



STATE HIGHWAY  
ADMINISTRATION

# *Maryland Department of Transportation*

## *State Highway Administration Baltimore, Maryland Invitation for Bids*

Contract No. BA0065172

△<sup>1</sup>F.A.P No. AC-NHPP-695-6(385)N

### **IS-695 TSMO**

## **IS-695 FROM IS-70 TO MD 43 TRANSPORTATION SYSTEMS MANAGEMENT AND OPERATIONS**

### **Baltimore County**

Minority Business Enterprises are encouraged to respond to this Solicitation Notice.

The State Highway Administration will only be responsible for the completeness of documents, including all addenda, obtained directly from posting on eMaryland Marketplace by the Administration.

Failure to complete and include the Addendum Receipt Verification Form may cause the bid to be irregular.

VENDOR I.D. NUMBER

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S.H.A. USE ONLY

## **NOTICE TO CONTRACTORS**

### **CARGO PREFERENCE ACT (CPA)**

All Contractors and Sub-Contractors are to be in compliance with the requirements of 46 CFR Part 381 and incorporate by reference the recommended clauses in 46 CFR 381.7(a)-(b) - ("Contractor and Subcontractor Clauses. "Use of United States-flag vessels")

(a) Agreement Clauses. "Use of United States-flag vessels:

"(1) Pursuant to Pub. L. 664 (43 U.S.C. 1241(b)) at least 50 percent of any equipment, materials or commodities procured, contracted for or otherwise obtained with funds granted, guaranteed, loaned, or advanced by the U.S. Government under this agreement, and which may be transported by ocean vessel, shall be transported on privately owned United States-flag commercial vessels, if available.

"(2) Within 20 days following the date of loading for shipments originating within the United States or within 30 working days following the date of loading for shipments originating outside the United States, a legible copy of a rated, 'on-board' commercial ocean bill-of-lading in English for each shipment of cargo described in paragraph (a)(1) of this section shall be furnished to both the Contracting Officer (through the prime contractor in the case of subcontractor bills-of-lading) and to the Division of National Cargo, Office of Market Development, Maritime Administration, Washington, DC 20590."

(b) Contractor and Subcontractor Clauses. "Use of United States-flag vessels: The contractor agrees-

"(1) To utilize privately owned United States-flag commercial vessels to ship at least 50 percent of the gross tonnage (computed separately for dry bulk carriers, dry cargo liners, and tankers) involved, whenever shipping any equipment, material, or commodities pursuant to this contract, to the extent such vessels are available at fair and reasonable rates for United States-flag commercial vessels.

"(2) To furnish within 20 days following the date of loading for shipments originating within the United States or within 30 working days following the date of loading for shipments originating outside the United States, a legible copy of a rated, 'on-board' commercial ocean bill-of-lading in English for each shipment of cargo described in paragraph (b) (1) of this section to both the Contracting Officer (through the prime contractor in the case of subcontractor bills-of-lading) and to the Division of National Cargo, Office of Market Development, Maritime Administration, Washington, DC 20590.

"(3) To insert the substance of the provisions of this clause in all subcontracts issued pursuant to this contract".

Guidance documents for this requirement, including the 12/11/2015 policy memo, the 12/8/2015 legal opinion and a page of Q&A's are available on the CPA construction Program Guidance page:

<https://www.fhwa.dot.gov/construction/cqit/cargo.cfm>

This requirement applies to material or equipment that is acquired for a specific Federal-aid highway project. It is not applicable to goods or materials that come into inventories independent of an FHWA funded-contract.

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
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**CONTRACT PROVISIONS**  
**CONTRACTOR REGISTRATION REQUIREMENTS**

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**CONTRACTOR REGISTRATION REQUIREMENTS**

On all Federal-Aid funded contracts, the Administration is requiring that Contractors have an active Dun and Bradstreet Data Universal Numbering System (DUNS) and be registered in the Central Contract Registration (CCR) database prior to Award of Contract.

The Contractor DUNS number is a unique nine-digit number issued by Dun & Bradstreet, followed by the optional 4 digit DUNS Plus number (reported as “999999999.9999”). A DUNS number can be obtained on-line at <http://fedgov.dnb.com/webform>.

The Central Contractor Registration (CCR) is no longer the primary registrant database for the U.S. Federal Government.

The System for Award Management (SAM) is the Official U.S. Government system that consolidated the capabilities of CCR/FedReg, ORCA, and EPLS. There is NO fee to register for this site. Entities may register at no cost directly from this page. User guides and webinars are available under the Help tab. Contractors can now register on-line at <https://www.sam.gov>.

