also not be placed when the combination of wind velocity, humidity, air temperature and the fresh concrete temperature produces an evaporation rate of 0.15 pounds per square foot of surface per hour as determined from ACI 308, Standard Practice for Curing Concrete. If the theoretical rate of evaporation is above 0.10 pounds per square foot per hour, the Contractor shall take all necessary precautions to reduce the probability of plastic shrinkage cracking, such as:

(a) Misting the surface of the concrete immediately behind the finishing machine with an approved fogger. If misting is used, it shall be applied continuously up until the placement of the wetted burlap covers.

(b) Covering the surface with polyethylene sheeting between the finishing and texturing operations.

(c) Reducing the temperature of the concrete mix.

420.03.07 Finishing Concrete Surfaces.

DELETE: First paragraph under Subparagraph (d)(1) in its entirety.

INSERT: The following.

(1) **Slab Grooving.** The new portion of deck slab shall be mechanically grooved to match the original deck slab surface if so grooved. The grooving operation shall start after the bridge deck slab has been cured in conformance with 420.03.10, and attained a minimum compressive strength specified in 420.03.15. The bridge deck shall be grooved in an orientation to match the existing grooves.

420.03.15 Loads on Concrete Structures.

DELETE: The subsection in its entirety.

INSERT: The following.

Loads shall not be applied to any new portion of the bridge deck and parapet until the final section of that unit of the deck has completed its specified curing period.

Vehicles, including the Contractor's, and heavy equipment are not permitted on any new portion of the bridge deck until the concrete cylinder breaks for the bridge deck have attained a minimum compressive strength of 4500 psi. However, loads such as stored materials, lightweight equipment, forms for concrete

parapets, etc. may be placed upon the concrete deck via cranes or other lifting devices when the concrete deck has attained a minimum compressive strength of 3000 psi.

The towers for the overhead span and cantilever sign structures are not permitted to be installed on the new parapet until the concrete cylinder breaks for the new portion of the deck and parapet have attained a minimum compressive strength of 4500 psi.

ADD: The following.

420.03.19 Scuppers and Downspouts.

New scuppers shall be installed as indicated on the Plans and as specified herein. The scuppers shall be manufactured by Wilton Corporation, Neenah Foundry Company, Fox Industries, Inc. or approved equal. Fabrication of the scuppers is not restricted to one type of material. The coating system for fiberglass and cast iron scuppers shall be as specified on the Plans. The coating system for scuppers fabricated with structural steel shall be galvanized in conformance with ASTM A123.

Where fabrication of scuppers using the details shown on the existing contract plans is required, the downspout shall extend far enough below the bottom of the proposed concrete deck to provide sufficient length for connecting the new scupper downspout. The size of the new scupper shall match the information shown on the existing contract plans unless otherwise noted. The tail piece of the new scupper and new downspout shall be such that it can accommodate the size and material of the existing downspout. A net minimum scupper pan slope of 4% shall be maintained at all times. The scupper grating for the scuppers matching the details shown on the existing contract plans shall be similar to the details shown on the Plans, except that the overall dimensions of the scupper grating shall be modified accordingly to fit.

The scupper grating material and coating for scuppers fabricated with structural steel shall conform to the information and details for cast iron scuppers shown on the Plans.

The Contractor has the option of reconstructing the scupper downspouts using steel pipe, cast iron pipe, PVC pipe or fiberglass pipe. The downspout material to be used is not restricted to one type of material. The selected material shall be compatible and able to create water tight joints between the reconstructed scupper downspout and the existing scupper downspouts to remain.

The scupper downspout piping shall be modified as required to connect the new downspout to the existing downspout located adjacent to the piers. The slope of the new scupper downspout shall be as steep as possible. Scupper downspout piping shall be installed so as to minimize the number of elbows greater than 45-degrees. Drilling or cutting holes in the existing steelwork for the passing of downspouts is prohibited. Downspout hangers shall be supported by the concrete deck or existing steel plates, angles,

etc. originally installed in the superstructure for the sole purpose of supporting downspout piping. Welding or bolting of the new scupper downspouts to the existing steel girders shall not be permitted.

Scupper downspouts consisting of PVC or fiberglass pipe shall be white. Scupper downspouts consisting of steel or cast iron pipe shall be painted with one shop applied coat in conformance with 912.03 and one field applied coat in conformance with 912.04. The color of the paint shall be white.

The Contractor shall prepare and submit a Working Drawing Submittal detailing scupper downspout system to be installed. Details shall include, but not be limited to, the material to be used for the scuppers and scupper downspouts, details of the proposed scuppers, schematic detail of the scupper downspout system including the type of fittings to be installed, downspout hangers, and method of anchoring the downspout hangers to the concrete deck.

420.03.20 Steel Shear Stud Developers.

Steel shear stud developers shall be installed in conformance with 431.03 where indicated on the Plans.

420.03.21 Junction Boxes.

Junction boxes shall be fabricated in conformance with dimensions shown on existing plans.

400-03.04 MEASUREMENT AND PAYMENT. New Sign Structure Supports will be measured and paid for at the contract unit price per each for the various pertinent New Sign Structure Support items specified in the Contract. The payment will be full compensation for all concrete, forms and form removal, curing and misting, steel reinforcement bars, welded splices or approved mechanical splices for steel reinforcement bars, steel shear studs, anchor rods or bolts, steel clamp plates, steel leveling plates, resilient laminated fabric pads and washers, preformed fabric pads, scuppers and associated downspout piping (the minimum necessary to tie into the exiting downspout piping system), downspout hangers and hardware, paint for downspouts, conduits, junction boxes, covers and associated hardware, floodlighting, installation of new chain link fencing and swing gates, and for all material, labor, equipment, tools, and incidentals necessary to complete the work as specified herein and on the Plans.

The installation of barrier delineators, parapet control joints and drains for conduits and junction boxes, mechanical grooving (if necessary) and placement of epoxy bonding compound will be incidental to the pertinent New Sign Structure Support items specified in the Contract.

For the purposes of bidding, the installation of anchor bolts for sign structures shall be cast into the New Sign Structure Support.

The removal of portions of the existing deck and parapet will be measured and paid for under other pertinent items in the Contract.

The installation of overhead and cantilever sign structures will be measured and paid for under other pertinent items in the Contract. Steel base plates affixed to the tower poles will be incidental to the pertinent sign structure items.

The installation of overhead and cantilever sign structures will be measured and paid for under other pertinent items in the Contract. Steel base plates affixed to the tower poles will be incidental to the pertinent sign structure items.

CATEGORY 400
STRUCTURES

SECTION 400-04 MAINTENANCE OF UTILITIES

400-04.01 DESCRIPTION. This work shall consist of the temporary relocation and support of the utility conduits located in the existing parapets or attached to the existing superstructure and/or substructure prior to the removal of portions of the existing concrete parapets as shown on the Plans, in accordance with the requirements of these Special Provisions and as may be directed by the Engineer. This work will also include the connection and disconnection of temporary cables, setting up and removing a temporary support ramp and supplying rigid conduits for the temporary support of the individual utility.

400-04.02 MATERIALS.

Structural Tubing	A 500, Grade B
Plates	A 709 Grade 36 Minimum
Anchors	Hilti HDI-L or an approved equal
Watertight Flexible Conduit	921.07.02, UL 1660
Rigid Conduit	921.07.02, UL 651
Electrical Cable and Wire	950.06
Electrical Cable and Wire Connectors	950.14
Welding	909.03
Grout	902.11 (d)

400-04.03 CONSTRUCTION. Prior to the removal of any portions of the existing concrete parapet or deck, the Contractor shall confirm the presence, location, type and status of the existing utilities at each proposed sign structure support location. Only active utilities need to be temporarily relocated during the removal operations. The active utilities shall be relocated, temporarily supported and spliced and a protective ramp structure fabricated and in place before any concrete demolition proceeds. Splicing of utility cables shall be in conformance with applicable portions of the National Electric Safety Code ("NESC") and shall be completed under the direct supervision of a master electrician licensed in the State of Maryland.

The Plans provide a means for protecting the utilities during construction so that Contractor equipment and vehicles may traverse them at all times. No vehicle or equipment shall be allowed to rest or stop on the protective ramps while they are in use. An alternate method of protecting the utilities may be proposed for substitution by the Contractor subject to the review and approval by the Engineer via an official Working Drawing Submittal.

The temporarily relocated utilities shall be supported off the back (or base of) the temporary concrete traffic barrier placed for maintenance of traffic. The Contractor shall provide a Working Drawing Submission of his proposed method of conduit support for review and approval by the Engineer. This Working Drawing Submission shall include the longitudinal limits of the temporary support and details of the attachment to the temporary concrete barrier.

Following the reinstallation of the existing utilities back into the reconstructed parapet, the temporary protective ramps shall be removed including the concrete anchors. Holes left behind from the anchors shall be filled with grout as specified herein.

400-04.04 MEASUREMENT AND PAYMENT. Maintenance of Utilities will not be measured or paid for, but the cost for this work will be incidental to the pertinent Removal of Portions of Existing Structure items specified in the Contract.

The relocation of the utilities back into the reconstructed bridge parapets will be paid for under other pertinent items specified in the Contract. Existing utilities may include, but not limited to, electrical, telephone and fiber optic cables.

CATEGORY 400
STRUCTURES

SECTION 400-05 BRIDGE MOUNTED SIGN SUPPORTS

400-05.01 DESCRIPTION. This work shall consist of furnishing, fabricating, transporting and erecting new bridge mounted sign supports (Type I, II, and III) as detailed on the Plans, in accordance with the requirements of these Special Provisions and as may be directed by the Engineer.

400-05.02 MATERIALS.

Structural Tubing	ASTM A500 Grade B
Structural Shapes and Plates	ASTM A709 Grade 50
Anchor Bolts (sign structures)	Hilti HVA, HAS or approved equal
High Strength Bolts	909.07
Sign Panel Bolts, U-Bolts	ASTM A307
Welding Materials	909.03

All anchor bolts and associated hardware shall be galvanized in accordance with A153. All steel tubing, shapes and plates shall be galvanized in accordance with A123.

400-05.03 CONSTRUCTION. The construction of Bridge Mounted Sign Supports shall be in accordance with the requirements of 430.03 and these Special Provisions.

Prior to drilling or placing new anchors for the Bridge Mounted Sign Supports, the Contractor shall confirm the presence, location, type and status of the existing utilities at each proposed sign structure support location within the existing parapets. These utility conduits shall not be damaged by the Contractor's operations and may require the relocation of the Bridge Mounted Sign Supports to avoid conflict or damage. Any damage to the existing utility conduit to remain as a result of the Contractor's operations will be borne by the Contractor and repaired to the satisfaction of the Engineer all at no cost to the Authority. If the location of any Bridge Mounted Sign Support is required to be moved, it shall be relocated only when written authorization is provided by the Engineer.

400-05.04 MEASUREMENT AND PAYMENT. Bridge Mounted Sign Supports will be measured and paid for at the Contract unit price per each for the various pertinent Bridge Mounted Sign Supports items specified in the Contract. The payment will be full compensation for fabricating, furnishing and installing the Bridge Mounted Sign Supports at the designated locations and for all material, labor, equipment, tools, and incidentals necessary to complete the work as specified herein and on the Plans.

New signs will be paid for under the Sheet Aluminum Signs and Extruded Aluminum Signs items as specified in the Contract.

CATEGORY 400
STRUCTURES

SECTION 400-06 WORKING DRAWINGS

400-06.01 DESCRIPTION. This work shall consist of the scheduling, preparation and distribution of working drawings as described in TC-1.03 and TC-4.01. The working drawings shall exhibit good drafting practice and represent the original work of the Contractor, fabricator or supplier. Submitting duplicated portions of the Plans as working drawings is prohibited. The Contractor shall also submit backup calculations for working drawings when so requested by the Authority including those for formwork and protective shields. Calculations shall be prepared, signed and sealed by a professional engineer registered in the State of Maryland who possesses experience in the field represented by the submittal.

400-06.02 MATERIALS. None.

400-06.03 CONSTRUCTION.

400-06.03.01 Schedule. As a first order of work, the Contractor shall prepare and submit a schedule for the submission of working drawings in conformance with these Special Provisions. The schedule shall be coordinated with and be in full accord with the Progress Schedule submitted to the procurement officer under GP-8.04 and TC-5.02. The Contractor is hereby notified that due to the nature of the work required and the potentially long material and fabrication lead times for many of the work items specified under this contract, it is paramount that working drawings are submitted in a timely fashion. Working drawings that are submitted late or in an amount that precludes providing a reasonable review period by the Authority will not be cause for a time delay claim by the Contractor. The Contractor is further alerted to the fact that delays in the schedule caused by the delinquent submittal of working drawings will not provide sufficient cause for an extension in Contract time.

The working drawing schedule shall include each type of working drawings (e.g., form plans, reinforcing steel, etc.), the approximate number of drawings to be reviewed, estimated date of first submission and estimated rate of submission of drawings (e.g., 5/week). Where possible, the most critical drawings shall be submitted first with enough time for review so as to minimize delays during construction.

400-06.03.02 Working Drawing Submittals. Working drawings shall be submitted to the following person for subsequent distribution and review:

Maryland Transportation Authority
Engineering Division
300 Authority Drive
Baltimore, Maryland 21222-2200
ATTN: Ms. Roxane Y. Mukai

Working drawings are not to be sent to the consultant engineering firm shown on the Plans.

The anticipated shop drawings include, but are not limited to the following: bridge mounted sign supports, demolition shields, formwork for concrete, reinforcement steel for deck, modified parapet and sign structure supports, fencing, temporary support of utilities, removal of existing sign structure brackets, and scuppers and associated downspout piping. The Contractor shall allow up to four (4) weeks for the review of each shop drawing submittal. This review time does not include the review of the pertinent submittals by the pertinent Railroad. Reference the Special Provisions located elsewhere herein for more information and requirements regarding the review of shop drawing submittals by the Railroad.

To expedite the checking and distribution of working drawings, fabricators or suppliers may send prints directly to the Authority with copies of all correspondence to the Contractor. If the Contractor requests that all plans be routed through the Contractor's office, then the establishment of that procedure should be the first order of work so as to avoid possible misunderstandings as to the processing. An alternate submittal process may be developed following the project Notice to Proceed pending approval by the Director of Engineering at the Maryland Transportation Authority ("Authority").

The Contractor, fabricator or supplier shall furnish to the Authority ten (10) prints each of all working drawings, etc. for primary review. Once the primary review is complete the Contractor, fabricator or supplier shall furnish the Authority additional prints (number to be furnished by primary reviewer) for stamping and forwarding for secondary review and distribution.

All working drawings for the project will not be considered accepted until they bear the acceptance stamps of both the consultant engineering firm and the Authority.

The Contractor is hereby notified that construction located over active Railroad tracks shall require the submission of working drawings to the pertinent Railroad when such work is located aerially and/or within 25 feet horizontally of the centerline of track. Reference the Special Provisions located elsewhere herein for more information and requirements.

Working drawings shall not be submitted for approval as a Request For Information ("RFI").

400-06.03.03 Revisions and Substitutions. All modifications shall be sent to the Authority for approval. Any modifications implemented, without written approval from the Authority shall be subject to the requirements of GP-5.02.

400-06.04 MEASUREMENT AND PAYMENT. Working drawings will not be measured or paid for, but the cost for this work will be incidental to other pertinent items specified in the Contract.

CATEGORY 400
STRUCTURES

SECTION 400-07 PROTECTION OF EXISTING STRUCTURES

400-07.01 DESCRIPTION. This work shall consist of the evaluation, preparation and submittal of engineering evaluations, calculations and working drawings as necessary when heavy equipment is placed onto any portion of the existing bridge deck roadway for the purpose of completing the various items of work specified in this contract including, but not necessarily limited to, the removal of existing sign structure support brackets, removal of portions of existing structures, new sign structure supports, bridge mounted sign supports, remove existing bridge mounted sign supports, remove existing overhead sign structures (bridge mounted) and the installation of overhead and cantilever sign structures. This work shall also consist of utilizing appropriate protective measures as stipulated herein when heavy equipment is placed onto the existing bridge deck.

400-07.02 MATERIALS. None.

400-07.03 CONSTRUCTION. Heavy equipment is defined as lifting equipment (e.g., crane or similar lifting equipment) proposed for use by the Contractor to assist in the completion of various Contract items that may produce a net loading effect greater than that imparted by a standard HS-20 and/or military design loading (i.e., threshold load). Military design loading is defined as two (2) 24,000 pound axles spaced 4 feet center-to-center. Prior to mobilizing any heavy equipment, the Contractor shall verify that the net live load effect produced by his proposed equipment and associated pick weight is less than this threshold load and provide any necessary calculations and supporting equipment catalog cuts and/or equipment manufacturer brochures for review and approval by the Engineer. If the Contractor's proposed equipment and associated pick weight produces a live load effect greater than the threshold load, calculations shall be prepared and submitted to the Engineer for review and approval demonstrating that this load effect does not overstress the existing structure (when compared to the operating stress level for each member effected). Elements to be checked include the steel girder superstructure and deck. All calculations shall be prepared, signed and sealed by a professional engineer registered in the State of Maryland who possesses experience in the field represented by the submittal. Appropriate plan drawings shall also accompany the calculations and shall depict the proposed maintenance of traffic set-up, the sequence of staging and the size, weight, and location of the pick(s) for the work as well as catalog cuts and/or equipment manufacturer brochures.

Regardless of the net loading effect as it compares to the threshold load, any equipment that utilizes outriggers for stability and/or support shall not bear directly on the existing concrete bridge deck. Timber crane distribution mats or similar blocking shall be placed underneath all outriggers during their use.

Crawler mounted cranes operated from the bridge deck are strictly prohibited from being used on this project unless authorization is granted by the Engineer in writing.

Similar to working drawings, all submittals shall be forwarded to the following person for subsequent distribution and review:

Maryland Transportation Authority
Engineering Division
300 Authority Drive
Baltimore, Maryland 21222-2200
ATTN: Ms. Roxane Y. Mukai

Working drawings are not to be sent to the consultant engineering firm shown on the Plans.

To expedite the checking and distribution of the submitted calculations and working drawings, the Contractor's representative may send this information directly to the Maryland Transportation Authority ("Authority") with copies of all correspondence to the Contractor. If the Contractor requests that all information be routed through the Contractor's office, then the establishment of that procedure should be the first order of work so as to avoid possible misunderstandings as to the processing. An alternate submittal process may be developed following the project Notice to Proceed pending approval by the Director of Engineering of the Authority.

The Contractor, or his representative, shall furnish to the Authority ten (10) sets each of all calculations, working drawings, etc. for primary review. Once the primary review is complete the Contractor, or its representative, shall furnish the Authority additional prints (number to be furnished by primary reviewer) for stamping and forwarding for secondary review and distribution.

All calculations and working drawings for the project will not be considered accepted until they bear the acceptance stamps of both the consultant engineering firm and the Authority.

The Contractor is hereby notified that construction located over active Railroad tracks shall require the submission of identical information to the pertinent Railroad when such work is located aerially and/or within 25 feet horizontally of the centerline of track. In addition, all cranes and associated hardware used in the individual picks shall be rated for 150 percent of the service weight of the pick (i.e., F.S. = 1.5). Reference the Special Provisions located elsewhere herein for more information and requirements.

400-07.04 MEASUREMENT AND PAYMENT. This item will not be measured or paid for, but the cost for the evaluation, preparation and submittal of engineering evaluations, calculations and working drawings as necessary will be incidental to other pertinent items specified in the Contract.

CATEGORY 400
STRUCTURES

SECTION 405 — REMOVAL OF EXISTING STRUCTURES

DELETE: This Section in its entirety and replace with 400-02 included elsewhere in these Special Provisions.

CATEGORY 400
STRUCTURES

SECTION 421 — REINFORCEMENT FOR CONCRETE STRUCTURES

DELETE: 421.03.07 in its entirety.

INSERT: The following.

421.03.07 Existing Steel Reinforcement Bars. The Plans indicate the locations and extent of existing steel reinforcement bars to remain. Following the removal of the deck slab and parapet concrete, all existing bars to remain shall be straightened and abrasive blast cleaned to remove all dirt, concrete, rust, etc. Wire brush cleaning will not be permitted under the Contract.

For any exposed existing reinforcement steel that is to be incorporated into the final structure:

(a) That has lost 20 percent or more of its original cross sectional area as determined by the Engineer, shall be cut out. A new bar of the same diameter shall be provided and placed so as to have the minimum required lap, or modified as per (c).

(b) Where the required bar lap length is available, it shall be used as a dowel.

(c) Where the required bar lap is not available or limits of concrete removal to achieve bar lap are too great, a welded or approved mechanical splice shall be provided. The welded or approved mechanical splice shall be used only where the minimum required concrete cover can be achieved. The use of dowels to achieve the required bar lap is prohibited on this Contract unless so authorized by the Engineering Division of the Authority.

If the expected steel reinforcement bar pattern is different than what is shown on the Plans, the Contractor shall stop work in this area and contact the Engineering Division of the Authority for further evaluation.

DELETE: 421.03.08 in its entirety.

INSERT: The following.

421.03.08 Substitution. Substitution of different size bars will be permitted only when approved by the Engineering Division of the Authority. No additional compensation will be allowed for substituting larger size bars in lieu of the bars specified. If a larger bar is substituted, the required longer lap length and/or development length as specified on the Plans shall be provided. The minimum concrete cover on the larger bars shall be maintained as required per the Plans.

CATEGORY 400
STRUCTURES

SECTION 499 — WORKING DRAWINGS

DELETE: This Section in its entirety and replace with 400-06.

CATEGORY 500
PAVING

SECTION 500-01 SAW CUTTING

500-01.01 DESCRIPTION. This work shall consist of saw cutting existing concrete deck slabs and parapets where indicated on the Plans, in accordance with the requirements of these Special Provisions and as may be directed by the Engineer.

500-01.02 MATERIALS. None.

500-01.03 CONSTRUCTION. The equipment used to saw cut the existing concrete deck slab and parapet shall be a saw cutting machine capable of cutting portland cement concrete slabs. The saw cutting machine shall consist of a suitable motor driven circular diamond blade cutter with a control device mounted to a sturdy frame. The machine shall be capable of cutting a groove in a straight line to the depth required on the Plans so that a neat and even joint can be cut to allow the removal of the deck slab and parapet without damage to portions to remain. A continuous water supply shall be supplied to the cutting element.

500-01.04 MEASUREMENT AND PAYMENT. Saw cutting will not be measured or paid for but will be incidental to the pertinent Removal of Portions of Existing Structure items specified in the Contract.

CATEGORY 500
PAVING

SECTION 559 — PERMANENT PREFORMED PATTERNED REFLECTIVE PAVEMENT MARKINGS

559.01 DESCRIPTION. This work shall consist of furnishing and applying permanent preformed patterned reflective pavement ("PPPRP") markings as specified in the Contract Documents or as directed by the Engineer.

559.02 MATERIALS.

Permanent Preformed Patterned Reflective Pavement Marking Materials	951.07

559.03 CONSTRUCTION.

559.03.01 General. PPPRP markings shall be applied in conformance with the manufacturer's recommendations or as directed by the Engineer.

On new hot mix asphalt projects, the PPPRP markings shall be inlaid into the hot surface of the top course of pavement. No top course paving shall be permitted unless the stripping crew and marking materials are at the project site.

When the Contract Documents specifies the use of PPPRP markings on concrete pavements or existing asphalt pavements, the Contractor shall use heat, solvent, or other type of adhesive primer in conformance with the manufacturer's recommendations.

Preformed legends and symbols shall conform to the applicable shape and sizes as specified in the MUTCD, and Contract Documents.

PPPRP markings shall conform to pavement contours and be resistant to deformation by traffic and damage from snow removal equipment. Surface preparation, use of solvents and primers and equipment used in the application of PPPRP markings shall conform with the manufacturer's recommendations and be approved by the Engineer. After PPPRP markings are applied, they shall be immediately ready for traffic

559.03.02 Quality Assurance/Quality Control. Refer to 549.03.01.

559.03.03 Cleaning Pavement Surfaces. Refer to 549.03.02.

553.03.04 Application. Refer to 549.03.03 and the following:

(a) Manufacturer's Recommendations. The Contractor shall provide a copy of the manufacturer's recommendations to the Engineer, and shall follow them for the installation of the line markings.

(b) Adherence. Adherence of PPPRP markings shall be randomly checked by using a paint scraper or another approved tool, which shall be held nearly parallel with the highway surface, so there is no dislodging of the tape.

(c) Thickness. The finished thickness of the PPPRP markings shall have a minimum caliper of 0.060 in. at the thickest portion of the patterned cross section, and a minimum caliper of 0.020 in. at the thinnest portion of the cross section. Measurements shall be made from the top of finished pavement surface.

(d) Color. The color of the markings shall match Federal Standard 595 (33538 - yellow, 37886 – white, or 37038 - black). The Contractor shall supply the specified color chips for the Engineer's use to visually determine that the PPPRP markings match the specified color.

(e) Retroreflectance. Refer to 549.03.03(h) and the following:

MINIMUM RETROREFLECTANCE

COLOR	RETROREFLECTIVITY	CORRECTIVE ACTION
White	350 or higher	None
Yellow	250 or higher	
White	less than 350	Necessary corrective actions, removal, replacement
Yellow	less than 250	

(f) Width. Refer to 549.03.03(e).

(g) Alignment. Refer to 549.03.03(f).

(h) Layout Markings. Refer to 549.03.03(i).

559.03.05 Quality Control Test Strip. Refer to 549.03.04.

559.03.06 Responsibility. Refer to Section 549.

559.03.07 Observation Period. The Contractor shall be responsible for any defects in materials and workmanship of the PPPRP markings for a period of 180 days from the date the markings are applied and under traffic.

The Engineer will not assess time charges during the observation period provided all other work on the Contract is complete. At the end of the observation period, the Engineer will inspect the pavement marking for durability, color, reflectivity, and inform the Contractor of all pavement markings that have failed and require replacement. The pavement marking will be considered failed for any of the following conditions:

(a) More than five percent of the substrate is exposed in any 2000 ft section of longitudinal pavement marking line.

(b) Retroreflectance values have dropped below 300 mcd/L/m^2 for white or 220 mcd/L/m^2 for yellow.

(c) Marking is discolored on a visual comparison with the color chips.

The Contractor shall remove and replace all failed PPPRP markings within 30 days of receiving written notification from the Engineer at no additional cost to the Administration. Work shall be in conformance with the manufacturer's recommendation and as approved by the Engineer before the project is accepted. The replacement markings shall conform to the same requirements as the original markings. If the work is not completed in this period, the Engineer will resume time charges until this work is completed.

At the end of the observation period, the Engineer will accept the work and terminate the Contractor's responsibilities upon satisfactory inspection of the PPPRP markings.

559.04 MEASUREMENT AND PAYMENT. Measurement and payment for the pertinent Permanent Preformed Patterned Reflective Pavement Marking items will be as specified in 549.04. The reflectometer will become the property of the Contractor at the completion of the project.

CATEGORY 600
SHOULDERS

DELETE: SECTION 605 — METAL TRAFFIC BARRIERS in its entirety.

INSERT: The following.

SECTION 605 — METAL TRAFFIC BARRIERS

605.01 DESCRIPTION. This work shall consist of constructing metal traffic barriers as specified in the Contract Documents or as directed by the Engineer.

605.02 MATERIALS.

Brown Polyester Coating	917.03
W Beam	918.01
Metal Posts	918.02
Traffic Barrier Hardware	918.03
Timber Posts	918.04
Wood Offset Blocks	918.04
Wire Rope	918.05
Rub Rail	A 36, Galvanized, A 123
Thrie Beam	M 180, Class A, Type 2
Reflective Delineators	As approved by the Office of Traffic and Safety
Recycled Composite Material Offset Blocks	As specified by the manufacturer

605.03 CONSTRUCTION.

605.03.01 Post Erection. Posts shall be driven unless otherwise permitted by the Engineer. The method of driving shall avoid battering or distorting the posts. Posts not driven shall be set in holes of sufficient diameter to allow tamping of the backfill. Postholes shall be backfilled with materials approved by the Engineer and placed in horizontal layers not to exceed 6 in. loose depth, then thoroughly compacted. When it is necessary to place posts in existing paving, all loose material shall be removed and the paving replaced. Prior to erection of the rail or cable elements, the post shall be properly aligned and be within a 1/4 in. tolerance of line and grade. Posts shall be plumb.

When rock is encountered at a depth less than the specified footing depth, a 12 in. diameter hole shall be drilled a minimum of 20 in. into the rock or to the planned footing depth, whichever is less. If the 20 in. depth is achieved prior to reaching the planned footing depth, the post shall be cut to the appropriate length. The cut edge shall be painted with an approved galvanizing repair paint prior to placement in the hole. After setting the post, the hole shall be backfilled with materials approved by the Engineer and placed in horizontal layers not to exceed 6 in. loose depth, then thoroughly compacted. The use of concrete or grout is prohibited.

605.03.02 Rail Assembly. Rail elements shall conform to the Contract Documents and be erected in a manner resulting in a smooth, continuous installation with laps in the direction of traffic flow. All bolts shall be drawn tight.

605.03.03 Offset Blocks. New traffic barrier W beam shall be installed with either wood or recycled composite offset blocks. The mixing of different types of manufactured composite blocks and the mixing of composite and wood blocks is prohibited. Offset blocks shall be routed or grooved to prevent them from rotating on the posts.

When an existing steel offset bracket is damaged, it shall be replaced with a steel bracket.

605.03.04 Brown Polyester Coated Traffic Barrier W Beam Using 6 Foot Post or 8 Foot Post. All components shall be padded and handled with nylon slings during loading, unloading, and installation.

The Contractor shall preserve the integrity of the polyester coating. If the polyester coating is chipped, scratched, blistered, or otherwise separated from the base metal, the Contractor shall repair the damaged areas using the repair kit supplied by the manufacturer. All repairs shall be completed to the satisfaction of the Engineer or be replaced at no additional cost to the Administration.

605.03.05 W Beam Barrier Reflective Delineators. Reflective delineators shall be installed on the traffic barrier W beam as specified in the Contract Documents.

605.03.06 Remove and Reset Existing Traffic Barrier. When the entire run or a portion of a run of traffic barrier is removed and reset, the metal offset brackets shall be replaced with either wood or recycled composite offset blocks. An 8 in. offset block shall be used when the entire run is removed and reset, and a 6 in. offset block shall be used when only a portion of a run is removed and reset. The holes in the blocks shall match the existing post holes. The posts shall be moved a minimum of 1 ft. in either direction from the existing location. When resetting the rail, the height of the rail shall be measured to ensure it conforms to the current height shown on the Standards. The offset distance from the edge of the roadway shall be maintained unless otherwise directed by the Engineer.

605.03.07 Remove and Reset Existing Median Traffic Barrier W Beam. When the entire run or a portion of a run of median traffic barrier W beam is removed and reset, the metal offset brackets shall be replaced with either wood or recycled composite offset blocks. An 8 in. offset block shall be used when the entire run is removed and reset, and a 6 in. offset block shall be used when only a portion of a run is removed and reset. The holes in the blocks shall match the existing post holes. The posts shall be moved a minimum of 1 ft. in either direction from the existing location. When resetting the rail, the height of the rail shall be measured to ensure it conforms to the current height shown on the Standards. The offset distance from the edge of the roadway shall be maintained unless otherwise directed by the Engineer.

605.03.08 End Treatments. Refer to Section 606.

605.04 MEASUREMENT AND PAYMENT. The payment will be full compensation for all rock excavation, components, restoration of grassed or paved areas, drilled post holes, assembly and erection of all component parts, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

605.04.01 Traffic Barrier W Beam Using 6 Foot Post or 8 Foot Post will be measured and paid for at the Contract unit price per linear foot. When a bottom W beam panel is specified for the Traffic Barrier W Beam item it will be measured and paid for at the Contract unit price per linear foot for Traffic Barrier W Beam Panel.

605.04.02 Traffic Barrier W Beam Median Barrier will be measured and paid for at the Contract unit price per linear foot.

605.04.03 Traffic Barrier Thrie Beam will be measured and paid for at the Contract unit price per linear foot.

605.04.04 Replacing 6 or 8 foot posts, installing additional 6 or 8 foot posts, splice joints, and replacing W beam panels will be measured and paid for at the Contract unit price as specified in the Contract Documents.

605.04.05 Removal and Disposal of Existing Traffic Barrier W Beam will be measured and paid for at the Contract unit price per linear foot.

605.04.06 Remove and Reset Existing Traffic Barrier will be measured and paid for at the Contract unit price per linear foot. Offset blocks will not be measured but the cost will be incidental to the item.

605.04.07 Remove and Reset Existing Median Traffic Barrier W Beam will be measured and paid for at the Contract unit price per linear foot. Offset blocks will not be measured but the cost will be incidental to the item.

605.04.08 Traffic Barrier W Beam Median Barrier with Bottom Panel will be measured and paid for at the Contract unit price per linear foot.

605.04.09 Remove and Reset Existing Median Traffic Barrier W Beam with Bottom Panel will be measured and paid for at the Contract unit price per linear foot.

605.04.10 W Beam Barrier Reflective Delineators will be measured and paid for at the Contract unit price per each.

605.04.11 The application of fusion bonded brown polyester coating to Traffic Barrier W Beam, as well as all special handling and touch up, will not be measured but the cost will be incidental to the item to which the coating is applied.

CATEGORY 600
SHOULDERS

SECTION 606 — PERMANENT TRAFFIC BARRIER END TREATMENT

606.04 MEASUREMENT AND PAYMENT.

DELETE: 606.04.01 in its entirety.

INSERT: The following.

606.04.01 Type A End Anchorage Terminal Either Option will be measured and paid for at the Contract unit price per each.

DELETE: 606.04.02 in its entirety.

INSERT: The following.

606.04.02 Type B through H, J, and K Traffic Barrier End Treatments will be measured and paid for at the Contract unit price per each. Type L Traffic Barrier Anchorage will be measured and paid for at the Contract unit price per each.

CATEGORY 800
TRAFFIC

800-1 CATALOG CUTS AND WORKING DRAWINGS

800-1.01 DESCRIPTION. This work shall consist of the Contractor preparing and transmitting submittals to demonstrate the performance of the work will be in accordance with the Contract Documents. Submittal schedules, catalog cuts, shop drawings, installation methods, manufacturer's certifications, photometric data and working drawings shall be furnished on all Contractor furnished items for highway signing, sign lighting, highway lighting and traffic signals. Stakeouts of the sign locations shall be submitted for all sign structure locations as specified in the Contract Documents.

800-1.02 MATERIALS. Not Applicable.

800-1.03 CONSTRUCTION.

Submittal Requirements. Submittals shall be scheduled and coordinated with the Contractor's construction schedule. A complete submittal schedule and list of required submittals shall be submitted with the first submittal, but no later than three (3) days after the pre-construction conference. The schedule for submission of submittals shall be arranged so that related equipment items are submitted concurrently.

The Engineer may require changes to the submittal schedule to permit concurrent review of related equipment. Shop drawings for closely related items such as a sign and its support structures shall be submitted together.

Submittal Documents. Contractor's drawings shall be neat in appearance, legible and explicit to enable proper review to ensure Contract compliance. They shall be complete and detailed to show fabrication, assembly and installation details, wiring and control diagrams, catalog data, pamphlets, descriptive literature, and performance and test data. They shall be accompanied by calculations or other sufficient information to provide a comprehensive description of the structure, machine or system provided and its intended manner of use. If the Contractor's drawings deviate from the Contract Documents, the Contractor shall so advise the Engineer in writing with the submittal and state the reason therefore.

No portion of the work requiring a Contractor's drawing shall be started nor shall any materials be fabricated, delivered to the site, or installed prior to the approval or qualified approval of such item. Fabrication performed, materials purchased or on-site construction accomplished which does not conform to approved Contractor's drawings shall be at the Contractor's risk. The Administration will not be liable for any expense or delay due to corrections or remedies required to accomplish conformity.

Shop drawings shall show types, sizes, accessories, layouts including plans, elevations and sectional views, component, assembly and installation details, and all other information required to illustrate how applicable portions of the Contract requirements will be fabricated and installed.

In case of fixed mechanical and electrical equipment, layout drawings drawn to scale shall be submitted to show required clearances for operation, maintenance and replacement of parts. Manufacturer's certified performance curves, catalog cuts, pamphlets, descriptive literature, installation and application recommendations, shall be provided and indicate conformance to the Contract Documents. Certifications shall be originals. Certification shall also be sent to the Office of Materials and Technology ("OMT") as required in the Contract Documents.

Manufacturer's catalog, product and equipment data shall be certified and shall include materials type, performance characteristics, voltage, phase, capacity, and similar data along with wiring diagrams when applicable. Indicate catalog, model and serial numbers representing specified equipment. Provide complete component information to verify all specified required items. Installation recommendations and instructions shall provide written Manufacturer's detail step by step preparation and installation of the materials, and products including recommended tolerances and space for maintenance and operation.

Catalog cuts for sign luminaires shall have photometric data attached for each sign to be illuminated. Photometric printouts shall include the sign number, the illumination on a one foot square grid covering the entire sign face, the average illumination, the maximum to minimum uniformity ratio, and a working drawing for the sign face attached.

Catalog cuts for roadway luminaires shall have photometric data attached as specified in the Contract Documents.

The Contractor shall submit working drawings as required for changes, substitutions, contractor design items, and Contractor designed methods of construction. Requirements for working drawings will be listed in appropriate Specification Sections and in Special Provisions. Drawings shall be accompanied by calculations or other information to completely explain the structure, machine or system described and its intended use. Review and approval of such drawings by the Engineer shall not relieve the Contractor from its responsibility with regard to the fulfillment of the terms of the Contract.

Working drawings and calculations as submitted shall be sealed, dated and signed by a Professional Engineer registered in the State of Maryland.

The review and approval of Contractor's drawings by the Administration shall not relieve the Contractor from its responsibility with regard to the fulfillment of the terms of the Contract. The Contractor shall be responsible for the verification and accuracy of all dimensions and insuring that all Contractor furnished items are compatible, and conform to all design and performance criteria.

All risks of error and omission are assumed by the Contractor and the Engineer will have no responsibility therefrom..

Submittal Process. Each Contractor's drawing submitted by the Contractor shall have affixed to it the following Certification Statement, signed by the Contractor:

"By this submittal, I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers and pertinent data and I have checked and coordinated each item with other applicable approved drawings and Contract requirements."

With the first submittal, submit a Contractor's submittal schedule, listing by Specification Section number, all submittals required and approximate date submittal will be forwarded.

Each submittal having catalog descriptions, shop drawings, working drawings, photometric data, manufacturer's certifications, method of construction and manufacturer's installation recommendations shall be submitted for approval.

Each submittal shall have a transmittal page that indicates the Contractor’s and Subcontractor's address and phone numbers. Submittals containing multiple items need the identification only on the exterior of each package. For original submittals, and each subsequent resubmittal that may be required, nine (9) copies will be submitted. A separate copy shall be forwarded to the Engineer.

All submittals for approval shall have the following identification data, as applicable, contained thereon or permanently adhered thereto:

(a) Drawing title, drawing number, revision number, and date of drawing and revision.
(b) Applicable Contract Drawing Numbers and Specification Section and Paragraph Numbers.

The first page of every catalog description, working drawing and material certification shall be stamped in red with the stamp shown in the next page.. All pertinent Contract Document information shall be filled in the spaces provided.

MARYLAND TRANSPORTATION AUTHORITY
SUBMITTAL PACKAGE #_____ DATED CONTRACT # _____ LOCATION PROJECT DESCRIPTION   ITEM # _____ THIS ITEM CONTAINS_____ PAGES ITEM DESCRIPTION
☐ ACCEPTED ☐ ACCEPTED AS NOTED ☐ REJECTED - REVISE & RESUBMIT
REVIEWERS NAME DATE

The Contractor shall indicate the submittal package by sequential numbering and date of submittal. Catalog, product data or brochure submittals containing various products, sizes and materials shall be underscored or highlighted to indicate the salient features required to meet the specifications. Likewise, items not applicable to the Contract shall be marked "not applicable" or crossed out.