**CONTRACT PROVISIONS**  
MARYLAND MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES  
(MdMUTCD) REQUIREMENTS

CONTRACT NO. BA0065172

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**NOTICE TO ALL HOLDERS OF THIS CONTRACT DOCUMENT**

**MARYLAND MANUAL ON UNIFORM TRAFFIC CONTROL  
DEVICES (MdMUTCD) REQUIREMENTS**

The 2011 Maryland Manual on Uniform Traffic Control Devices (MdMUTCD) is the legal State standard for traffic control devices. All traffic control devices (temporary or permanent) utilized on Administration projects shall be in conformance with the requirements provided in the 2011 Edition of the Administration's MdMUTCD for Streets and Highways.

**NOTICE TO ALL HOLDERS OF THIS CONTRACT DOCUMENT**

**NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM (NCHRP)  
REPORT 350 AND THE MANUAL FOR ASSESSING SAFETY HARDWARE (MASH)  
COMPLIANCE FOR DEVICES USED IN THE MAINTENANCE OF TRAFFIC AND  
TRAFFIC CONTROL**

Except as otherwise specified in this section, all temporary and permanent highway safety features, including longitudinal barriers, transitions, end terminals, crash cushions, breakaway/yielding supports, truck-mounted attenuators, and work zone traffic control devices, shall meet values recommended when applicable tests are performed for evaluation criteria for the respective evaluation factors, as defined in NCHRP Report 350, or the MASH 2016, as noted herein. When conformance with NCHRP Report 350 or MASH 2016 is required, provide the Engineer with the manufacturers' certifications that the devices comply with the specified criteria. All temporary and permanent highway safety features shall comply with MASH 2016 criteria by the relevant dates noted below.

**TEMPORARY INSTALLATIONS FOR MAINTENANCE OF TRAFFIC**

The implementation dates below apply to temporary work zone roadside safety hardware and devices.

Temporary work zone devices, including Category 1, 2, 3 and 4 devices manufactured after 12/31/2019, when applicable, must be successfully tested to the 2016 edition of MASH. Relevant devices manufactured on or before 12/31/2019, and successfully tested to NCHRP 350, the 2009 edition of MASH, or otherwise authorized, may continue to be used.

Unless specifically waived in the Contract Documents, only devices approved on Qualified Product List by the Administration may be used.

**Category 1 Devices**

These devices include cones, tubular markers, flexible delineator posts, and drums, none of which have any accessories or attachments, and are used for channelization and/or delineation.

**Category 2 Devices**

These devices include Type I, II, and III barricades, portable sign supports with signs, intrusion alarms, and vertical panels. Category 1 devices, such as drums or cones, that are modified with accessories or attachments shall be considered Category 2 devices.

**Category 3 Devices**

- (a) Truck Mounted Attenuators (TMAs) and Trailer Truck Mounted Attenuators (TTMAs).
- (b) Temporary Barrier.
  - (1) Concrete Barrier.
  - (2) Traffic Barrier W-Beam and Water Filled Barrier.
  - (3) Steel/Aluminum Barrier.

**CONTRACT PROVISIONS**  
(NCHRP) REPORT 350 AND MASH COMPLIANCE

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(c) Temporary End Treatments.

**Category 4 Devices**

These devices include area lighting supports, arrow panels, and portable variable message signs that may be portable or trailer-mounted.

Use of Category 4 devices shall comply with the provisions of Part 6 of the MD MUTCD.

**PERMANENT ROADSIDE HARDWARE INSTALLATION**

The implementation dates below apply to both new and replacement installations of roadside safety hardware on National Highway System (NHS) roadways except when a waiver is approved by FHWA

**December 31, 2017:** Contracts with bid openings after this date shall meet MASH 2016 testing criteria for all installations and replacements of W-beam barriers and cast-in-place concrete barriers as specified in Contract Documents.

**June 30, 2018:** Contracts with bid openings after this date shall meet MASH 2016 testing criteria for all installations and replacements of W-beam tangent terminals as specified in Contract Documents.

**December 31, 2018:** Contracts with bid openings after this date shall meet MASH 2016 testing criteria for all installations and replacements of crash cushions.

**December 31, 2019:** Contracts with bid openings after this date shall meet testing criteria as defined in MASH 2016 guidelines for all new permanent installations and full replacements of bridge rail, transitions, all other longitudinal barrier (including portable barriers installed permanently), other W-beam terminals (such as double-sided or median terminals, flared terminals, and terminals installed on a flare), sign supports, cable barrier, cable barrier terminals, all other terminals, and all other breakaway hardware as specified in Contract Documents.