If one or more of the items in a submittal are not approved, resubmittal of only the unapproved items is required, highlighted to show the particular item being resubmitted. Resubmittals shall bear original submittal number and be lettered sequentially.

Three (3) copies of all Contractor's drawings will be returned to the Contractor.

Each submittal shall be in accordance with the Contractor's submission schedule. Allow thirty (30) days for checking and appropriate action by the Engineer.

Contractor's submittals will be returned, marked with one of the following classifications:

ACCEPTED: no corrections, no marks

ACCEPTED AS NOTED: a few minor corrections. Item shall be installed in accordance with the corrected drawings.

REJECTED - REVISE & RESUBMIT: requires corrections or is otherwise not in accordance with the Contract Documents. No items shall be fabricated. Correct and resubmit drawings as per original submission. Allow thirty (30) days for checking and appropriate action by the Engineer.

800-1.04 MEASUREMENT AND PAYMENT. Catalog cuts, manufacturer's certifications, photometric data and working drawings will not be measured but the cost will be incidental to the pertinent items specified in the Contract Documents.

CATEGORY 800
TRAFFIC

800-2 FIELD EQUIPMENT CABINETS

800-2.01 DESCRIPTION

This work shall consist of furnishing and installing base or pole mounted field equipment cabinets at locations shown on the Plans. This work shall include all materials, labor, necessary hardware and electrical connections. The contractor will be required to coordinate and schedule with the Authority delivery of the equipment to the site.

All components furnished under this functional specification shall be current production equipment and of recent manufacture. To ensure overall system compatibility, all field equipment cabinets shall be from the same manufacturer.

800-2.02 MATERIALS

Electrical/electronic equipment, cabinets, and all component parts shall meet the requirements as specified in Section 820.02 and the standards as set forth in these special provisions:

1) Anchor bolts/Bolts/Nuts/Washers
2) Cabinets and doors
3) Mounting hardware
4) Conduit
5) Power service conditioning and distribution equipment
6) Electrical wires, harnesses and connectors
7) Environmental control equipment

800-2.03 CONSTRUCTION

800-2.03.01 Electronic Equipment

Any additional electronic equipment (controllers, multiplexers, etc.) to be installed in the field cabinets shall be as specified.

800-2.03.02 Cabinets - General

1) Serial numbers and model numbers, if available, shall be permanently engraved on all removable components and hardware.

2) The serial number and model number shall be etched, stamped, or molded.

   a. The use of adhesive backed labels is not acceptable.

   b. Mainframe serial numbers and model numbers shall be readable without disassembly or removal of any part of the cabinet or components located within the cabinet and located on the front face of the mainframe unit.

3) All cabinets shall meet or exceed the requirements of a National Electric Manufacturers Association ("NEMA") 3R rating and shall be UL listed.

4) All cabinets and doors shall be fabricated from 5052-H32 sheet aluminum alloy with a minimum one eighth of an inch (1/8 in.) thickness.

5) All mounting hardware and cabinet bracing shall also be made from aluminum.

6) All external welds shall be made using the Tungsten Inert Gas ("TIG") welding method.

7) Detailed cabinet drawings and material catalog cuts shall be submitted to the Authority for review and approval prior to ordering cabinets. Drawings shall include, at a minimum, dimensions, equipment placement layout, and cabinet wiring schematics.

800-2.03.03 Cabinets - Electrical

1) All conductor wire runs shall be continuous with no splices.

2) All wiring harnesses shall be encased in a continuous sheath. The use of cable ties to arrange wiring harnesses is not acceptable. The use of adhesive backed wire holders is also not acceptable.

3) All cabinet back and panel harness wiring shall be soldered at its destination point as specified.

4) All conductors shall be labeled. Labels shall be either attached to each end of the conductor and indicate the destination of the other end of the conductor, or shall be a continuous, permanent identification of the conductor's function and located every six inches along the conductor.

5) All conductors used in the controller cabinet wiring shall conform to the following color code requirements.

   a. AC Neutral conductors shall be identified by a continuous white color.

   b. AC Ground conductors shall be identified by a continuous green color.

c. AC Positive conductors shall be identified by a continuous black or red color depending on phase.

d. All other conductors shall be identified by any color not previously specified.

6) All bolts used for electrical connections shall be fabricated from stainless steel.

7) All hardware used for electrical connections and terminal facilities shall be fabricated using cadmium-plated brass.

8) All fuse holders shall be of the encased type.

9) All switches shall be encased, environmentally sealed, and rated for one hundred and twenty-five percent of capacity. Switches and thermostats shall break the "hot" side of the line.

10) All welds shall be neatly formed and free of cracks, blow holes and other irregularities.

11) All inside and outside edges of the cabinet shall be free of burrs.

12) All access door openings shall have a double flange on all four (4) sides.

800-2.03.04 Cabinets - Mechanical

1) Size.

All cabinets shall be base or pole mounted NEMA TS-2, size 6. The size 6 cabinets shall be a minimum of fifty-five inches in height by thirty-eight (38) inches in width by twenty-six (26) inches in depth (55 in. H x 38 in. W x 26 in. D). The top of the cabinet shall have a depth of twenty-eight (28) inches to provide the necessary ventilation opening.

2) Equipment Racks.

The Contractor shall furnish and install a removable E.I.A. 19-rack-mount assembly in all NEMA size 6 cabinets furnished and installed under this contract. The rack(s) shall be installed on the left side of the cabinet, facing the door. All power distribution equipment shall be mounted on the right inside wall, opposite the rack assembly. The Contractor shall provide all hardware associated with the mounting of equipment in the rack assembly.

a. Features:

i. Forty-two (42) inches vertical space (24 rack spaces).

ii. All welded 16 gauge carbon steel tubing construction.
iii. Four point leveling
iv. Modular construction
v. ASA 61 Gray color

b. Accessories:

i. One (1) Patch Panel Frame 48 inch High (Color Gray)
ii. Two (2) 48-inch, 14-gauge, zinc-plated carbon steel mounting rails
iii. Three (3) sliding, ventilated shelves: gray color.

3) Fan-Forced Ventilation

A thermostatically controlled cooling fan shall be provided for all cabinets.

a. The fan and thermostat shall be mounted at the top of the cabinet.

b. The fan and thermostat shall be rated for one hundred and twenty-five percent of capacity.

c. The thermostat shall be manually adjustable, within a ten degree range, from seventy degrees Fahrenheit to one hundred and sixty degrees Fahrenheit.

d. The fan bearing mechanism shall be of ball bearing design.

e. The fan shall have a minimum rated capacity of one hundred cubic feet per minute (100 CFM) air flow.

f. The fan shall have a minimum rated design life of one hundred thousand hours (100,000 hrs).

4) Natural Ventilation

The cabinets shall be designed for continuous operation over an outside temperature range of -13 degrees Fahrenheit to +113 degrees Fahrenheit (-25^{o} Celsius to +45 ^{o} Celsius) without requiring fans, in the event the cabinet cooling system fails.

a. All cabinets shall be provided with louvered vents in the front door with a removable air filter. Louvers shall satisfy the NEMA Rod Entry Test for a 3R rated ventilated enclosure.

Three (3) extra filters shall be supplied for each cabinet installed.

b. The filter shall cover the vents and be held firmly in place with top and bottom brackets and a spring loaded upper clamp.

c. Exhaust air shall be vented out of the cabinet between the top of cabinet and the main access door.

d. The exhaust area shall be screened with a material having a maximum hole diameter of one eighth of an inch (1/8").

5) Water Runoff

All cabinets shall have a sloped top surface to prevent the accumulation of water on the cabinet.

6) Finish

All outside surfaces of the cabinets shall have a smooth, uniform, natural aluminum finish.

7) Access Door

All cabinets shall have a single access door located on the front of the cabinet.

a. The door opening shall be a minimum of eighty percent of the front surface area of the cabinet.

b. All doors shall be provided with a gasket conforming to the physical properties listing in UL508 Table 21.1 and be such that the gasket forms a weather tight seal between the door and the cabinet.

c. All doors shall be hinged on the right side as viewed facing the cabinet.

d. Hinges shall be of a single, continuous design utilizing a fixed hinge pin.

e. All hinging shall be bolted to the cabinet and door utilizing ¼-20 stainless steel carriage bolts and nylon lock nuts.

f. All hinge pins shall be capped at the top and bottom by weld to render the pin tamper proof.

g. All cabinets shall have hinges fabricated from 0.093 inch stainless steel using a 0.250 inch diameter stainless steel hinge pin and shall provide a three (3) inch open width.

h. All cabinets shall include a door restraint to restrict the door to a maximum one hundred and thirty-five (135) degrees of swing.

i. The restraint mechanism shall provide latching positions at ninety (90) degrees and at one hundred and thirty-five (135) degrees.

j. All cabinets shall be equipped with a lock compatible with the State's existing cabinet locks, (dead bolt type) and key hole cover and be keyed for a number 1 key. The Offeror shall provide the State with a minimum of one (1) key each per cabinet.

8) Interior Lighting

A seventy-five watt rough service bulb with a non-corrosive metal cage shall be mounted to the inside top front portion of the cabinet. A door-activated switch shall be installed to turn the cabinet light on when the front door is opened. The door switch shall be on a separate circuit by itself and used only to turn on the cabinet light.

9) Internal Heating

If required, the cabinet may be equipped with a 250 watt resistance type heater. The heating element shall be controlled by a thermostat, the set point of which shall be manually adjustable.

10) Electrical Power

The control cabinet shall be equipped with a metal-encased, split-phase load center, equipped with main breakers rated at 60 amperes for all cabinets.

a. Main Breakers

The main breakers shall be double-pole type, so that an overload on either phase will disconnect the entire cabinet from the line.

b. Branch Circuit Breakers

All branch circuit breakers shall be molded case single or double-pole, 120/240 volts AC, 10 000-ampere interruption capacity, supplied in a Q.O.U. mounting system. Circuit breakers shall be provided in all panel spaces as follows:

i. 15-ampere single pole circuit breakers shall be provided for each side of the load center.

ii. Cabinets shall have one double-pole 40-ampere breaker and four 15-ampere single-pole breakers (two per phase).

c. GFI

One convenience Ground Fault Interrupter dual electrical outlet shall be provided on the cabinet power panel. This outlet shall be wired to remain energized at all times.

d. Grounding

The cabinet shall be furnished with ground bars, capable of accepting four (4) to fourteen (14) gauge stranded wire, to provide the following:

i. Two (2) AC to Neutral - Minimum of thirty-six positions.

ii. Chassis ground - Minimum of eighteen positions.

e. Wiring Harnesses and Terminals

All wiring harnesses shall be of sufficient length to allow for the placement of the electronic equipment as specified on the Plans.

i. The cabinet shall be wired to permit the utilization of all of the specified functions and capabilities of all electronic equipment contained therein.

ii. All back panel or rack wiring is to be complete such that no additional hardware or wiring shall be necessary to utilize all functions of the electronic equipment.

iii. All terminal facilities shall be readily accessible for field connection without requiring the removal of any of the equipment installed inside the cabinet.

iv. All wires not utilized shall be terminated and labeled as a terminal strip. The practice of tying back of unused wires is unacceptable.

11) Certification

The following must accompany all electrical and mechanical components supplied:

a. Instruction manuals.

b. Maintenance manuals.

c. Descriptive parts list with industry standard part numbers where applicable.

d. Three (3) complete sets of wiring and schematic diagrams. Schematics shall include a list of tests points with the following information provided for each point:

i. Nominal operating voltage.

ii. Wave form and all pertinent information regarding the wave form at each test point.
iii. Integrated circuit schematics.
iv. Connection and I/O diagrams.

800-2.04 FIELD EQUIPMENT CABINET INSTALLATION

The Contractor shall install the new base or pole mounted cabinets as shown on the Plans. If an alternate mounting arrangement is required for mounting the new field equipment cabinet, the Contractor shall design and implement an alternative mounting arrangement. Shop drawings detailing the alternative mounting arrangement shall be submitted by the Contractor to the Authority for approval prior to the installation of the field equipment cabinet. The existing cabinets shall be transported by the Contractor to a storage site, as directed by the Authority.

800-2.05 MEASUREMENT AND PAYMENT

Furnishing and installing Field Equipment Cabinets will be measured and paid for at the Contract unit price. Work will include all labor, materials, including all lenses, housing, door, gasket, visor, reflector, wiring, and lamp socket complete and operational and incidental connections and testing in order to assure operation, as approved by the Authority, and development of shop drawings as required.

Payment shall be full compensation for all materials, labor, equipment and all other incidentals including removable racks, electronic equipment, including all incidentals necessary to complete the work necessary to complete this work. The Authority will make payment for the following items only upon completion of the installation and commissioning of the Field Equipment Cabinets acceptance by the Authority.

CATEGORY 800
TRAFFIC

800-3 SQUARE PERFORATED TUBULAR STEEL POSTS

800-3.01 DESCRIPTION.

This work shall consist of furnishing and installing Square Perforated Tubular Steel Sign Posts and Square Perforated Tubular Steel Anchor Bases for mounting traffic signs as specified in the Contract Documents, or as directed by the Engineer.

800-3.02 MATERIALS.

Steel Posts	A570 Grade 50
Galvanizing	A653 Designation G-90
Spray Galvanizing Compound	A780

Square Tubular Steel Sign Supports and Square Tubular Steel Anchor bases shall be formed from 12 gauge steel. All sides of the tubes shall have 7/16 in. die punched circular holes or perforated knock-outs, at one in. centers along their entire length.

The Tubular Steel Sign Supports shall be two in. square tubes. Maximum 9 Square Feet for single sign support or 18 Sqaure Feet for two sign supports of sign areas with a clearance of 7 ft.-0 in. or less from ground to bottom of sign can be installed.

Square Tubular Steel Anchor Bases shall be comprised of two telescoping tubes. The first shall be 2 ¼ in. square, 3 ft. long, formed from 12 gauge steel and shall snugly fit over the sign support. The second section shall be a 2 ½ in. square, 18 in. long, formed from 12 gauge steel, and shall snugly fit over the 2 ¼ in. section.

800-3.03 CONSTRUCTION.

The Square Tubular Steel Anchor Base assembly shall be constructed by placing the 18) in. base section over the 3 ft. base section so that they are flush at the top and the holes are aligned. The entire unit shall be driven into the ground so that one or two rows of holes in the Square Perforated Tubular Steel Base are exposed (maximum 4 in. exposure allowed). The base shall be driven so that it remains plumb and to provide the final sign assembly with the correct orientation.

Finished length of the Tubular Steel Sign Supports shall be determined by adding the total height of the signs to 8 ft, 2 in. The sign support shall be cut to the correct length, and cold spray galvanizing shall be applied to the cut end. The signs shall be bolted to the top of the sign supports, using tamper proof bolts or drive rivets. The Square Tubular Steel Sign Supports shall be lowered 8 in. into the base, and the sign support secured to the base using two corner bolts designed for this purpose.

800-3.04 MEASUREMENT AND PAYMENT. Square Perforated Tubular Steel Sign Posts will be measured and paid for at the Contract unit price per each. The payment will be full compensation for the sign support, corner bolts, and painting as required, and for all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Square Tubular Steel Anchor bases will be measured and paid for at the contract unit price per each. The payment will be full compensation for both tubes comprising the base section, all excavation, anchor bases, and for all materials, labor, equipment, tools, and incidentals necessary to complete the work.

CATEGORY 800
TRAFFIC

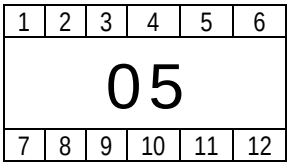
800-4 SIGN INSTALLATION DATE STICKERS

800-4.01 DESCRIPTION. This work shall consist of furnishing and installing a sign installation date sticker to identify the date of installation for every proposed sign.

800-4.02 MATERIALS. The sign installation date sticker shall be a self-adhesive label which displays the year and month (see example below), and would allow the sign installer to hole-punch the month, to indicate date of installation. The sign installation date sticker shall be provided by the sign sheeting manufacturer. The sticker shall be a minimum size of 2inch wide by 1inch high, and shall not exceed 8inch wide by 4inch high.

800-4.03 CONSTRUCTION. The sign installation date sticker shall be installed, on the date of installation on the lower reverse corner of the sign, closest to traffic. The sign installation date sticker shall be directly applied to the aluminum sign as per the manufacturer's specifications. The Contractor shall prepare the surface as required by the manufacturer's specifications.

800-4.04 MEASUREMENT AND PAYMENT. Sign Installation Date Sticker will not be measured but the cost will be incidental to the appropriate furnish and install sheet aluminum and extruded aluminum signs items in the contract. The payment will be full compensation for all materials, labor, equipment, tools and incidentals necessary to complete the work.



Note: Numbers shown for display purposes only.

CATEGORY 800
TRAFFIC

800-5 TELECOMMUNICATIONS SERVICE PEDESTALS

800-5.01 DESCRIPTION. This work shall consist of furnishing and installing tubular PVC pedestals to be used as communication system demarcation points as specified in the Contract Documents or as directed by the Engineer. The pedestals shall contain a flat, internal, backplane for mounting Network Interface Devices (NIDs) and splices. This work shall include all necessary hardware and electrical connections.

800-5.02 MATERIALS. Pedestals shall be constructed of green Polyvinyl Chloride (PVC).

(a) All mounting hardware shall be aluminum of stainless steel.

(b) Security Locking bolt shall be 216 tool steel.

800-5.03 CONSTRUCTION. Pedestals shall be tubular, with a diameter of 10 inches, and an approximate length of 38 inches with the dome installed, and shall have the following features:

(a) 360 degrees access to cables and apparatus.
(b) Forty-two inch powder-coated steel or aluminum stake for mounting. The stake shall be an accessory from the pedestal manufacturer.
(c) Locking bolt for security, plus security hasp for padlock.
(d) Universal PVC backboard with aluminum ground plate
(e) Two, 3-inch conduits with elbows for communications wires.
(f) All mounting hardware.
(g) Shroud option included for conductor protection.
(h) Service wire channel option included.

800-5.04 MEASUREMENT AND PAYMENT. Furnishing and installing Telecommunications Service Pedestals will be measured and paid for at the contract unit price for each. The payment will be full compensation for the pedestals, mounting stakes, conduit elbows, material, labor, and optional equipment specified, including all incidentals necessary to complete the work.

CATEGORY 800
TRAFFIC

800-6 UTILITY CONNECTIONS AND UTILITY STAKEOUT

800-6.01 DESCRIPTION. This work shall consist of utility connections, and utility stakeout, as specified in the Contract Documents or as directed by the Engineer.

This work shall consist of contacting Miss Utility as required by Law and providing evidence of Miss Utility Marking of the construction area.

This work shall include written notification to the Maryland Transportation Authority at least 72 hours in advance of excavation for each site.

800-6.02 MATERIALS.

Disconnect Switches and Utility Connections 950.13.10

800-6.03 CONSTRUCTION. The Contractor shall arrange a meeting with the utility company representatives, the Engineer and the District Utility Engineer as specified in the Contract Documents to establish a schedule for utility connections before any equipment or material is installed.

The Contractor shall not disconnect, de-energize, reconnect, tamper with, or otherwise handle any of a utility company's facilities. The Contractor shall be responsible for the utility service connections to the utility company's supplied point of service.

The Contractor shall make the necessary arrangements with the utility companies to insure having needed utilities available at the time of turn on. Any utility energization, connection or disconnection delays will not be considered a valid reason for any work time extension claim. Difficulties in securing utility company services are to be reported to the Engineer at the earliest possible time.

Utility Stakeout. The Contractor shall contact Miss Utility and assure that all construction areas are marked where excavation will take place. The Contractor shall maintain the markings. The Contractor shall pay any Miss Utility fees. The Contractor shall submit copies of Miss Utility tickets to the Engineer as evidence of this work.

The Contractor shall provide a written notification of intent to excavate an area to the Maryland Transportation Authority at least 72 hours in advance of such activity. The Maryland

Transportation Authority is not a subscriber to utility marking services. This notification shall permit the Authority to mark any utilities within the excavation area.

The written notification shall be provided to the Authority's Project Manager and a copy provided to the Administrator at the affected facility as indicated below:

Dave Roehmer, FMT	410-537-1250	410-537-1207

In addition to the above, for work on SHA right of way the Contractor shall notify the appropriate agencies listed in the Contract Documents, and those listed below a minimum of 72 hours (excluding weekends and holidays) prior to the Contractor's anticipated beginning of any underground work.

a) Request the Statewide Operations Center (800-543-2515) to stake out SHA fiberoptic and communication cables.

b) Request the Communications Division (410-747-8590) to stake out ITS devices.

c) Request the ITS operations section (410-787-7662) to stake out ITS devices.

The Contractor shall plan the work to minimize interference with any existing traffic control devices.

The contractor shall maintain markings of utilities until excavation work is complete.

Existing equipment shall remain in it's original condition until the new equipment has been completed, satisfactorily tested and its operation accepted by the Engineer.

800-6.04 MEASUREMENT AND PAYMENT. Utility Connection. Utility Service Equipment connections will be measured and paid for as specified in 807.04.01.

All utility company energization, connection or disconnection costs will be the responsibility of the Administration.

Utility Stakeout. Utility Stakeout will not be measured but the cost will be incidental to other pertinent items specified in the Contract Documents.

CATEGORY 800
TRAFFIC

SECTION 800-7 - DYNAMIC MESSAGE SIGN - ISDN COMMUNICATIONS

800.7.01 DESCRIPTION. This work consists of coordinating, obtaining, connecting and maintaining ISDN telephone service Dynamic Message Signs (DMS's) indicated on the Plans. The communication line shall allow MdTA's Authority Operations Center (AOC) and Maryland's SHA's Emergency Operations Centers (SOC) to communicate with and control the DMS's. The integration of the signs into the control systems will be done by others and is not part of this contract.

800-7.02 MATERIALS. Not applicable.

800-7.03 CONSTRUCTION. The Contractor shall coordinate with the local telephone provider (Verizon) to obtain dedicated ISDN telephone lines to the DMS equipment cabinets; one line per cabinet, as shown on the plans. The Contractor shall be responsible for all charges for the application of services, charges to install service, and monthly recurring costs until the Contract is complete.

The Contractor must provide the access numbers and other configuration information necessary for the Maryland Agencies to configure the Operations System to communicate with the DMS via the ISDN service.

The service accounts shall be transferred to the MdTA upon final approval of the DMS system.

800-7.04 MEASUREMENT AND PAYMENT. ISDN Service shall be paid per each complete service connection based on actual invoiced amounts from the service provider (Verizon). Profit, overhead, or any other additional charges or fees above and beyond those assessed by the ISDN provider are not to be included in this item. The price shall include coordinating with the local telephone provider for service for each DMS equipment cabinet, connecting the lines to the communications terminals and control equipment, and final testing the connections. An allowance of $50,000.00 has been budgeted in the Schedule of Prices. The monthly service charges shall be paid separately.

Monthly ISDN Service Charges shall be paid per month of service per each ISDN service. Payment will be based on the actual invoiced amounts from the ISDN provider. The Contractor shall submit copies of the invoices and proof of payment to the Engineer for reimbursement. Profit, overhead, or any other additional charges or fees above and beyond those assessed by the ISDN provider are not to be included in this item. An allowance of $40,000.00 has been budgeted in the Schedule of Prices.

CATEGORY 800
TRAFFIC

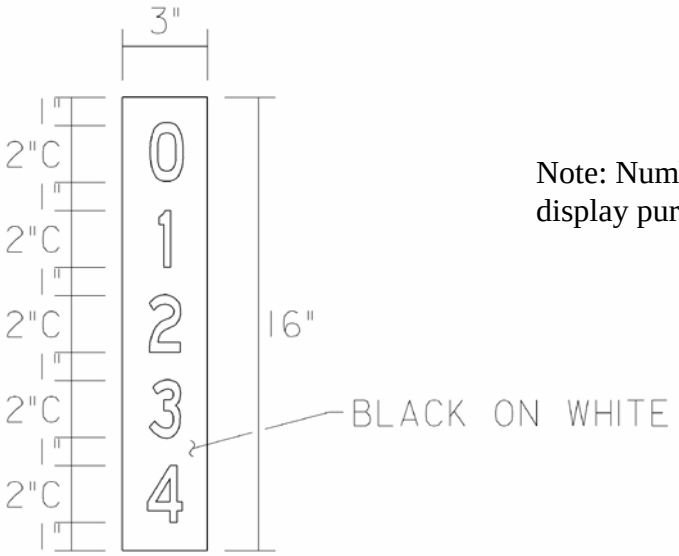
800-8 SIGN STRUCTURE IDENTIFICATION NUMBER LABEL

800-8.01 DESCRIPTION. This work shall consist of furnishing and installing a Sign Structure Identification Number Label on all Authority owned sign structures (overhead and cantilver) within the limits of the project. The Contractor shall contact the Authority's Bridge Engineer to coordinate identification numbers for each sign structure that are owned and maintained by the Authority as detailed on the Plans. Sign structures not owned and maintained by the Authority, as detailed on the plans, will not require labels.

800-8.02 MATERIALS. Sign Structure Identification Number Labels shall be fabricated of the same sheeting material for other signs in the contract as specified on Drawing No. SN-1. Reflective Sheeting per 950.03.

800-8.03 CONSTRUCTION. The Sign Structure Identification Number Label shall be installed perpendicular to traffic, at 7'-0" from top of roadway to bottom of Identification Number. The sheeting only shall be directly applied to the sign structure as per the manufacturer's specifications. The Contractor shall prepare the surface as required by the manufacturer's specifications.

800-8.04 MEASUREMENT AND PAYMENT. Sign Structure Identification Number Labels will not be measured but the cost will be incidental to the appropriate furnish and install sign structure items in the Contract. For existing sign structures, the costs will be incidental to other pertinent items in the Contract. The payment will be full compensation for all materials, labor, equipment, tools and incidentals necessary to complete the work.



Note: Numbers shown for display purposes only.

CATEGORY 800
TRAFFIC

800-9 INSTALLATION OF DYNAMIC MESSAGE SIGNS AND CONTROLLERS

This work shall consist of installing the Dynamic Message Signs (DMS) and Controllers at locations shown on the plans. This equipment has been purchased by the Authority under separate contract and will be provided to the contractor as required. The contractor will be required to coordinate and schedule ordering of the equipment with the Authority. There is a minimum 6 month lead time for delivery of the equipment to the site after placement of order. The contractor will be responsible for coordinating and working with the DMS Manufacturer (Daktronics, Inc.) representative during the installation of the DMS and controllers.

800-9.01 GENERAL REQUIREMENTS

This item consists of installing new Dynamic Message Signs and Sign Controllers and replacing existing DMS and controllers, respectively, in accordance with the Plans and Special Provisions, or as directed by the Engineer. The DMS and Controllers shall operate as part of an integrated Traffic Control System, including the central system, new communications network, and field cabinets.

The DMS Manufacturer will be responsible for providing the following:

- Supplying the Dynamic Message Sign (ready for installation)
- Supplying the DMS Controller with appropriate software/firmware
- Supplying the communications cable from the controller cabinet to the DMS (The DMS Manufacturer shall supply up to 150 feet of fiber optic cabling for controller to DMS communications).
- Providing the final connections and testing of communications cable.
- Supplying the structural sign frames for the connection of static signs to the DMS. The DMS manufacturer shall supply the static sign frames assembled but not mounted to the DMS.

The Contractor will be responsible for providing the following:

- Providing all information necessary for the DMS order 6 months prior to the date when the DMS is needed on site. The information shall include but not be limited to contact information for the contractor's representative responsible for site delivery coordination, the location within Maryland to which the DMS shall be delivered, the DMS number or other plan reference, the proposed delivery date to the site, and a signed order form. The delivery date may not be delayed more than 30 calendar days from the originally proposed delivery date.

- Providing a final delivery date 30 days prior to the originally proposed delivery date and arranging to take possession of the DMS on the final delivery date. The final delivery date may be up to 30 days after the originally proposed date. Once the final delivery date is set, it may not be changed. If the contractor does not provide a final delivery date, the DMS will be delivered on the originally proposed date and the contractor MUST arrange to take possession and store the DMS.

- Delivering any existing DMS and controllers that are noted as "to be salvaged" on the plans to a designated storage area to be determined by the Authority. Existing DMS that are not intended for salvage shall be disposed of by the contractor.

- Mounting the static signs on the static sign frames and mounting the assembled frame and static sign on the DMS, for DMS signs that include static sign messages.

- Installing the new DMS (excluding only work items identified above for DMS manufacturer)

- Arranging reasonable access to the delivered signs for final assembly of miscellaneous items such as visors and static sign frames, by the DMS supplier, when the DMS is delivered.

- Installing and terminating the communications cable (fiber optic cable provided by DMS manufacturer) into the conduits. The cable shall run from the controller location to the DMS communications connection within the DMS.

- Furnishing and Installing all power cables from the controller cabinet to the DMS.

- Salvaging and turning over to the State the modems or telephone equipment contained within the existing enclosures.

- Installation of (2) 1 1/2" Galvanized conduits for power and communications from the controller cabinet to the DMS housing for power and communications cabling. The conduit containing the power conductors shall also have a separate ground wire installed and sized per the NEC.

- Grounding the DMS and traffic cabinet shall be grounded according to the provision outlined in Articles 250 and 600 of the National Electrical Code with the exception that the ground shall not exceed 10 ohms. Verify and measure the ground system resistance to ensure that it is 10 Ohms or less for the earth ground to be used for the DMS. In the event that the earth ground is not adequate, present or in excess of 10 Ohms, the Contractor shall install an earth ground system to meet the noted requirements. Additionally, a separate ground wire shall be installed from the DMS to a ground rod and shall present a maximum resistance of 10 ohms to ground.

- Supplying all power wiring for the DMS and associated traffic cabinet installation. All wiring for AC Conductors shall be sized appropriately per the NEC and shall have insulation rated as

- THHN as a minimum. Neutral conductors shall be 200% rated. Feeder breaker for DMS and wire sizes shall be as specified below.

Sign type	Maximum Power Draw	Minimum Breaker size
1	35	2P50
1 Modified	30	2P40
2	25	2P40
3 modified A, B, C, D, or E	30	2P40
5	40	2P60
6	40	2P60

Breaker Size	#8AWG	#6AWG	#4AWG	#2AWG	#1AWG
40A	Up to 163ft	Up to 254ft	Up to 391Ft	Up to 617ft	Up to 757ft
50A	Not allowed	Up to 203ft	Up to 313ft	Up to 493ft	Up to 606ft
60A	Not allowed	Not Allowed	Up to 261ft	Up to 411ft	Up to 505ft

- Supplying fiber optic communications cable per the DMS supplier's specification if the cable distance from the controller to the DMS exceeds 150'. The DMS manufacturer provides only 150' of fiber optic cable.

- Connection of the utility power from the utility demarcation to the DMS and/or traffic cabinet. The Contractor shall provide all conduit required for the DMS and traffic cabinet installation. Conduit that is exposed shall be galvanized rigid steel and shall be sized to meet the DMS requirements.

- All coordination with Authority and DMS Manufacturer, including any necessary maintenance of traffic required for commissioning and testing by the DMS Manufacturer. The contractor will be required to provide a bucket truck for use by the commissioning contractor during the DMS commissioning and testing.

800-9.02 DYNAMIC MESSAGE SIGN INSTALLATION

The Contractor shall install new Dynamic Message Sign on proposed overhead, cantilever, or pedestal sign structure. The DMS Manufacturer will provide horizontal Z-bar mounting hardware mounted to the DMS sign, and vertical W4x13 members for connection to the overhead/cantilever sign structure. The contractor shall be responsible for field drilling the holes in both the horizontal Z-bar and vertical W4x13 members, and making connections of these members with hardware supplied by DMS Manufacturer. Contractor shall supply 3M™ Polyethylene Protective Tape 8179, or approved equal, to place between horizontal Z-bar and vertical W4x13 members. Contractor shall be responsible for supplying u-bolts and all hardware to connect the vertical W4x13 to the overhead/cantilever sign

structure, and making these final connections. The contractor shall notify the Authority seven days in advance of the installation.

No DMS's shall be installed until power and communication systems have been installed to the control cabinet, inspected and approved. Commissioning of the DMS shall be completed within two (2) weeks of installation.

800-9.03 ELECTRICAL DISTRIBUTION

The power distribution shall be through a panel board with overload protection consisting of thermal magnetic circuit breakers. Power shall be supplied through the ground mounted control cabinet utilizing 15 and 20 amp branch circuits to connect devices within the cabinet. The DMS is powered by a breaker and feeder as described above. Contractor shall uncover the grounding electrode to allow the DMS Manufacturer to test the grounding of the DMS and structure at the time of commissioning.

Within the traffic control cabinet the Contractor shall ensure that a minimum of two GFCI outlets are installed on a single electrical circuit.

Within the DMS, the following minimum loads shall be identified and provided by an electrical panel that was furnished and installed by the DMS supplier as part of the construction of the DMS. The contractor shall connect the feeder coming from the ground mounted control cabinet to the electrical panel within the DMS to complete the electrical distribution system.

1) Heating loads shall be on separate circuits.
2) The ventilation system shall be on separate circuits.
3) The DMS power supplies shall have dedicated circuits.
4) Any communications devices, interface boards, or other microprocessor-controlled devices shall have a dedicated circuit.
5) A circuit shall be provided for sign convenience outlets.
6) A circuit shall be provided for interior lighting, and other miscellaneous devices.

All panels shall have 200% neutral busses due to the heavy use of switching power supplies common to the DMS design. The neutral conductor from the ground-mounted cabinet to sign shall be 200% rated. A cover plate shall be provided and installed on panel boards. It shall not be possible to make inadvertent contact with the bus bars. All circuits must be labeled and the phases of the electrical circuit shall be balanced. Devices that introduce harmonic distortion or sudden load changes shall be located on one phase and microprocessor-controlled devices on the other phase of the 240V/120V circuit.

800-9.04 MEASUREMENT AND PAYMENT

Installation of Dynamic Message Signs Types I and Modified Type III with Integrated Controllers will be measured per each. The payment shall be full compensation for all materials, labor, equipment and all other incidentals necessary to complete this work. The Authority will make payment for the above items only upon completion of the installation, commissioning and testing of the DMS and acceptance by the Authority.

Payment for furnishing and installing other items associated with this work including static sign panels, sign structure, catwalks, spacer frames, hardware and maintenance of traffic will be measured and paid under the pertinent bid items in the contract.

CATEGORY 800
TRAFFIC

SECTION 803-OVERHEAD SIGN STRUCTURES

803.03 CONSTRUCTION.

Add the following;

At least 48 hours after the sign structure is completely constructed/installed, including all the signs per contract requirements, the Contractor shall return to the structure, inspect all anchor bolts & nuts, and, if necessary, retighten the anchor bolts and nuts per the specifications. All costs related to this shall be part of the pertinent sign structure bid item.

CATEGORY 800
TRAFFIC

SECTION 809 — TRENCHING AND BACKFILLING

635 **ADD:** the following paragraphs before the "Cable Treatment" paragraph:

"Miss Utility". Where trenching and backfilling for the placement of conduits, splice boxes, handholes and handboxes is required, the contractor must contact "Miss Utility". "Miss Utility" shall be notified 48 hours in advance of any work under the contract and test pit all marked locations for exact position of cables, conduits, and other underground utilities.

Depth. Unless otherwise specified on the contract drawings, trenches shall be excavated to a depth such that all conduits, wires, and duct cable in trench is at a finished elevation at least 24" below the final grade. Where trenches are placed on slopes, cover shall be measured from the outside jacket of the duct cable or conduit to the nearest top of grade. This measurement will generally be perpendicular to the slope of the grade.

Where proper trench depth cannot be obtained, and improper depth presents a hazard to the cables, or conduit, the Engineer may direct that lengths of 4" galvanized rigid steel conduit be installed as a sleeve. The sleeve length shall be in intervals of 10'. The contractor must bend conduit to conform to the line and grade of the trench. Additionally, the Engineer may require concrete cover in shallow trench, on slopes, or where other conditions indicate the need.

Width. Unless otherwise specified on the contract drawings, trenches shall be excavated to a width such that all conduits, wires, and duct cables in the trench are placed with at least 3" of backfilled material between the outside edge of the conduits, wires, and duct cables and undisturbed earth.

Stake Out. Stake out trenches prior to trenching and review the exact placement with the Engineer. Generally, keep trenches at least 3' behind guardrail and curb, and out of drainage ditches, gutters, culverts etc.. Run trenches in as straight a line as possible and parallel to the nearest roadway.

Guardrail. Where guardrail is to be placed, reset, removed, or otherwise worked in any manner, that tends to disturb the earth, place conduits and wiring only after such work is complete so as to avoid damage to the electrical work by the guardrail work.

Curb and Gutter. Where curb or gutter work is to be done in close proximity to electrical work, perform the work in the order and fashion necessary to minimize the risk of damaging either of the two types of works.

Unsuitable Materials in Trench. Remove any objects or projections into a trench, which may damage the wire or cable duct. These may include rocks, debris, glass, old cables, concrete, etc..

Alternatively, provide a galvanized rigid steel sleeve with grommets where projections into the trench cannot be removed.

Restoration. Backfill trench and tamp to achieve compaction. Seed, mulch and stabilize earth such that area is restored to previous conditions.

CATEGORY 800
TRAFFIC

SECTION 814 – LED SIGNAL HEADS

DELETE: SECTION 814 in its entirety.

INSERT: The following:

814-01 DESCRIPTION. This work shall consist of furnishing and installing vehicle traffic control signal heads that utilize Light Emitting Diodes ("LED") with mounting hardware as specified in the Contract Documents or as directed by the Engineer.

814-02 MATERIALS. Vehicular LED signal heads shall, as a minimum, meet the July 1998 Institute of Transportation Engineers ("ITE") VTCSH Part II and current SHA standards and measurement criteria for LED traffic signal modules.

(a) All materials shall be clean, smooth and free from flaws, cracks, blowholes and other imperfections.

(b) Signal heads shall be furnished with the section assembled together including all hardware as specified or shown in the Contract Documents.

(c) All metallic signal head hardware shall be stainless steel material.

(d) Vehicular and optically-programmed signal heads and pedestrian signal indications shall be capable of mating to the same type of the signal heads from either the top or bottom of each housing.

(e) All hardware furnished shall be installed on the corresponding fitting and threaded component.

(f) The LED traffic signal lamp manufacturer shall be International Organization for Standardization (ISO) 9001 certified and a registered U.S. EPA Energy Star partner. With the exception of Yellow Ball lamps, all LED lamps shall be US EPA - Energy Star compliant.

The following mounting hardware items shall conform to Table 1 and the following:

Table 1

Item	Description	A	B	C	D
1	Aluminum Alloy - Casting	A 319	A 380	A 713	6063 T6
2	Yield Strength, KSI	18	23	25	25
3	Tensile Strength, KSI	27	47	35	30
4	Brinell Hardness	70	80	75	73
5	Elongation (% in 2")	1.5	4	3	12
6	Stainless Steel	A 316	N/A	N/A	N/A
7	Galvanized Steel	A 157	A 153	G 60	
8	Steel flat sheet	16 gauge	N/A	N/A	N/A
9	Coating	*	Anodized Finish	N/A	N/A

* The signal head housing shall be yellow in accordance with Federal Standards 595A, Color Chip #13538. The signal head door and visor shall be optical flat (dull) black Federal Standard #595A, color chip #37038. Aluminum signal heads shall be painted using fusion bonded polyester coating method.