### **OCCUPYING WETLANDS/WATERWAYS FOR DESIGN-BUILD**

The Contractor is hereby alerted to the importance of preserving waterways and wetland areas. The Administration, in conjunction with the various environmental agencies, has developed these Contract Documents so as to minimize or eliminate disturbance and damage to existing waterways and wetland areas. Any design changes must result in further avoidance and minimization of disturbance of wetlands and waterways. In order to accomplish this, the following must be rigidly adhered to:

- (a) Prior to performing any work on the project, the areas of wetland will be identified and marked by orange safety fence or as directed by the Engineer. All personnel of the Contractor or sub-contractors shall be alerted to these designated areas.
- (b) The Contractor or sub-contractors shall not impact any wetland or waterway, whether it be permanently or temporarily unless otherwise stipulated in the permit and approved as an authorized action by the appropriate regulatory agency. No fill shall be placed in these areas without an appropriate permit. No storage of equipment or materials will be allowed in wetlands.
- (c) The Contractor or sub-contractor shall not impact a wetland or waterway that is not covered by an existing wetland permit.
- (d) If the Contractor impacts any wetland or waterway for which they do not have a wetland permit, they shall be responsible for contacting the State Highway Administration's Environmental Programs Division prior to restoring the wetland areas and mitigating the wetland impacts to the full satisfaction of the environment regulatory agencies, which could include monetary compensation.
- (e) The cost of restoration and mitigation of the impacted areas shall be at no additional cost to the Administration.
- (f) The Design-Builder will prepare permit modifications at the conclusion design and at the conclusion of construction. The modification will be based on surveyed as-built plans and will include standard 8.5"x 11.0" plates and a revised Joint State/Federal Nontidal Wetlands and Waterways Permit application.
- (g) This Contract will include the oversight of an Environmental Monitor supplied by the Administration. His duties will be to make sure the Contractor abides by all conditions in the environmental permits. He will also assist the Contractor in developing ideas to minimize impacts to the wetlands. The Contractor will still be responsible for all violations occurring as stated above.

The importance of not abusing waterways and wetland areas cannot be overemphasized. It is possible that abuse of waterways and wetland areas could jeopardize the operation of the total Contract and could be cause for a shut-down. If a shut-down occurs because of the Contractor's failure to secure the required permits(i.e. the Contractor's method of work includes impacts not approved by previously acquired permits), the Contractor's negligence or operations, all costs and

damages to the Contractor and to the State will be at the Contractor's expense. Non-compliance with these requirements will not be considered for an extension of Contract time.

**BEST MANAGEMENT PRACTICES FOR WORKING IN NONTIDAL WETLANDS, WETLAND BUFFERS, WATERWAYS, AND 100-YEAR FLOODPLAINS**

1. NO EXCESS FILL, CONSTRUCTION MATERIAL, OR DEBRIS SHALL BE STOCKPILED OR STORED IN NONTIDAL WETLANDS, NONTIDAL WETLAND BUFFERS, WATERWAYS, OR THE 100-YEAR FLOODPLAIN.
2. PLACE MATERIALS IN A LOCATION AND MANNER WHICH DOES NOT ADVERSELY IMPACT SURFACE OR SUBSURFACE WATER FLOW INTO OR OUT OF NONTIDAL WETLANDS, NONTIDAL WETLAND BUFFERS, WATERWAYS, OR THE 100-YEAR FLOODPLAIN.
3. DO NOT USE THE EXCAVATED MATERIAL AS BACKFILL IF IT CONTAINS WASTE METAL PRODUCTS, UNSIGHTLY DEBRIS, TOXIC MATERIAL, OR ANY OTHER DELETERIOUS SUBSTANCE. IF ADDITIONAL BACKFILL IS REQUIRED, USE CLEAN MATERIALS FREE OF WASTE METAL PRODUCTS, UNSIGHTLY DEBRIS, TOXIC MATERIAL, OR ANY OTHER DELETERIOUS SUBSTANCE.
4. PLACE HEAVY EQUIPMENT ON MATS OR SUITABLY OPERATE THE EQUIPMENT TO PREVENT DAMAGE TO NONTIDAL WETLANDS, NONTIDAL WETLAND BUFFERS, WATERWAYS, OR THE 100-YEAR FLOODPLAIN.
5. REPAIR AND MAINTAIN ANY SERVICEABLE STRUCTURE OR FILL SO THERE IS NO PERMANENT LOSS OF NONTIDAL WETLANDS, NONTIDAL WETLAND BUFFERS, OR WATERWAYS, OR PERMANENT MODIFICATION OF THE 100-YEAR FLOODPLAIN IN EXCESS OF THAT LOST UNDER THE ORIGINALLY AUTHORIZED STRUCTURE OR FILL.
6. RECTIFY ANY NONTIDAL WETLANDS, WETLAND BUFFERS, WATERWAYS, OR 100-YEAR FLOODPLAIN TEMPORARILY IMPACTED BY ANY CONSTRUCTION.
7. ALL STABILIZATION IN THE NONTIDAL WETLAND AND NONTIDAL WETLAND BUFFER SHALL CONSIST OF THE FOLLOWING SPECIES:

ANNUAL RYEGRASS (LOLIUM MULTIFLORUM), MILLET (SETARIA ITALICA), BARLEY (HORDEUM SP.), OATS (UNIOLA SP.) AND/OR RYE (SECALE CEREALE). THESE SPECIES WILL ALLOW FOR THE STABILIZATION OF THE SITE WHILE ALSO ALLOWING FOR THE

VOLUNTARY REVEGETATION OF NATURAL WETLAND SPECIES. OTHER NON-PERSISTENT VEGETATION MAY BE ACCEPTABLE, BUT MUST BE APPROVED BY THE NONTIDAL WETLANDS AND WATERWAYS DIVISION. KENTUCKY 31 FESCUE SHALL NOT BE UTILIZED IN WETLAND OR BUFFER AREAS. THE AREA SHOULD BE SEEDED AND MULCHED TO REDUCE EROSION AFTER CONSTRUCTION ACTIVITIES HAVE BEEN COMPLETED.

8. AFTER INSTALLATION HAS BEEN COMPLETED, MAKE POST CONSTRUCTION GRADES AND ELEVATIONS THE SAME AS THE ORIGINAL GRADES AND ELEVATIONS IN TEMPORARILY IMPACTED AREAS.
9. TO PROTECT AQUATIC SPECIES, IN-STREAM WORK IS PROHIBITED AS DETERMINED BY THE CLASSIFICATION OF THE STREAM:
  - A. USE I WATERS: IN-STREAM WORK SHALL NOT BE CONDUCTED DURING THE PERIOD MARCH 1 THROUGH JUNE 15, INCLUSIVE DURING ANY YEAR.
  - B. USE III WATERS: IN-STREAM WORK SHALL NOT BE CONDUCTED DURING THE PERIOD OCTOBER 1 THORUGH APRIL 30, INCLUSIVE, DURING ANY YEAR.
  - C. USE IV WATERS: IN-STREAM WORK SHALL NOT BE CONDUCTED DURING THE PERIOD MARCH 1 THROUGH MAY 31, INCLUSIVE, DURING ANY YEAR.
10. STORMWATER RUNOFF FROM IMPERVIOUS SURFACES SHALL BE CONTROLLED TO PREVENT THE WASHING OF DEBRIS INTO THE WATERWAY.
11. CULVERTS SHALL BE CONSTRUCTED AND ANY RIPRAP PLACED SO AS NOT TO OBSTRUCT THE MOVEMENT OF AQUATIC SPECIES, UNLESS THE PURPOSE OF THE ACTIVITY IS TO IMPOUND WATER.

**CONTRACT PROVISIONS**  
DBE FOR FEDERAL-AID CONTRACTS

CONTRACT NO. BA0065172  
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**AFFIRMATIVE ACTION REQUIREMENTS  
UTILIZATION OF DISADVANTAGED BUSINESS ENTERPRISES  
FOR FEDERAL-AID CONTRACTS**

**CONTRACT GOALS**

FOR THE PURPOSE OF THIS CONTRACT, A GOAL OF 27 PERCENT HAS BEEN ESTABLISHED FOR SOCIALLY AND ECONOMICALLY DISADVANTAGED BUSINESSES THAT ARE OWNED AND CONTROLLED BY – THOSE INDIVIDUALS WHO ARE BLACK AMERICANS, HISPANIC AMERICANS, ASIAN-PACIFIC AMERICANS, SUBCONTINENT ASIAN AMERICANS, NATIVE AMERICANS, OR WOMEN PURSUANT TO THE MARYLAND DEPARTMENT OF TRANSPORTATION (MDOT) MINORITY BUSINESS ENTERPRISE PROGRAM:

It is the policy of the Maryland Department of Transportation that disadvantaged business enterprises as defined in 49 CFR Part 26 and the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) shall have an equal opportunity to participate in the performance of the contracts financed in whole or in part with Federal funds under these agreements. Consequently, the disadvantaged business enterprise requirements of 49 CFR Part 26 and SAFETEA-LU apply to this agreement.