Hardware:

- Hub plate shall meet A, 1 thru 5 and 9B.
- Span-wire hanger clamp shall meet C, 1 thru 5
- Balance Adjuster shall meet 6A, 7A, and 7B.
- Two-way lower arm shall meet 7C and 8A.
- Two-way tri-stud arm shall meet A, 1 thru 5.
- Span wire entrance fitting shall meet C, 1 thru 5
- Mast-arm mount signal bracket (1-way, 2-way, and 5-section) shall meet 1A and 1D.
- Side pole upper and lower- arm assembly shall meet 1B thru 5B or 1D thru 5D.

Light Emitting Diodes. LEDs shall be Aluminum Indium Gallium Phosphide type.

(a) The LED shall be rated for 100,000 hours continuous operation, at 30 mA drive current, with less than 30 percent lumen depreciation.

(b) Each LED shall have a 20 to 22 degree cone of vision.

(c) Each LED shall have dominant wavelength between 585 and 595 NM. All LEDs in a sign shall have the same dominant wavelength

Signal Heads and Pedestrian Indications Housings and Doors.

(a) Aluminum signal head housing and doors shall be of die-cast aluminum as indicated in the latest Institute of Transportation Engineers Vehicle Traffic Control Signal Head Specification.

(b) Dual hinge-latch mechanisms shall be mounted on the signal head housing and not the signal head door. Captive door latch mechanisms (one for 8 in. and two for 12 in. vehicular signal heads, one for 9 in. and two for 12 in. pedestrian signal heads) shall secure the signal head door to the signal head housing by use of stainless steel eyebolts and wing nut assemblies.

(c) All openings to the signal head housing interior shall be provided with a gasket conforming to the physical properties listing in UL 508 and shall provide a weather resistant fit to the housing.

(d) Referenced vehicle type LED modules shall fit in all standard ITE compliant incandescent vehicle traffic signal housings. Each module shall incorporate a printed circuit board inclusive of all of the LEDs and required circuit components, 39 inch 16 AWG wire leads with strain relief and spade terminals, a rigid housing for protection in shipping, handling and installation, and a one piece neoprene gasket. Screw-in type products are not allowed for vehicle signals. The individual LEDs utilized in Red, Green, and Yellow Ball type lamps shall utilize the latest technology in thermal management including an integral copper slug that is imbedded into the LEDs. Each individual LED shall be rated to withstand in excess of one (1) watt of power at 25° C, during continuous operation. Ball lamps shall contain no more than 18 LEDs.

(e) The LEDs shall be mounted and soldered to a printed circuit board. The LED signal module shall be watertight when properly installed in a traffic signal housing. The LED signal module shall utilize the same mounting hardware used to secure the incandescent lens and gasket assembly, and shall only require a screwdriver or standard installation tool to complete the mounting. The LED signal module assembly shall weigh less than 5 pounds. For vehicle signals, the incandescent lamp sockets and reflectors shall be removed from the signal head housings, to ensure customer long-term compliance with utility company rebate programs. So as to minimize possible maintenance problems, the LED lamp module may not protrude into the signal visor area more than three-quarters of an inch (3/4”) in depth.

(f) The housing of the LED signal module shall be marked ‘TOP’ to designate the proper orientation of the LED signal module in the traffic signal housing. The housing of Red, Green, and Yellow LED Ball type traffic signal modules shall utilize a partial, embedded and integral metal layer, in its design and construction. Manufacturer’s part number, date code, and electrical characteristics of the LED signal module shall be visible on the rear of the assembly. A label shall be affixed to back of the Red and Green Ball type modules, that certifies their complete compliance with the July 1998 ITE VTCSH, Part II specification for LED traffic signal modules.

Visors.

(a) Visors shall be as indicated in the latest Institute of Transportation Engineers Vehicle Traffic Control Signal Head Specification, tunnel type. Visor shall be 10 in. for 12 in.

(b) signal heads and 8 inch visor for 8 inch signal heads, 9 inch visor for 12 inch. pedestrian signal indications, and 9.5 inches visor for optically programmed signal heads.

(c) Visors shall be secured to the signal head door by a minimum of four screws mounted perpendicular to the face of the signal head door.

(d) Visors for aluminum vehicular signal head sections and pedestrian signal indications shall be made from aluminum alloy sheet. Visors for polycarbonate signal sections shall be either formed from sheet plastic or assembled from one or more injection, rotational or blow-molded polycarbonate sections.

Optical System. Optical System for Vehicular Signal Heads shall conform to the following.

(a) Red and Green Ball LED lamps shall meet the July 1998 ITE VTCSH Part II, standards and measurement criteria for LED traffic signal modules. Test data to verify the compliance of Red and Green Ball LED signals to the July 1998 ITE VTCSH, Part II specification, including the entire test listed in the design qualification section, shall be supplied from either:

Lighting Sciences
7630 East Evans Road
Scottsdale, Arizona 85260
-or-
ETL Testing Laboratories
3933 US Route 11
Cortland, New York 13045-0950

Additionally, Red and Green Ball LED lamps shall have been tested by SHA and found by same, to be compliant with SHA specifications for LED traffic signal lamps. Compliance certificates, issued by the SHA lab, shall be furnished prior to bid award and product acceptance.

(b) The control circuitry shall prevent the current flow through the LEDs in the off state to avoid any false indication as may be perceived by the human eye, during daylight and evening hours. The LED traffic signal module shall be operationally compatible with NEMA TS - 1 and NEMA TS - 2 conflict monitoring parameters. The intensity of Red and Green LED Ball signal modules shall not vary by more than 10 percent over the allowable voltage range as specified in the electrical section below.

(c) Within five (5) minutes of turn-on, the initial luminous intensity of Yellow Ball lamps shall meet that of ITE compliant Green Ball lamps, at 25 degrees centigrade, at 120 volts AC. Additionally, Yellow Ball LED lamps shall have been tested by SHA and found by same, to be compliant with SHA specifications for LED traffic signal lamps. Compliance certificates, issued by the SHA lab, shall be furnished prior to bid award and product acceptance.

Lens.

(a) Outer lenses for Ball type modules shall be made of ultraviolet stabilized polycarbonate, and shall serve to enhance the optical efficiency of the LED traffic signal module. Individual lens-lets are specifically not allowed. Red, Green, and Yellow Ball type signals shall incorporate an inner Fresnel lens that is sealed to the lamp housing, and serves to collimate the light emitted by the LED light engine. The outer lens shall serve to focus the collimated light, so as to meet ITE intensity and distribution standards. Additionally, Red, Green, and Yellow Ball lamps shall almost perfectly, approximate to the motorist, the appearance of an incandescent traffic signal. This means that the surface of Red, Green, and Yellow Ball LED lamps shall appear to the motorist as nearly totally uniform in illumination, and have a wide viewing angle that makes it suitable for installation on wide boulevards or single-tethered span wire. This also means that it shall not be apparent that LEDs are used as the light source for Red, Green, and Yellow traffic signal Ball type lamps. The external lens surface for all vehicle signals shall be smooth, with no raised features, so as to minimize the collection of dirt, diesel smoke, and other particulate contaminates, and to facilitate periodic cleaning. External lens facets are not allowed. The lens shall be keyed to the housing of the LED signal module to insure the proper orientation and to avoid possible rotation during any handling. External lenses shall be hard-coated.

Electrical.

(a) The entire signal head assembly shall be either listed or labeled by a Maryland State Fire Marshall or a recognized electrical inspection agency.

(b) Each single section and the middle section of three section signal heads shall have a minimum of a six section, twelve position terminal block capable of accepting three No. 14 AWG spade terminal ends. The top section of two section pedestrian signal head shall be furnished with a minimum of five section, 10 terminal blocks capable of accepting three No. 14 AWG spade terminal ends.

(c) Power factor shall be 0.90 or greater, at nominal rated voltage, at 25° C, after 60 minutes of operation. Total harmonic distortion ("THD") shall be less than 20 percent at rated voltage, at 25° C.

(d) All LED traffic signal modules shall be in compliance with FCC noise regulations and must meet the FCC Title 47, SubPart B Section 15 regulation.

(e) The Red and Yellow lamps shall utilize exclusively AlInGaP (Aluminum Indium Gallium Phosphide) technology, either AS (Absorbing Substrate) or TS (Transparent Substrate), and shall not exhibit degradation of more than 30% of their initial light intensity following accelerated life testing (operating at 85º C and 85% humidity, for 1,000 hours). AlGaAs (Aluminum Gallium Arsenide) technology is not acceptable.

(f) The Green LEDs shall utilize Indium gallium nitride technology. Green LED traffic signal modules shall not be illuminated when the applied voltage is less than 35 VAC. They shall be illuminated (unregulated) when the applied voltage is 45 VAC to 80 VAC. Their illumination shall be in compliance with the July 1998 ITE VTCSH, Part II, when the applied voltage is between 80 VAC and 135 VAC.

(g) The LED signal modules shall be connected directly to line voltage, **120 Volts AC nominal**, and shall be able to operate over the voltage range of 80 VAC to 135 VAC.

(h) The 8" and 12" Red Ball units shall consume no more than a nominal 7 and 10.5 watts respectively, at 120 VAC, at 25 degrees centigrade. Maximum power consumption shall not exceed 13 and 17 watts respectively, at 120 VAC, at 74 degrees centigrade.

(i) Green Ball LED traffic signal modules shall consume no more than a nominal 11.6 and 14.6 watts for the 8" and 12" lamps respectively, at 120 VAC, at 25 degrees centigrade. Maximum power consumption shall not exceed 12 and 15 watts respectively, at 120 VAC, at 74 degrees centigrade.

(j) Yellow Ball LED traffic signal modules shall consume no more than a nominal 13 and 22 watts for the 8" and 12" lamps respectively, at 120 VAC, at 25 degrees centigrade. Maximum power consumption shall not exceed 16 and 25 watts respectively, at 120 VAC, at 74 degrees centigrade.

(k) Transient voltage suppression rated at 1500 watts for 1 millisecond and fusing with a maximum rating of 2 amps shall be provided to minimize the effect and repair cost of an extreme over voltage situation or other failure mode.

WARRANTY

a. LED traffic signal modules supplied shall be warranted for five (5) years against manufacturing defects.

814.03 CONSTRUCTION.

Aiming - Signal heads shall be aimed to be visible in accordance with the minimum requirements of the MUTCD (Chapter 4, Section B).

814.04 MEASUREMENT AND PAYMENT. LED Signal Head Signal Indications furnished and installed will be measured and paid for at the contract unit price per each section of signal head type and size as specified in the Contract Documents. The payment will be full compensation for all mounting hardware, assembly, material, lens, labor, equipment, tool, and incidentals necessary to complete the work.

SECTION 820 GENERAL ELECTRICAL WORK AND TESTING

See Section 820 of the SHA's *Standard Specifications for Construction and Materials* in conjunction with the changes shown in this Section.

820.01 DESCRIPTION

ADD: The following.

(a) This work includes contacting, coordinating and cooperating with BG&E for the changes and additions to the electrical service.

(b) The Plans show only diagrammatic locations of cables, conduits, and other underground utilities. They are approximate and do not show every detail. The Contractor shall provide working drawings, shop drawings, and catalog cuts, etc., which show final details of the installation.

820.01.01 Codes, Standards, Inspection, and Documentation

(a) All work shall be performed in accordance with the codes and standards listed below. In addition, materials and construction methods shall meet the minimum requirements and recommendations of the listed codes, standards, and organizations. Unless otherwise stated, the latest edition, revision, or supplement, as of the date of advertisement, of the specified codes shall be used.

- ANSI - American National Standards Institute
- ASTM - American Society for Testing and Materials
- IEEE - Institute of Electrical and Electronic Engineers
- NEC - National Electrical Code (NFPA70)
- NEMA - National Electrical Manufacturers Association
- NESC - National Electrical Safety Code
- NFPA - National Fire Protection Association
- UL - Underwriters' Laboratories
- TIA - Telecommunications Industry Association

(b) All materials supplied by the contractor shall be new and UL listed, where such listing is possible. Submit catalog cuts for all materials in accordance with Shop Plans & Working Drawings in SPECIAL PROVISIONS (TC4.01).

(c) The MDTA Chief Electrical Inspector or his appointed representative will inspect the entire installation. The Contractor shall contact the Electrical Inspector at least 48 hours before

needed inspections. All trenches shall be inspected before backfilling. All equipment, conduits, etc. shall be inspected at rough in and prior to concealment. All work shall be inspected prior to power-up. Contact the Chief Electrical Inspector, Douglas Evans, at 410-977-2687 or devans3@mdta.state.md.us to arrange necessary inspections.

(d) All rough-in work shall be documented via a digital camera prior to concealment. Camera shall be color, minimum of 5 mega pixels, and images shall be clear and readable to the naked eye. All color photos shall be time stamped with the date of the picture. Filename or other label shall identify project number and general location of the picture. All pictures shall be submitted on a CD or DVD at the conclusion of the project, however, electronic copies shall be made available at any time by request to the project engineer, inspector, and/or electrical inspector.

(e) Special attention is directed to the fact that the Standard Specifications For Construction and Materials dated July 2008 and published by the Maryland Department of Transportation, State Highway Administration, also governs this work, and is referenced frequently herein as the "Specifications."

(f) All work shall be performed in accordance with NECA 1-2006 (Standard for Good Workmanship in Electrical Construction) or latest revision.

(g) Unless clearly specified otherwise, all voltages indicated are AC (alternating current), shall be at 60 Hz, and stated as RMS values.

820.01.02 Quality Assurance and Quality Control

The contractor shall inspect all materials furnished or installed under this contract and shall bring any damage, failure, or other problem to the attention of the project inspector prior to incorporation into the work. The contractor shall provide his own quality assurance and quality control for the work performed in the contract. The inspectors operating on behalf of the state are not a replacement for contractor’s management and the contractor’s own quality assurance and quality control.

Prior to final inspections/punch list development the contractor shall conduct his own inspections. The use of inspection checklists and quality control documents is required as evidence that inspections have been completed.

820.01.03 Fire-stopping

(h) All penetrations into fire walls or core holes between floors and walls must be properly fire-stopped in accordance NEC requirements for fire stopping.

(i) Penetrations into the surface of any firewall or presumed firewall should be only slightly larger than the cable or cables that will need to pass through it. This will make fire stopping easier and allow the wall to maintain a better over all structural integrity.

820.03 CONSTRUCTION

820.03.01 GENERAL

ADD: The following.

For the purpose of this specification, “direct supervision” shall mean that the qualified Master Electrician shall be at the job site at all times electrical work is performed. The Master Electrician shall be the single point of contact for inspection and quality control issues related to electrical work and shall be able to effectively manage the electrical work force.

The contractor must provide qualified labor to perform installation. Where licenses or certifications are available or required by local jurisdictions, state jurisdictions, or federal jurisdictions for certain skilled trades, such as electrical, mechanical, plumbing, welding, etc. The skilled trade workers shall have current versions of the appropriate license or certification prior to working the associated specialty and shall provide copies to the Project Engineer or Inspectors upon request.

Installation, splicing, terminating, and testing of fiber optic cable shall be performed by a trained and qualified fiber optic cable technician. Copies of certifications and experience shall be submitted to the Engineer prior to starting work.

ADD: The following just prior to paragraph 820.04.

820.03.04 Testing Fiber Optic Cables
Circuit tests shall be performed to verify that each fiber is connected to the proper circuit, and that it is continuous with no breaks, or damaged sections, in the fiber. All strands shall meet current EIA/TIA-568 specifications. Dark fibers and excessive attenuation due to breaks, bends, bad splices, defective connectors and bad installation practices shall not be accepted and shall be corrected. For fiber optic testing standards, see EIA-455-171 (FOTP-171), EIA 526-14.

(a) All cables shall have ST connectors installed prior to testing. All testing, for purposes of acceptance of the system, shall be conducted on fully installed and assembled fiber optic cables.

(b) Upon completion of testing, replace or repair any failed cable(s) with a new fiber or cable, and test the new cable to demonstrate acceptability.

(c) Insertion loss testing shall be performed.

(d) These tests shall be measured in dB.

(e) These tests shall use 850 nm and 1300 nm light sources for multimode fiber and 1300 and 1550 nm for single mode fiber.

(f) Test shall be documented for all wavelengths as noted above.

(g) Test results shall be documented on paper and stored on a computer diskette and shall be turned over to the electrical inspector after testing is complete. Attachment 820-A to this Section shows a sample fiber optic test report.

(h) An optical time domain reflectometer (OTDR) approved by the Engineer shall be used to conduct testing. The OTDR shall be calibrated to sheath (jacket) length, not optical length, by adjusting the unit's index of refraction. Properly trained technicians shall conduct tests.

(i) All OTDR traces shall maximize both the vertical and horizontal scales to the greatest extent possible and still fit the entire trace on the screen.

(j) A cable segment shall be deemed a failure if the total loss exceeds the calculated loss for that length of cable as indicated in Attachment 820-A. A cable segment shall fail if any individual splice loss is greater than 0.3dB, or if any mated connector pair loss is greater than 1.0dB, or if there is any point loss (over less than 1' of cable) of more than 1.0dB.

(k) After the circuit test, a functional test shall be performed. This test shall consist of allowing the system to operate as normal for 30 consecutive days. Any failures shall be repaired by the Contractor at his own expense, and the test restarted.

820.03.05 All switches and breakers shall be operational and the operation of the devices they control verified. That is, the Contractor shall test switches and breakers in the presence of the MDTA electrical inspector to prove and assure that the device (or devices) specified is (are) controlled and no other device (or devices) is (are) controlled. All panel schedules shall be accurate and reflect the final installation.

820.03.06 All GFI protected outlets shall be tested with a suitable tester in the presence of the MDTA electrical inspector. The tester shall be a device that plugs into the outlet and indicates proper wiring of the outlet. A switch on the tester shall be utilized to introduce a ground fault that must trip the GFI device.

820.03.07 All Uninterruptible Power Supplies shall be tested by removal of power sources. Verify proper transfer to battery and backup time consistent with the manufacturers load vs time data for the particular model of UPS. Restore normal power and verify that batteries are charged and normal operation commences.

820.03.08 All PVC conduit fittings, except threaded fittings, shall be schedule 80 and glued and water tight. All GRSC fittings shall be tight fit.

820.03.09 All photo electric controls shall be tested by applying a temporary shade to simulate photometric changes intended to activate the controls. Such testing shall be performed by the contractor in the presence of the MDTA electrical inspector.

820.03.10 All three phase panels, loads, motors, generators, UPS's, and ATS's shall be checked for proper phase rotation and consistent phase termination between termination points. Ie: Phase A is the same Phase at all Phase A termination points and the phase rotation is the same at all points. Such testing shall be performed by the contractor and witnessed by the electrical inspector.

820.03.11 Flexible metal conduit (Greenfield) and liquid tight flexible metal conduit (seal tight), and liquid tight flexible non-metallic conduit may be used as follows. Flexible fabric innerduct and innerduct used for low-voltage and fiber optic systems is not covered by this requirement.

(a) Lengths not exceeding 3' shall be used to connect transformers over 5KVA and motors.

(b) Lengths not exceeding 6' may be used for the final connection of light fixtures used in ceilings.

I Lengths not exceeding 6" may be used for the final connection devices that may be subject to minor vibration or minor movement perhaps from temperature expansion and contraction.

(d) Other lengths as clearly specified on the plans or as approved by the Engineer.

820.03.12 Conduit/Cable labeling. Interior cable and raceways shall be permanently labeled at a minimum of every 50 feet, **every 25 feet when view is obstructed, and within 5' of any wall or floor/ceiling penetration** at all junction boxes, terminations, **and within 12" of electrical panel.** Label color shall be Safety Orange with Black Letters and shall follow ANSI (ASME) A13.1 for location and size.

820.03.13 Unless specifically shown otherwise on the plans, wiring derived from different system voltages shall be installed in separate conduits. Wiring of different voltages derived from the same system (i.e. Control wiring) may be permitted to be installed in the same conduit or junction box provided that all requirements of the NEC are maintained.

820.03.14 No wiring other than the primary voltage indicated shall be installed in electrical panels and Safety/Disconnect Switches. Exception may be granted for wiring that terminates on a device within the panelboard or safety/disconnect switch that is integral to the operation of that device. Enclosures for switches or overcurrent devices shall not be used as junction boxes, auxiliary gutters, or raceways for conductors feeding through or tapping off to other switches or overcurrent devices.

820.03.15 Branch Circuits: Any circuits supplying more than 50% non-linear loads shall have a dedicated neutral conductor

820.03.16 Conduit or tubing 1" and larger shall be provided with a suitable insulating bushing.

820.03.17 Panel Board Labeling. All circuits installed or modified by the contractor in any way shall be properly labeled in the associated panel board panel schedule. This work shall include verifying that the existing load on the affected circuit(s) is also correctly identified. The label shall identify the type of load(s) served (e.g.: receptacles, lighting, appliances, motors, pumps, etc..) and the location (e.g.: room 103, sump pit#1, etc…). Where changes are minor (e.g. Two circuits or less being changed), the existing

panel schedule may be modified as approved by the Electrical Inspector. Larger changes shall require a new panel schedule typed, neat in appearance. The new schedule may copy the identifying labels of the old schedule provided that the contractor has not made any changes to those circuits. To clarify, replacing a panel board, moving circuits within a panel board, or similar changes shall be considered modifying the circuit and shall require testing to verify the connections of all such circuits and coordinating the panel schedule with the existing conditions.

820.03.18 Fire Stopping. All penetrations into fire walls or core holes between floors and walls must be properly fire-stopped in accordance NEC requirements for fire stopping. Penetrations into the surface of any firewall or presumed firewall should be only slightly larger than the conduit, cable or cables that will need to pass through it. This will make fire stopping easier and allow the wall to maintain a better over all structural integrity.

820.03.19 Construction Stakeout and Coordination

a) The Contractor shall coordinate this work with the work of other trades to avoid conflicts. Electrical cables and equipment damaged by the execution of work of other trades shall be completely removed and replaced with new.

b) The Contractor shall keep an up-to-date set of as-built red lined drawings on the job site. Submit as-built drawings upon completion of the work. The Contractor shall note the exact location of trenches at 100-foot intervals on the as-built drawings by station, and offset from the roadway. The Contractor shall show only the work that is part of the final project on as-built drawings.

820.03.20 Boxes and Cabinets. Unless specified otherwise, junction boxes, pull boxes, disconnect switches, cabinets, and other boxes installed outdoors and above ground shall be NEMA4X rated; except cabinets and boxes requiring ventilation which shall be NEMA3X rated.

820.03.21 Rodent stopping. All conduits that connect to exterior mounted cabinets shall be stuffed with copper mesh at the cabinet end point to deter rodent egress through the conduit. The copper mesh shall be installed after all wires and cables have been installed. The mesh shall be removable and the mesh and installation and removal technique shall not damage wires or cables.

ATTACHMENT 820-A

SAMPLE FIBER OPTIC CABLE TEST REPORT

(To be filled out after installation is complete)

Job Name: FIBER SPURS **Job ID: MA-247-000-006**	**Fiber Cable:**
Location (A):	**Location (B):**

ANSI/EIA/TIA 568A: Cable Loss Factor (CLF); 1km=3280.83 feet

3.75 db/km **(0.00114 db/ft)** @ 850 nm for 62.5/125 μm MM

0.50 db/km **(0.00045 db/ft)** @ 1300 nm for 62.5/125 μm MM

0.50 db/km **(0.00015 db/ft)** @ 1310 nm and 1550 nm for OSP SM

1.0 db/km **(0.00030 db/ft)** @ 1310 nm and 1550 nm for ISP SM

0.5 Connector Loss (CL) = 0.75 db per pair of connectors

Splice Loss (SL) = 0.3 db each

To calculate ACCEPTABLE LOSS (db): Multiply cable length x (CLF) + (CL) + (SL) = DB margin:___

Cable Length	Strand No.	A to B	B to A	Fiber ID
Feet	1			Blue
850 NM MM	2			Orange
dB	3			Green
	4			Brown
	5			Slate
	6			White
	7			Red
	8			Black
	9			Yellow
	10			Violet
	11			Rose
	12			Aqua

Cable Length	Strand No.	A to B	B to A	Fiber ID
Feet	1			Blue
1300 NM MM	2			Orange
dB	3			Green
	4			Brown
	5			Slate
	6			White
	7			Red
	8			Black
	9			Yellow
	10			Violet
	11			Rose
	12			Aqua

Cable Length	Strand No.	A to B	B to A	Fiber ID
Feet	1			Blue
1550 NM MM	2			Orange
dB	3			Green
	4			Brown
	5			Slate
	6			White
	7			Red
	8			Black
	9			Yellow
	10			Violet
	11			Rose
	12			Aqua

Technician: _____ **Date:** _____

CATEGORY 800
TRAFFIC

SECTION 822-REMOVE AND RELOCATE
EXISTING SIGNS AND SIGN STRUCTURES

DELETE: 822.04.02 in its entirety

INSERT: The following:

822.04.02 Remove Signs from Existing Overhead Structure will be measured and paid for at the Contract unit price per square foot area of the sign. Removal of sign and sign luminaire supports, luminaries, catwalks, conduit and cable will not be measured but the cost will be incidental to the Contract unit price for removing the signs.

CATEGORY 800
TRAFFIC

830 COMMON WORK RESULTS FOR ELECTRICAL

830.01.01 RELATED DOCUMENTS
Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

830.01.02 SUMMARY
Section Includes:

Electrical equipment coordination and installation.

Common electrical installation requirements.

830.01.03 COORDINATION
Coordinate arrangement, mounting, and support of electrical equipment.

Allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.

Provide for ease of disconnecting the equipment with minimum interference to other installations.

Allow right of way for piping and conduit installed at required slope.

Connect raceways, cables, wireways, cable trays, and busways so that will be clear of obstructions and of the working and access space of other equipment.

830.02 EXECUTION
830.02.01 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION
Comply with NECA 1.

Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

CATEGORY 800
TRAFFIC

832 - ELECTRICAL IDENTIFICATION

832.01 GENERAL
832.01.01 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

832.01.02 SUMMARY

This Section includes the following:

a) Identification for raceway.
b) Identification for conductors and control cable.
c) Warning labels and signs.
d) Equipment identification labels.

832.01.03 SUBMITTALS

Product Data: For each electrical identification product indicated.

832.01.04 QUALITY ASSURANCE

Comply with ANSI A13.1 and ANSI C2.

Comply with NFPA 70.

Comply with 29 CFR 1910.145.

832.01.05 COORDINATION

Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

Coordinate installation of identifying devices with location of access panels and doors.

832.02 PRODUCTS

832.02.01 RACEWAY IDENTIFICATION MATERIALS

Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

Color for Printed Legend:

a) Power Circuits: Black letters on an orange field.

b) Legend: Indicate system or service and voltage, if applicable.

Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches wide; compounded for outdoor use.

832.02.02 CONDUCTOR AND COMMUNICATION- AND CONTROL-CABLE IDENTIFICATION MATERIALS

Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inches (2” x 2” x 0.05”), with stamped legend, punched for use with self-locking nylon tie fastener.

832.02.03 WARNING LABELS AND SIGNS

Comply with NFPA 70 and 29 CFR 1910.145.

Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.

832.02.04 EQUIPMENT IDENTIFICATION LABELS

Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and ultraviolet-resistant seal for label.

Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark gray background. Minimum letter height shall be 3/8 inch.

832.02.05 MISCELLANEOUS IDENTIFICATION PRODUCTS

Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

832.03 EXECUTION

832.03.01 APPLICATION

Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A: Identify with orange self-adhesive vinyl label, snap-around label, or self-adhesive vinyl tape applied in bands.

Power-Circuit Conductor Identification: For conductors No.8 AWG and larger in vaults, pull and junction boxes use color-coding conductor tape. Identify source and circuit number of each set of conductors. For single conductor cables, identify phase in addition to the above.

Branch-Circuit Conductor Identification: Where there are conductors for more than three branch circuits in same junction or pull box, use color-coding conductor tape. Identify each ungrounded conductor according to source and circuit number.

Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply self-adhesive warning labels. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.

Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels,

control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

Labeling Instructions:

a) Outdoor Equipment: Engraved, laminated acrylic or melamine label.

b) Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.

Equipment to Be Labeled:

a) Identification labeling of some items listed below may be required by individual Sections or by NFPA 70.
b) Panelboards, electrical cabinets, and enclosures.
c) Transformers.
d) Disconnect switches.
e) Enclosed circuit breakers.
f) Push-button stations.
g) Contactors.
h) Remote-controlled switches and control devices.
i) Outlets.

832.03.02 INSTALLATION

Verify identity of each item before installing identification products.

Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

Apply identification devices to surfaces that require finish after completing finish work.

Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

Attach nonadhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.

System Identification Color Banding for Raceways and Cables: Each color band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

Color-Coding for Phase and Voltage Level Identification, 600 V and Less: Use the colors listed below for ungrounded conductors. Color shall be factory applied or, for sizes larger than No. 10 AWG if authorities having jurisdiction permit, field applied.

Colors for 208/120-V Circuits:

a) Phase A: Black.
b) Phase B: Red.
c) Phase C: Blue.

Colors for 480/277-V Circuits:

a) Phase A: Brown.
b) Phase B: Orange.
c) Phase C: Yellow.

Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

CATEGORY 800
TRAFFIC

SECTION 840 — FIBER OPTIC CABLES

840.01 DESCRIPTION
This work shall include furnishing and installing fiber optic cables where required.

840.02 MATERIALS
Fiber Optic Cables 952

840.02.01 Terminations. All terminations shall be of the ST type. ST connectors shall conform to TIA/EIA-47500 OOB and TIA/EIA-604-2. The maximum loss shall be 1.0 dB per mated pair, or 0.5 dB for each termination. Any termination with losses above these limits shall be removed and replaced by the Contractor at its sole expense. Terminations shall have ceramic ferrule and metallic bayonet connector. All terminations shall have a boot with integral strain relief. All fibers are to be terminated on an ST patch panel mounted within a termination box at all ITS equipment cabinets.

840.02.02 Fusion Splices. Each finished splice shall have a loss of 0.15 dB or less. Loss calculations shall use an average of bi-directional measurements. The average splice loss is defined as the summation of the loss as measured in both directions using an Optical Time Domain Reflectometer (OTDR) through the fusion splice, divided by two.

840.03 CONSTRUCTION
All fiber optic cables installed in this project shall be permanently marked and labeled at both ends of the cable and inside all junction boxes and manholes.

840.03.01 Splicing Reels of Cable. Reels of cable shall be visually inspected for breaks, abrasions and other physical damage. Contractor shall ensure continuity in each reel of cable prior to installation. Contractor shall notify the Engineer immediately if the tests conducted on the cables prior to installation indicate unsuitability of the cable for the application.

The method of joining two reels of fiber optic cables shall be fusion splicing all trunk cable fibers of one reel to the corresponding fibers in the second reel. All splices for joining two fiber reels of trunk cable together shall be made in splice enclosures as needed. When a reel runs out of cable, any excess beyond the planned termination point shall be cut off and disposed of by the Contractor. The splice joining the two cable reels shall be made in the splice enclosure that contains the cable-to-cable splice. It shall be the Contractor's responsibility to calculate the cost to join fiber optic reels on the project based upon the reel lengths the Contractor orders. Where interconnect system length permits, the Contractor can avoid the cost of joining cable reels together by ordering a single reel of sufficient length to extend from one end of the project to the other.

Before any fiber-optic cable installation is performed, the Contractor shall submit to the Engineer a copy of the cable manufacturer's recommended and maximum pulling tensions for each cable size and type. These pulling tensions shall be specified for pulling from the cable's outer jacket. Included with these pulling tensions shall be a list of the minimum allowable cable bending radius and the cable manufacturer's approved pulling lubricants and guidelines for their application. Only these lubricants will be permitted.

840.03.02 Transportation and Handling of Fiber Optic Cables. Cables shall be packaged wound on non-returnable wood spools or reels. The diameter of the drum shall be a minimum of 20 times the diameter of the cable. Each reel shall contain only one continuous length of cable. Labels shall be attached to the reel showing length, cable identification name and number, and date of manufacture. In addition, the Contractor shall:
Provide documentation to accompany each reel that shows the attenuation of each cable fiber in dB/Km.
Support the cables and avoid crushing, stressing, and over-bending.

The Contractor shall comply with the cable manufacturer's specifications regarding bend radius and maximum tensile loading.
The Contractor shall not allow cables to hang freely without support at the cable manufacturer's recommended points.

The Contractor shall not allow the cable to press against or rest on sharp edges.
Fiber optic cable installed in conduit shall be in accordance with the following:

(a) The Contractor shall provide cable lubricant compatible with the cable sheathing material when pulling the cable. The Contractor shall attach pulling fixtures to the cable strength members. When indirect attachments are used, the Contractor shall match the grip diameter and length to the cable diameter and characteristics. When indirect attachment is used on cables having only central strength members, the Contractor shall reduce pulling forces to ensure that fibers are not damaged from forces being transmitted to the strength member.

(b) When pulling the cable, the Contractor shall continuously monitor pull line tension, which shall not exceed the maximum tension given by the cable manufacturer. Mechanical stress placed upon the cable during installation shall be such that the cable is not twisted nor stretched.

(c) The Contractor shall provide a cable feeder guide between the cable reel and the face of the duct or conduit to protect and guide the cable into the duct or conduit as it is rolled off the reel. As the cable is rolled off the reel, the Contractor shall carefully inspect the jacket for defects. The Contractor shall take precautions during installation to prevent the cable from being kinked or crushed and that the minimum bend radius is not exceeded at anytime. The Contractor shall hand feed and guide the cable through each junction box and apply additional lubricant at intermediate junction boxes. When practical, the Contractor shall use the center pulling technique to lower the pulling tension. When the cable is pulled out of a junction box, it shall be protected from dirt and moisture.

(d) After installation, there shall be no tension on the cable, except for the cable weight.

(e) Tension of the cable shall be continually monitored with a Tensionmeter during installation.

(f) The applied tension shall not exceed the manufacturer’s specifications.

(g) The central strength member and the Aramid yarn shall be directly attached to the pulling eye. "Basket Grip" type attachments to the outer jacket of the cable shall not be permitted. A breakaway swivel shall be used on all pulls

Where fiber optic cables are installed underground, the cables shall be in conduit only where specifically shown on plans. Refer to SHA’s Standards and Specifications for Construction and Materials and plan details for trenching and backfill requirements. Where any single jacketed cable installed underground

has more than 12 fibers, conduit shall be used and all fiber optic cables in the affected section shall be in conduit.

All splices shall be fusion type and be installed in approved fiber optic splicing trays, splicing enclosures, or other approved devices. Splices are permitted only where indicated on plans.

840.03.03 Installation. At no time shall the bending radius of a cable be exceeded. For all cables, the minimum bending radius shall be 20 times the cable diameter during installation. After installation, the minimum bending radius shall be 10 times the cable diameter.

At no time shall the pulling (tensile) strength of the cable be exceeded during installation. The Contractor must take appropriate precautions to assure that the installation does not damage the cables.

An experienced and trained fiber optic cable technician shall perform all splices and terminations. The Contractor shall submit to the Engineer documentation on its technician's experience of at least one year, or recent certification from an independent testing or certification organization for fiber optic cable splicing and termination. All splicing and terminations shall be in accordance with these specifications and the latest versions of applicable EIA/TIA standards.

840.04 TESTING AND TEST EQUIPMENT

All testing and test equipment shall be in conformance with the following:

(a) TIA/EIA-455-B Standard Test Procedure for Fiber Optic Fibers, Cables, Transducers, Sensors, Connecting and Terminating Devices, and other Fiber Optic Components.

(b) TIA/EIA-526 Standard Test Procedures for Fiber Optic Systems.

All fiber optic cables, splices, and terminations shall be tested using an Optical Time Domain Reflectometer (OTDR). OTDR testing shall occur after completion of the installation, splice, or termination.

OTDR measurements shall be made once in each direction on each fiber. OTDR graphs shall be stored on disk and submitted to the MdTA.

Acceptable loss per each fiber, per direction, shall be the sum of the cable length times the specified loss as indicated above. An allowance of 0.5 dB per connector (1.0dB per connector pair) shall be permitted, plus 0.05 dB per fusion splice. Any cable, termination, or splice, installed under this contract, with losses in excess of the acceptable limit shall be repaired, or replaced by the Contractor at the Contractor's sole expense.

Where OTDR results indicate excessive loss, or other problems, in existing fibers, terminations, or splices, the Contractor shall submit those findings to the Engineer as soon as possible.

840.05 MEASUREMENT AND PAYMENT

Fiber Optic Cables shall be paid per linear foot, by the number of fibers in each jacketed cable. This price includes labeling splicing, terminating and testing including, but not limited to, OTDR testing.

All pay items shall include all materials, labor, ST connectors and terminals, and equipment necessary to furnish and install, and test a complete, operational, and acceptable system as specified herein and as shown on the plans.

Payment of items shall include all testing and guarantees required by the specifications and special provisions.

CATEGORY 900
MATERIALS

665 **DELETE:** SECTION 902 — PORTLAND CEMENT CONCRETE AND RELATED PRODUCTS in its entirety.

INSERT: The following.

SECTION 902 — PORTLAND CEMENT CONCRETE AND RELATED PRODUCTS

902.01 STORAGE. Storage of materials shall conform to the Contract Documents and as directed by the Engineer.

902.02 CERTIFICATION OF PORTLAND CEMENT AND BLENDED HYDRAULIC CEMENT. The manufacturer shall furnish certification as specified in TC-1.02. The certification shall also include:

(a) The mill shall report its quality control procedures, and submit a new report whenever there is a procedural change.

(b) The mill's control laboratory shall be inspected by the Cement and Concrete Reference Laboratory of the National Institute of Standards and Technology on their regularly scheduled visits. The Engineer shall be provided with copies of the reports of these inspections along with an account of the action taken to correct cited deficiencies.

(c) Records of data accumulated by the quality control procedures shall be produced upon request.

(d) A certified document shall accompany each shipment stating that the contents conform to all applicable requirements. Additionally, the document shall show the producer's name, mill location, carrier number, date loaded, weight contained in carrier, silo number, consignee, destination, Contract number, and type of cement. The signature and title of the signer shall be shown on the document.

(e) The mill shall, upon request, supply certified chemical and physical test values that can be associated with any sample representing cement drawn from a particular silo on a given date.

(f) Acceptance of cement by certification will be terminated if test results differ from mill results by more than the precision limits given in the test method. The acceptance procedure will then revert to storage testing and approval prior to shipment.

902.03 HYDRAULIC CEMENT.

902.03.01 Portland Cement. M 85, with the fineness and the time of setting determined using T 153 and T 131, respectively.

902.03.02 Ground Iron Blast Furnace Slag. M 302, Grade 100 or 120. The Contractor may request to substitute a maximum of 50 percent of the weight of cement with ground iron blast furnace slag. When ground iron blast furnace slag is used, the minimum cement factor and water/cement ratio will be determined on the basis of the combined weight of the portland cement and ground iron blast furnace slag. When ground iron blast furnace slag is used to control alkali silica reactivity, see Table 902 B for percentage.

902.04 BLENDED HYDRAULIC CEMENT. M 240, Type I (PM) or a Type IP containing 15 to 25 percent pozzolan by weight of cement. Maximum loss on ignition is 3.0 percent. Do not use ground iron blast furnace slag for blending. The requirement for a manufacturer's written statement of the chemical composition is waived.

902.05 MASONRY CEMENT. C 91, except the water retention and staining tests are waived.

902.06 CONCRETE ADMIXTURES. Do not use concrete admixtures that contribute more than 200 ppm of chlorides based on the cement content when tested per MSMT 610. Use only prequalified admixtures.

Do not use pozzolan and Type I (PM) or Type IP cement in the same mix. Since the strength gains are delayed with these materials, a longer period of time may be required for curing and form removal.

902.06.01 Air Entraining Admixtures. M 154.

902.06.02 Chemical Admixtures. M 194, Type A, D, or nonchloride C.

902.06.03 High Range Water Reducing Admixtures. M 194, except that it shall be a liquid, the water content shall be a maximum of 85 percent of that of the control, and the durability factor shall be a minimum of 90. Use Type F for early strength, which shall produce a minimum compressive strength in 12 hours of 180 percent of that of the control. Use Type G when early strength is not specified. The manufacturer shall furnish certification as specified in TC-1.02. The certification shall include curves indicating the fluid ounces of admixture per 100 lb of cement as related to water reduction and strength gain for 12 hours when used with a minimum cement factor of 700 lb.

902.06.04 Pozzolans. The use of pozzolans may be requested to control alkali silica reactivity or for other reasons. When a pozzolan is used, determine the minimum cement factor and water/cement ratio on the basis of the combined weight cement and pozzolan. See Table 902 B for percentage of fly ash, and microsilica.

(a) Fly Ash. M 295, pozzolan Class C or F, except that the maximum permissible moisture content shall be 1.0 percent, and when used in concrete Mix Nos. 3 and 6 the maximum loss on ignition 3.0 percent.

(b) Microsilica. C 1240, except that the oversize requirement is waived.

902.06.05 Corrosion Inhibitors. Corrosion inhibitors shall be calcium nitrite based and contain a minimum of 30 percent active ingredients by mass. The gallonage of corrosion inhibitor used in the concrete mixture shall be included as water when determining the water/cementitious materials ratio.

902.07 PORTLAND CEMENT CONCRETE CURING MATERIALS. Use burlap cloth, sheet materials, liquid membrane forming compounds, or cotton mats.

902.07.01 Burlap. M 182, Class 1, 2, or 3.

902.07.02 Sheet Materials. M 171 with the following exceptions:

(a) White Opaque Burlap Polyethylene Sheeting. Tensile strength and elongation requirements are waived. Use sheeting having a finished product weight of not less than 10 oz/yd^2.

(b) White Opaque Polyethylene Backed Nonwoven Fabric. 902.07.02(a), with the thickness requirement waived. Use material having a finished product weight of not less than 5 oz/yd^2.

(c) White Opaque Polyethylene Film. Tensile strength and elongation requirements are waived.

902.07.03 Liquid Membrane. M 148. Field control testing of the white pigmented curing compounds is on the basis of weight per gallon. The samples shall not deviate more than ± 0.3 lb/gal from the original source sample.

902.07.04 Cotton Mats. Cotton mats consist of a filling material of cotton bats or bats covered with unsized cloth and tufted or stitched to maintain the shape and stability of the unit under job conditions of handling.

Use coverings of either cotton cloth, burlap or jute having the following properties:

(a) Cotton cloth covering shall weigh not less than 6.0 oz/yd^2 and have an average of not less than 32 threads/in. of warp and not less than 28 threads/in. of filling. Use raw cotton, cotton comber waste, cotton card strip waste, or combinations thereof as the raw material used in the manufacture of the cotton cloth.

(b) Burlap or jute covering for cotton mats shall weigh not less than 6.4 oz/yd^2 and shall have not less than of 8 threads/in. of warp and not less than 8 threads/in. of filling. Use the grade known commercially as "firsts" and they shall be free from avoidable imperfections in manufacture and from defects or blemishes affecting the serviceability.

Use a cotton bat, or bats made of raw cotton, cotton waste, cotton linters, or combinations thereof, as the filling material for the mats. Mats shall weigh not less than 12 oz/yd^2.

902.08 FORM RELEASE COMPOUNDS. Use form release compounds that effectively prevent the bond of the concrete to the forms. Form release compounds shall not cause discoloration of the concrete or adversely affect the quality or rate of hardening at the interface of the forms.

The flash point of the form release compound shall not be less than 100 F when tested per T 73.

902.09 PARAFFIN WAX. Use clear paraffin wax for use as a bond breaker for concrete. The flash point shall not be less than 380 F when tested under D 92.

902.10 PORTLAND CEMENT CONCRETE. Section 915 and as specified herein.

902.10.01 Proportioning. Prior to the start of construction, submit to the AME the source and proportions of materials to be used for each concrete mix. The mixture shall meet 902.10.03.

The concrete, with the exception of water and chemical admixtures, shall be proportioned by weight. Water and chemical admixtures may be proportioned by volume or weight. The mix shall be uniform and workable.

902.10.02 Materials.

Coarse Aggregate	901.01
Fine Aggregate	901.01
Cement	902.03 and 902.04
Concrete Admixtures	902.06
Synthetic Fibers	902.15
Water	921.01

902.10.03 Portland Cement Concrete Mixtures.

The concrete mixes shall conform to the following:

TABLE 902 A

PORTLAND CEMENT CONCRETE MIXTURES									
MIX NO.	28 DAY SPECIFIED COMPRESSIVE STRENGTH psi	STANDARD DEVIATION psi	CRITICAL VALUE psi	MIN CEMENT FACTOR lb/yd^3	COARSE AGGREGATE SIZE M 43 / M 195	MAX WATER/ CEMENT RATIO by wt	SLUMP RANGE in.	TOTAL AIR CONTENT %	CONCRETE TEMPERATURE F
1	2500	375	2430	455	57, 67	0.55	2 — 5	5 — 8	70 ± 20
2	3000	450	3010	530	57, 67	0.50	2 — 5	5 — 8	70 ± 20
3	3500	525	3600	580	57, 67	0.50	2 — 5	5 — 8	70 ± 20
4	3500	525	3600	615	57, 67	0.55	4 — 8	N/A	70 ± 20
5	3500	525	3600	580	7	0.50	2 — 5	5 — 8	70 ± 20
6	4500	675	4770	615	57, 67	0.45	2 — 5	5 — 8	65 ± 15
7	4200	630	4420	580	57	0.50	1½ — 3	5 — 8	70 ± 20
8	4000	600	4180	750	7	0.42	2 — 5	5 — 8	65 ± 15
9	3000 (a)	N/A	N/A	800	57, 67	0.45	4 — 8	5 — 8	70 ± 20
10	4500	675	4770	700	¾" – No. 4	0.45	2 — 5	6 — 9	65 ± 15
11	4200	630	4420	—	57, 67	0.45	2 — 5	5 — 8	65 ± 15
12	4200	630	4420	—	¾" – No. 4	0.45	2 — 5	6 — 9	65 ± 15

Note 1: When concrete is exposed to water exceeding 15,000 ppm sodium chloride content, Type II cement shall be used. In lieu ofType II cement, a Type I cement may be used in combined form with an amount of up to 50 percent replacement with ground iron blast furnace slag, or an amount of up to 25 percent replacement with Class F fly ash. The Contractor shall submit to the Engineer the proposed mix proportions and satisfactory test results per C 1012 showing a sulfate resistance expansion not exceeding 0.10 percent at 180 days

Note 2: The temperature of Mix No. 6 when used for other than superstructure work as defined in TC-1.02 shall be 70 ± 20 F.

Note 3: Type A or D admixture shall be added to bridge, box culvert, and retaining wall concrete.

Note 4: Nonchloride Type C admixtures may be used when approved by the Engineer.

Note 5: Other Slump Requirements:
When a high range water reducing admixture Type F or Type G is specified, the slump shall be 4 to 8 in.
When synthetic fibers are specified, the slump shall be 5 in. maximum.
When concrete is to be placed by the slip form method, the slump shall be 2-1/2 in. maximum.
When the absorption of the coarse aggregate is greater than 10 percent, the slump shall be 3 in. maximum.

Note 6: Mix 9 shall contain a Type F high range water reducing admixture.

Note 7: Mix 10 and 12 shall be proportioned as specified in 211.2 of the ACI's Recommended Practices for Selection Proportions for. Structural Lightweight Concrete. The maximum average Density of Cured Concrete shall be 118 lb/ft^3. Control testing for Density of Cured Concrete shall be two companion cylinders for each 100 yd^3, or fraction thereof, as specified in M 195.

Note 8: Mix 11 and 12 shall also conform to all requirements as specified in Table 902 C.

(a) Acceptance will be based on a minimum compressive strength of 3000 psi in 24 hours. Design approval will be given based on trial batch obtaining a minimum compressive strength of 2500 psi in 12 hours. Testing shall conform to 902.10.08 except that cylinders shall remain in the molds until tests are conducted.

Coarse and fine aggregate having an expansion up to 0.10 percent when tested for alkali silica reactivity (ASR) MSMT 212 may be used without restriction. Aggregates having an expansion greater than 0.10 but less than 0.35 percent are considered reactive and may only be used when one of the options in table 902 B are employed. Those having an expansion of 0.35 percent and greater are prohibited.

TABLE 902 B

OPTION	ALKALI CONTENT OF CEMENT % max	REPLACE CEMENT WITH		SPECIFICATION
		MATERIAL	% BY WEIGHT	
1	1.50	Class F Fly Ash	15 – 25	M 295
2	1.50	Ground Iron Blast Furnace Slag	25 – 50	M 302 Grade 100 or 120
3	1.50	Microsilica	5 – 7	C 1240
4	—	Blended Cement (a)	100	M 240
5	0.60 (b)	Low Alkali Cement	100	M 85

(a) Pozzolan content of 15 – 25 percent by weight of cement
(b) For mix 9 used for Portland cement concrete pavement repairs; the maximum allowable percentage of alkalies in Portland cement shall be 0.70.

When reactive aggregate is used, designate which option will be used to control the formation of the ASR gel. If an option other than option 5 in Table 902 B above is chosen, conduct tests per MSMT 212 using the reactive aggregate and the proposed cementitious material. The expansion test results shall not be greater than 0.10 percent. When more than one reactive aggregate is used in a concrete mix, each shall be tested individually and the maximum amount of pozzolan required to reduce the expansion of all the aggregates to 0.10 percent or less shall be used. Submit the aggregate source, test results, and the percent and type of replacement cement to the Engineer. The Engineer may withhold source approval pending verification testing.

TABLE 902 C

MIX PHYSICAL PROPERTIES		
TEST PROPERTY	**TEST METHOD**	**SPECIFICATION LIMITS**
Minimum Cementitious Materials Factor, lb/yd^3	—	580
Maximum Content of Portland Cement, lb/yd^3	—	550
Water/Cementitious Materials Ratio by Wt.	—	0.45
Corrosion Inhibitor, gal/yd^3	902.06.05	2.0
Synthetic Fibers, lb/yd^3	902.15	1.5
Permeability of Field Concrete, moving average of three tests, coulombs max	T 277 Modified	2500
Permeability of Field Concrete, individual test, coulombs max	T 277 Modified	3000
Shrinkage at 28 days, microstrains	C 157	400

Note 1: Only Type I or II Portland cement shall be used.

Note 2: Mixes shall contain ground iron blast furnace slag, fly ash or microsilica.

Note 3: The water to cement ratio shall be based upon the total water to cementitious materials ratio. The gallonage of the corrosion inhibitor shall be included in the water/cementitious materials ratio.

Note 4: The permeability test value of field concrete shall be the average of two test specimens representing production concrete. Test specimens shall be molded on the project site in 4 x 8 in. molds conforming to M 205. Test specimens shall be handled under same conditions as compressive strength test specimens in conformance with C 31 for the first seven days. When seven days old, they shall be cured in a 100 F water bath for the remainder of the 28 day curing. The 28 day rapid chloride permeability of the specimens will be determined in conformance with T 277. Test for the geometry of test specimens will be waived.

Note 5: Shrinkage tests will be performed on trial mixes only.

Note 6: High range water reducing admixture may be used except the water reducing requirements will be waived.

Note 7: A sealer conforming to 902.12 shall be used on the finished surface.

902.10.04 Trial Batch. A trial batch shall be prepared to certify that each mix meets 902.10.05 and 902.10.06. Approval will be given when the test results meets the minimum required average strength.

Make arrangements with the AME at least two weeks in advance, to have an authorized representative present during the batching and testing. Each trial batch shall consist of at least 3 yd^3 of concrete. Supply all equipment, and labor required to produce the trial batches and conduct the required tests at no additional cost to the Administration.

The AME may waive the requirement for a trial batch when past performance records show that the required average strength requirement has been met.

902.10.05 Design Required Average Strength.

Specified compressive strength, f_c', psi	Required average compressive strength, f_{cr}', psi
$f_c' \leq 5000$	Use the larger value computed from Eq. (A-1) and (A-2) $f_{cr}' = f_c' + 1.34s$ (A-1) $f_{cr}' = f_c' + 2.33s - 500$ (A-2)
Over 5000	Use the larger value computed from Eq. (A-1) and (A-3) $f_{cr}' = f_c' + 1.34s$ (A-1) $f_{cr}' = 0.90 f_c' + 2.33s$ (A-3)

where:

f_c' = the 28 day specified compressive strength.

s = the standard deviation as specified in 902.10.06.

A test is defined as the average strength of two companion cylinders.

902.10.06 Standard Deviation.

(a) When past performance records are available, a standard deviation will be established from documented performance records of the producer consisting of a minimum of 15 consecutive 28 day compressive strength tests obtained within the last 12 months.

The standard deviation will be established as the product of the calculated standard deviation and multiplier.

NUMBER **OF TESTS**	***MULTIPLIER*** **FOR STANDARD** ***DEVIATION***
15	1.16
20	1.08
25	1.03
30 or more	1.00

Interpolate for intermediate number of tests.

(b) When past performance records are not available, the required average strength shall meet to the following:

Specified compressive strength, f_c', psi	Required average compressive strength, f_{cr}', psi
$f_c' < 3000$	$f_{cr}' = f_c' + 1000$
$3000 \leq f_c' \leq 5000$	$f_{cr}' = f_c' + 1200$
$f_c' > 5000$	$f_{cr}' = 1.10\, f_c' + 700$

902.10.07 Standard of Control. The average of all sets of three consecutive strength tests shall equal or exceed the critical value as specified in 902.10.03 which shall be computed using the following formula:

Critical Value = $fc^{'}$ + (1.14 X S) – 500

Failure to conform to this criteria shall be cause for immediate investigation and remedial action up to and including suspension of production. A design standard deviation equal to 15 percent of the specified strength shall be used for calculation until a minimum of 15 test results are obtained.

The actual average strength and standard deviation shall be computed upon the availability of 28 day strength data comprising a minimum of 15 tests. Should this determination indicate an excessive margin of safety, the concrete mix may be modified to produce lower average strength

as approved by the Engineer. If these calculations indicate a coefficient of variation greater than 15, the quality of the concrete and testing will be evaluated.

902.10.08 Testing. Sampling per T 141. Testing as follows:

TEST	METHOD	*MINIMUM TEST FREQUENCY*	*RESPONSIBILITY*
Temperature (e)	T 309	*1 per 50 yd^3 (or fraction thereof)*	*Project Engineer*
Slump (a)(e)	T 119	1 per 50 yd^3 (or fraction thereof)	Project Engineer
Air Content (a)(e)	T 152 T 196	1 per 50 yd^3 (or fraction thereof)	Project Engineer
Compression (b)(c)(d)	T 23	1 per 50 yd^3 (or fraction thereof)	Project Engineer
Compression (b)(c)(d) Mix No. 7 Only	T 23	3 per Day	Project Engineer

(a) A second test will be made when the first slump or air content test fails. Acceptance or rejection will be based on the results of the second test.
(b) Compressive strength tests are defined as the average of two companion cylinders.
(c) The Contractor shall be responsible for the making of all early break cylinders and furnishing the molds, stripping, curing/delivery of all cylinders, including 28 day cylinders, to the testing laboratory.
(d) The Project Engineer will be responsible for making, numbering and signing the 28 day cylinders.
(e) When constructing plain and reinforced concrete pavements, the testing frequency for slump, air content, and temperature shall be 1 per 100 yd^3 or fraction thereof.

902.10.09 Acceptance. Concrete will be acceptable if both of the following requirements are met:

(a) The average of all sets of three consecutive strength tests equal or exceed the specified design strength.

(b) No individual strength test (average of two companion cylinders) falls below the specified design strength by more than 500 psi.

902.10.10 Price Adjustment. A price adjustment will be based on the Contract unit price per cubic yard of concrete. If the unit is a lump sum item, the price per cubic yard for the concrete will be determined by dividing the cubic yards into the Contract lump sum price.

(a) Test Results More Than 500 psi Below the Specified Design Strength. Failing strength tests will be considered individually with a price adjustment being applied on the percentage basis as shown below.

(Price per yd^3) X (quantity of yd^3 represented by the failing concrete strength) X (percent of failure).

Example:

$400.00 per yd^3 X 50 yd^3 X [1-(3600/ 4500 psi)] = $4,000.00

No payment will be allowed when the test results fall below 50 percent of the specified design strength for structural concrete or 40 percent for incidental concrete.

The Engineer will determine when the strength of the concrete represented by the failing tests is sufficient to remain in place or whether it must be removed and replaced with Specification concrete.

(a) Test Results 500 psi or Less than the Specified Design Strength. Strength failures 500 psi or less than the specified design strength will be averaged with the next two consecutive tests. If those two tests include a failure greater than 500 psi, those tests will be evaluated as in 902.10.10(a) and replaced with the next consecutive test. If the resulting average falls below the specified design strength, a price adjustment will be applied as specified in the table below. Any failure will only be included in one grouping.

STRENGTH BELOW THE SPECIFIED (avg of 3 tests) DESIGN LEVEL, psi	**ADJUSTMENT FACTOR**
MIX NO. 1 THRU MIX NO. 7	
1 – 100	0.005
101 – 200	0.01
201 – 300	0.02
301 – 400	0.04
401 – 500	0.08

Adjustment price equals (price per yd^3) X (quantity of yd^3 represented by the failing cylinders) X (the adjustment factor).

Example:

$400.00 per yd^3 X 50 yd^3 X 0.01 = $200.00

902.11 MORTAR FOR GROUT. Mortar used for grouting anchor bolts, pipe, handrail posts, and miscellaneous items shall be composed in accordance with one of the following:

(a) One part Portland cement or blended hydraulic cement and one part mortar sand by dry loose volume.

(b) Prepared bag mixes consisting of Portland cement or blended hydraulic cement and mortar sand. The prepared mixes shall produce a mortar meeting the strength requirements specified in the Contract Documents.

(c) Use nonshrink grout when specified. The grout shall have a minimum compressive strength of 5000 psi in seven days when tested as specified per T 106, except that the cube molds shall remain intact with a top firmly attached throughout the curing period. The

nonshrink grout shall have a minimum expansion of 0.0 percent after seven days when tested as specified per T 160.

(d) Epoxy grout shall consist of sand and epoxy mixed by volume in per the manufacturer's recommendations. The grout shall be capable of developing a minimum compressive strength of 6500 psi in 72 hours when tested per MSMT 501. Sand for epoxy grout as specified in 901.01.

(e) An epoxy or polyester anchoring system may be used when approved by the Engineer in accordance with the manufacturer's recommendations. Strength values shall be as specified in the Contract Documents.

902.12 LINSEED OIL. Shall consist of a 50-50 mixture (by volume) of boiled linseed oil meeting Federal Specification TT-L-190 and kerosene per D 3699

902.13 LATEX MODIFIED CONCRETE. Portland cement concrete containing prequalified Laboratory approved styrene butadiene latex emulsion is defined as Latex Modified Concrete (LMC).

Latex emulsion shall have a minimum of 90 percent of the nonvolatiles as styrene butadiene polymers. The latex emulsion as specified in Table 902.13 A. The material shall be stored in suitable containers and be protected from freezing and exposure to temperatures in excess of 85 F.

LMC shall be proportioned using volumetric mixing and designed as follows:

LATEX MODIFIED CONCRETE	
MATERIAL	**SPECIFICATION LIMITS**
Portland Cement, CWT/yd^3, min	6.6
Latex Emulsion/Cement Ratio	0.31 – 0.34
Water/Cement Ratio, max	0.22
Entrained Air, %	6.0 ± 3
Slump, in.	5 ± 1

The physical properties of LMC shall conform to Table 902.13 B. The Contractor shall furnish the necessary 3 X 6 in. molds per M 205 to be used for the fabrication of compressive strength cylinders.

Control and Acceptance Sampling.

(a) Submit a two qt minimum sample, of the styrene butadiene latex emulsion to the AME daily for each lot of material used in a day's production.

(b) A batch for LMC is defined as the capacity of the equipment being used on the project. Slump and air samples will be taken and tested before the placement of a batch is permitted. The slump shall be measured four to five minutes after discharge from the mixer. The test material shall be deposited off the deck and not be disturbed during this waiting period. One additional sample for slump and air will be taken randomly during the placement of each batch. For seven day compressive strength, two tests each per batch are required. A test is defined as consisting of two companion cylinders. The samples for these tests will be taken at random while the placement is in progress.

TABLE 902.13 A

REQUIREMENTS FOR CHEMICAL PROPERTIES OF LATEX EMULSION MATERIALS

PROPERTY	SPECIFICATIONS		QUALITY ASSURANCE TESTS	
	LIMITS	TOLERANCE	PREQUALIFICATION TESTS	CONTROL AND ACCEPTANCE
Color	White	—	X	X
pH	9.0 – 11.0	—	X	X
Weight, lb/gal	8.40 – 8.47	—	X	X
Solids Content, %	46 – 53	—	X	X
*Butadiene Content, % of polymer	30 – 40	—	—	—
Viscosity @ 10 rpm-cps	Match Original	± 20	X	X
*Surface Tension, dynes/cm max	50	—	—	—
*Mean Particle Size, polymer – Å	1400 – 2500	—	—	—
Coagulum, % max	0.10	—	X	X
*Freeze-Thaw Stability, coagulum, % max	0.10	—	X	X
Infrared Spectra of Latex Film	Match Original	—	X	X
Infrared of Alcohol, Soluble Portion of Latex	Match Original	—	X	X
Shelf Life, min	1 yr	—	X	—

Note 1: Quality assurance tests shall be conducted as specified in MSMT 612 except those denoted by an * shall be conducted as specified in FHWA RD – 78-35.

Note 2: The original or prequalification sample shall be accompanied by the producer's certification on all of the tests and properties noted above and as specified in TC-1.02. The certification shall contain actual test values of the product and the infrared spectrograph.

Note 3: A separate certification is required for each lot of material. The certification shall note the date of manufacture, lot size, and whether or not the material is identical to the formulation of the original sample.

TABLE 902.13 B

LATEX MODIFIED CONCRETE PHYSICAL PROPERTIES			
TEST PROPERTY	**TEST VALUES**	***QUALITY ASSURANCE TESTS***	
		PREQUALIFIED TESTS	**CONTROL AND ACCEPTANCE**
7 Day Compressive Strength, psi min	3000	X	X
28 Day Compressive Strength, psi min	3500	X	—
42 Day Compressive Strength, psi min	3500	X	—
7 Day Flexural Strength, psi min	550	X	—
28 Day Flexural Strength, psi min	650	X	—
42 Day Shear Bond Strength, psi min	2000	X	—
Durability Factor, 300 cycles, % min	85	X	—
Chloride Permeability, Ppm max	510	X	—
Scaling Resistance, 50 cycles, max	3	X	—

Note 1: Quality assurance tests shall be conducted as specified in MSMT 721.

Note 2: Seven Day Compressive Strength Test will be used for Control & Acceptance of the material. The minimum specified design strength is 3000 psi at seven days. The mix design approval and acceptance will be based on a coefficient of variation of 10 percent with a probability of 1 in 10 tests falling below the specified strength. Only test values 80% or greater than the specified strength will be accepted

902.14 RAPID HARDENING CEMENTITIOUS MATERIALS FOR CONCRETE PAVEMENT REPAIRS. Materials shall be a dry, packaged cementitious mortar having less than 5 percent by weight of aggregate retained on the 3/8 in. sieve and meet the following requirements:

Classification.

Class I — For use at ambient temperatures below 50 F.

Class II — For use at ambient temperatures of 50 to 90 F.

Class III — For use at ambient temperatures above 90 F.

Chemical Requirements. C 928 except that no organic compounds such as epoxy resins or polyesters as the principal binder

Physical Requirements. Meet the following when tested per MSMT 725:

A. **COMPRESSIVE STRENGTH, psi min**				
CLASSIFICATION	**< 2 hr**	**2-6 hr**	**6 hr**	**28 days**
Type I — Slow	—	—	2000	4500
Type II — Rapid	—	2000	—	4500
Type III — Very Rapid	2500	—	—	4500

TEST RESULTS	
TEST PROPERTY	**LIMITS**
Bond Strength, 7 days, psi min	2000
Length Change, increase after 28 days in water, based on length at 3 hr, % max	+ 0.15
Length Change, decrease after 28 days, % max	- 0.15
Freeze Thaw, loss after 25 cycles in 10% $CaCl_2$ solution, % max	8
Initial Setting Time, minutes min	10

Marking. All packages delivered to the project shall be marked with the following information:

(a) Date material was packaged.

(b) Approximate setting time.

(c) Recommended dosage of water or liquid component.

(d) Mixing instructions.

(e) Class or temperature range.

Certification. The manufacturer shall furnish certification as specified in TC-1.02 showing the actual test results for each class and type of material submitted to the Laboratory.

902.15 SYNTHETIC FIBERS. When synthetic fibers are specified in the Contract Documents, the fibers shall be 1/2 to 1-1/2 in. long and conform to C 1116, Type III. The manufacturer shall furnish certification as specified in TC-1.02. The quantity of fibers used and their point of introduction into the mix shall conform to the fiber manufacturer's recommendations.

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MATERIALS

SECTION 950 - TRAFFIC MATERIALS

950.03 REFLECTORIZATION OF SIGNS AND CHANNELIZING DEVICES.

DELETE: 950.03.03 Type IX Retroreflective Sheeting in its entirety.

INSERT: The following.

950.03.03 Permanent Signs Retroreflective Sheeting. Retroreflective sheeting for permanent signs shall conform to ASTM D 4956-05, except as modified below:

MINIMUM REFLECTIVE INTENSITY VALUES FOR RETROREFLECTIVE SHEETING
Minimum Coefficient of Retroreflection·(R_A) cd/(lx · m^2)
Per ASTM E-810 (Average of 0 and 90 degree orientation)

Observation Angle°	Entrance Angle°	White	Yellow	Fluor. Yellow	Fluor. Yellow-Green	Red	Green	Blue	Fluor. Orange
0.2	-4	570	425	340	455	114	57	26	170
0.2	30	215	160	130	170	43	21	10	64
0.5	-4	400	300	240	320	80	40	18	120
0.5	30	150	112	90	120	30	15	6.8	45
1	-4	120	90	72	96	24	12	5.4	36
1	30	45	34	27	36	9	4.5	2	14

INSERT:

950.03.07 Permanent Traffic Signs (PTS) Unless otherwise specified in the Contract Documents, retroreflective sheeting for permanent signs shall conform to 950.03.03.

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SECTION 950 - TRAFFIC MATERIALS

950.12 LUMINAIRES AND LAMPS

820.01.01 Luminaire Construction

DELETE: subsection C and replace with:

(c) Sign lighting luminaires shall utilize Inductively Coupled Electrodeless Lighting Systems ("ICELS"). Each ICELS shall consist of a heavy gauge A383 aluminum die cast luminaire housing with 5/32" thick microprismatic tempered glass lens. All fasteners shall be stainless steel. The luminaire shall be complete with sheet aluminum reflector made from 95 percent reflective aluminum. The completed luminaire shall be U.L. and wet location listed. The luminaire shall be compliant with vibration testing in accordance with ANSI C136.21, the 2001 American National Standard for Roadway Lighting Equipment – Luminaire Vibration. The lamp and ballast shall be securely mounted within the luminaire. The completed luminaire housing shall be IP66 rated. The luminaire shall be rated to start and operate between -40° F to +131° F when operated at 277V. The lamp and ballast shall be rated for a 100,000 hour life and lumen output shall be at least 70 percent of initial output at 60,000 hours. Lamp system Color Rendering Index (CRI) shall be 75 or greater. Ballast shall be universal type suitable for operation with any standard voltage from 120VAC through to 277VAC, 60Hz. The lamp system shall be an instant on/instant re-strike system. The system wattage (lamp and ballast) shall be rated 150 Watts with maximum system draw of 156W at 277V and 161W at 120V. The lamp and ballast shall be furnished with a six (6) year manufacturer warranty that shall replace failed lamps and ballasts with parts-only replacement lamps or ballasts upon failure.

ADD: to table in section 950.12.02

TYPE	WATTS	INITIAL LUMENS	RATED LIFE (10 hr/start)	PERCENT INITIAL LUMENS
ICELS	150	11,000	60,000	≥0.70 @ 60,000hrs ≥0.63 @ 100,000hrs

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MATERIALS

SECTION 951 — PAVEMENT MARKING MATERIALS

951.04 REMOVABLE PAVEMENT MARKING TAPE. Removable pavement marking tape shall remain in place on the pavement surface without being displaced by traffic, or affected by weather conditions. The material shall be capable of being removed without the use of heat, solvents, grinding, or sand blasting and shall not leave an objectionable residue.

The material shall be of good appearance and free from cracks. Edges shall be true, straight and unbroken. Line marking material shall be in rolls having no more than three splices per 150 ft. of length. All marking materials shall be packaged in conformance with accepted commercial standards and shall have a minimum shelf life of one (1) year.

Performance Requirements. When applied in conformance with the manufacturer's recommendations, the material shall provide a neat, durable marking that will not flow or distort due to temperature if the pavement surface or underlying markings remain stable. The material shall be weather resistant and, through normal traffic wear, shall show no lifting or shrinkage that will significantly impair the intended usage of the tape throughout its useful life, and shall show no significant tearing while in place, or other signs of poor adhesion. The material shall be capable of easy removal without tearing into small pieces.

951.04.01 White and Yellow. Removable preformed pavement marking materials shall conform to the requirements of the Md MUTCD and the following:

(a) Composition. The marking material shall consist of a mixture of polymeric materials, pigment, and glass beads distributed uniformly throughout the surface.

(b) Color. The color of the marking materials shall match Federal Test Standard No. 595 for the following color numbers:

White - 37925
Yellow - 38907

(c) Glass Beads. Glass beads shall conform to the General Requirements of M 247 and have a minimum refractive index of 1.90 when tested as specified in MSMT 211.

(d) Frictional Resistance. The British Pendulum Number shall be a minimum of 50 when tested as specified in E 303.

(e) Certification. Samples submitted to the Office of Materials Technology ("OMT") for testing shall be accompanied by the manufacturer's certified analysis in conformance with TC-1.02.

Any material supplied for a Contract shall be identical in composition to the material originally submitted for testing. Conformity will be determined by OMT.

(f) Field Testing. Line marking materials conforming to the Contract Documents will be field tested by The National Transportation Product Evaluation Program ("NTPEP") and over a 180 day period as specified in MSMT 723 for conformance with the following:

(1) Ease of Application - satisfactory.

(2) Removability - a minimum rating of 2.

(3) Residue Remaining at Time of Removal (day and night) - minimum rating of 2.

(4) Durability, Appearance, and Night Visibility - minimum weighted rating of 4.

(5) Loss or Movement - minimum rating of 2.

Upon satisfactory completion of the field testing, the marking materials will be placed on OMT's Qualified Products List. The material shall conform to all criteria for a minimum period of 120 days to be considered satisfactory.

951.04.02 Black. Removable preformed pavement marking materials shall conform to the requirements of the Md MUTCD and the following:

(a) Composition. The non-reflective blackout tape shall not contain metallic foil and shall consist of a mixture of high quality polymeric materials, pigments, and inorganic fillers distributed throughout its cross-sectional area, with a matte black non-reflective surface. The film shall be pre-coated with a pressure sensitive adhesive. A nonmetallic medium shall be incorporated to facilitate removal.

For patterned materials, a minimum of 20 percent of the total surface area shall be raised and coated with nonskid particles. The channels between the raised areas shall be substantially free of particles.

(b) Color. The color of the blackout material shall match Federal Test Standard No. 595 for the following color numbers:

Black - 37038 (or as approved by the Engineer)

(c) Frictional Resistance. The British Pendulum Number shall be a minimum of 50 when tested as specified in E 303.

(d) Certification. Samples submitted to OMT for testing shall be accompanied by the manufacturer's certified analysis in conformance with TC-1.02.

Any material supplied for a Contract shall be identical in composition to the material originally submitted for testing. Conformity will be determined by OMT.

(e) Field Testing. Line marking materials conforming to the Contract Documents will be field tested by The National Transportation Product Evaluation Program ("NTPEP") and over a 180 day period as specified in MSMT 723 for conformance with the following:

(1) Ease of Application - satisfactory.

(2) Removability - a minimum rating of 2. The manufacturer shall show that the blackout tape can be manually removed after its intended use, intact or in large pieces, at temperatures above

40º F without the use of heat, solvents, grinding, or sand or water blasting. The blackout tape shall remove cleanly from existing markings that are adequately adhered to the pavement surface.

(3) Residue Remaining at Time of Removal (day and night) - minimum rating of 2.

(4) Durability, Adhesion, Appearance, and Night Visibility - minimum weighted rating of 4. The manufacturer shall demonstrate that the properly applied blackout tape adheres to the roadway and existing stable roadway markings under climatic and traffic conditions normally encountered in the construction work zone.

(5) Loss or Movement - minimum rating of 2.

Upon satisfactory completion of the field testing, the marking materials will be placed on OMT's Qualified Products List. The material shall conform to all criteria for a minimum period of 180 days to be considered satisfactory.

951.04.03 Packaging. Preformed pavement markings shipping package shall conform to the manufacturer's shipping requirements to prevent damage during delivery and unloading of all shipments. The shipping package shall be marked with the following information placed on each container:

(a) Description of item.

(b) Date of manufacture.

(c) Successful Bidder's Name.

(d) Purchase Order Number.

(e) Lot Number.

(f) Color.

(g) Installation instructions.

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SECTION 951 — PAVEMENT MARKING MATERIALS

951.07 PERMANENT PREFORMED PATTERNED REFLECTIVE PAVEMENT ("PPPRP") MARKING MATERIAL. The material shall be capable of adhering to hot mix asphalt and portland cement concrete surfaces, and to any existing pavement markings in accordance with manufacturer's recommendations by a pre-coated pressure sensitive adhesive. A primer shall be used to precondition the surface if recommended by the manufacturer. The markings shall be capable of being inlaid in new hot mix asphalt surfaces during the paving operation.

The material shall be highly durable and retroreflective and shall be fabricated of a polymeric material designed for longitudinal and legend/symbol markings subjected to high traffic volumes and severe wear conditions, such as shear action from crossover or encroachment on typical longitudinal configurations, and where high levels of reflectivity are required to ensure the safety of the motoring public.

The material shall be of good appearance and free from cracks. Edges shall be true, straight and unbroken. Line marking material shall be in rolls having no more than three splices per 150 ft. of length. All marking materials shall be packaged in conformance with accepted commercial standards and shall have a minimum shelf life of one (1) year.

The material shall remain in place on the pavement surface without being displaced by traffic, and shall not be affected by weather conditions.

951.07.01 Permanent Preformed Patterned Reflective Pavement Marking Material Components.

Composition. The material shall consist of a mixture of polymeric materials, pigments and reflective spheres distributed throughout the base cross-sectional area and reflective spheres bonded to the topcoat surface to provide immediate and continuing retroreflection.

Restrictions. The combined total of lead, cadmium, mercury and hexavalent chromium shall not exceed 100 ppm. Diarylide based pigments and non-leachable lead pigmentation are not acceptable. The presence of these compounds shall be tested for compliance to the specification by X-ray diffraction, ICP, or another comparable method, capable of this level of detection.

951.07.02 Permanent Preformed Patterned Reflective Pavement Marking Material Physical Requirements.

(a) Reflectance. The manufacturer shall certify that the white and yellow materials shall have the minimum initial retroreflectance values of 350 mcd/L/m^2 for white and 250 mcd/L/m^2 for yellow markings in any 528 ft section. Reflectance shall be measured using a reflectometer with CEN 30-meter geometry (88.76 degree entrance angle and 1.05 degree observation angle).

(b) Color. The color of preformed markings shall essentially match the 37886, 33538 or 37038 color chips for white, yellow or black respectively as shown in Federal Standard 595A.

(c) Frictional Resistance. The surface of the retroreflective pliant polymer shall provide a minimum initial average skid resistance value of 45 BPN when tested according to ASTM E 303.

951.07.03 Field Testing. Materials conforming to this specification shall be field evaluated at the National Transportation Product Evaluation Program ("NTPEP") Northeast test deck for performance. Materials performing satisfactorily throughout the test period will be placed on the Administration's Prequalified Materials List. All marking materials supplied during the Contract shall be identical in composition to the materials submitted for initial testing. Conformity with these requirements will be determined by the Office of Materials and Technology.

951.07.04 Prequalification. Samples shall be taken by the Administration for testing. The manufacturer shall submit any data from AASHTO NTPEP Northeast Test Deck which support material performance. Materials conforming to this Specification will be placed on the Administration's Prequalified List of Patterned Tapes.

951.07.05 Certification. The Contractor shall furnish notarized certification as specified in TC-1.02. The manufacturer shall certify that any reflective thermoplastic materials supplied during the Contract conforms to the identical formulation as the samples submitted for evaluation on the NTPEP Northeast test deck, and identify the formulas by referring to the code used on the deck. Reflective thermoplastic materials which fail to conform will be rejected.

The manufacturer shall also provide the following:

(a) Material Safety Data Sheets for all materials submitted for testing and use.

(b) A facility, presently in operation, capable of producing the reflective thermoplastic materials in the quantity and quality required by the Administration.

(c) A laboratory subject to the Administration's approval which is capable of performing the required tests.

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MATERIALS

SECTION 952 — FIBER OPTIC CABLES

952.01 FIBER OPTIC CABLES

All fiber optic cables shall be graded index glass fiber. Fiber optic cladding material shall be concentric with the fiber optic wave-guide core and shall match Corning SMF-28 fiber numerical aperture and optical transmission properties.

Fiber Optic cables shall be of loose tube (gel free) type with a non-metallic strength member and each buffeted tube shall contain a water blocking material that is non-nutritive to fungus and electrically non-conductive. The water blocking material shall allow free movement of the fibers, without loss of performance, during installation and normal operation. .

Protective covering of the fiber optic cable's jacket shall be a continuous covering on a single length cable with the same material, and shall be free from holes, splits, blisters, and other imperfections. The cable jacket shall also be made of a low friction material.

All fiber optic cables to be used in this project shall be rated for outdoor use.
Cable jacketing shall be permanently labeled approximately every two feet with the cable manufacturer's name, cable type, fiber count, manufacturing date, and incremental cable length. The cable length shall be to the cable sheath length.

Color coding of the fibers shall be in accordance with EIA specifications.

Fiber optic cables shall be appropriately rated for the purpose.

All fiber optic cables shall be UL listed.

952.01.02 Single-Mode Fiber Optic Cables

Maximum loss shall be 0.45 dB/Km at 1300 nm and 0.45 db/Km at 1550 nm. Single mode fiber shall be color coded Yellow. Single mode fiber shall not be dispersion shifted. The fiber cable shall meet the following specifications:

Fiber Dimensions
1. Single mode 8.3 µm core
2. 125 µm cladding,
a. Core-cladding concentricity _ 0.5 µm
b. Cladding non-circularity _ 1%
3. 250 µm coating
4. 900 µm buffering
5. Proof Test Level – 100 kpsi

Cable Minimum Bending Radius
1. During installation: 20 times cable diameter
2. After installation: 10 times cable diameter
3. Buffered Fiber Minimum Bending Radius: 0.75 inch (1.91 cm)

Operating Temperature Range
-40°C to +85°C

Storage Temperature Range
-55°C to +85°C

Optical Specifications
1. Maximum Fiber Loss: 0.40 dB/km at 1310 nm (typical range 0.35 to 0.40 dB/km)
2. Numerical Aperture: equivalent to Corning SMF-28 fiber.