The bidder agrees to ensure that disadvantaged business enterprises as defined in 49 CFR Part 26 and SAFETEA-LU have an equal opportunity to participate in the performance of contracts and subcontracts financed in whole or in part with Federal funds provided under this agreement. In this regard, all bidders shall take all necessary and reasonable steps in accordance with 49 CFR Part 26 and SAFETEA-LU to ensure that disadvantaged business enterprises have an equal opportunity to compete for and perform on Federally funded contracts.

The Maryland State Highway Administration, in accordance with the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 USC §§ 2000d to 2000d-4) and the Regulations, hereby notifies all bidders that it will affirmatively ensure that any contract entered into pursuant to this advertisement, disadvantaged business enterprises will be afforded full and fair opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, or national origin in consideration for an award. "

**A. GENERAL**

For the purpose of these requirements, the following terms as defined below shall apply:

**Administration Representative** – A DBE/MBE Officer or employee of an Administration who enforces the laws and regulations pertaining to disadvantaged and minority business enterprise and contract compliance.

**Affirmative Actions** – Specific steps taken to eliminate discrimination and its effects, to ensure nondiscriminatory results and practices in the future, and to involve disadvantaged and minority business enterprises fully in contracts and programs.



**CONTRACT PROVISIONS**  
**DBE FOR FEDERAL-AID CONTRACTS**

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**Business Enterprises** – Any legal entity which is organized in any form other than as a joint venture (e.g., sole proprietorship, partnership, corporation, etc.) to engage in lawful commercial transactions.

**Certified Business** – A business which by order of the Chair/MBE Advisory Council or his/hers designee, has been certified as a bona fide DBE/MBE. MDOT certification does not equate to a pre-qualification status.

**DBE – Disadvantaged Business Enterprise** – Reference 49 CFR, Part 26, Subpart A) a small business concern: (1) which is at least 51 percent owned by one or more socially and economically disadvantaged individuals. Where stock ownership is involved, the disadvantaged owner(s) shall own at least 51 percent of each class of voting stock and at least 51 percent of the aggregate of all classes of stock that have been issued (also applies to publicly owned businesses); and (2) whose management and daily business operations are controlled by one or more of the socially and economically disadvantaged individuals who have ownership. In this specification the terms MBE and DBE have the same meaning.

**DBE/MBE Directory** – A compilation of businesses certified by MDOT as disadvantaged, minority, or socially and economically disadvantaged businesses. The directory will be published annually with quarterly supplements. It will also be provided in automated format and on the Internet to be updated as changes are made.

**DBE/MBE Participation Packet** – The documents submitted by the bidder or proposer pursuant to the appropriate special bid provisions. The DBE/MBE Participation Packet consists of the Certified DBE Utilization and Fair Solicitation Affidavit and the DBE Participation Schedule, both of which must be submitted with your bid or initial price proposal. The DBE Participation Packet also includes the following documents, which shall be submitted after bids or proposals are opened: Outreach Efforts Compliance Statement (MDOT-OP-018-2), DBE Subcontractor Project Participation Affidavit (MDOT-OP-019-2), MDOT Joint Venture Disclosure Affidavit (D-EEO-006), and Minority Contractor Unavailability Certificate (OOC46).

**DBE/MBE Program** – A program developed by MDOT to implement the requirements of Title 14, Subtitle 3 of the State Finance and Procurement Article, Annotated Code of Maryland; Title 10, Subtitle 3 of the State Finance and Procurement Article of the Annotated Code of Maryland for Leases of State-Owned Property; and 49 CFR, Part 26, Subparts A and C for all Federal Department of Transportation Financial Assistance Programs.

**Director, Office of Equal Opportunity** – The individual designated for the Administration's overall MBE compliance.

**Joint Venture** – An association of a DBE/MBE firm and one or more other firms to carry out a single, for-profit business enterprise, for which the parties combine their property, capital, efforts, skills, and knowledge, and in which the DBE/MBE is responsible for a distinct, clearly defined portion of the work of the contract and whose share in the capital contribution, control, management, risks, and profits of the joint venture are commensurate with its ownership interest.

**Small Business Administration (SBA) 8(a) Certification** – The SBA 8(a) Certification Program is a Federal Program which establishes firms as disadvantaged and eligible for participation in the Federal SBA Program.

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**Socially and Economically Disadvantaged Individual Pursuant to 49 CFR, Part 26** – Those individuals who are citizens of the United States (or lawfully admitted permanent residents). For convenience, these individuals and groups are referred to as “minorities” in this document and who are:

1. Found by the MDOT to be socially and economically disadvantaged on a case-by-case basis;
2. Any individual in the following groups, members of which are rebuttably presumed to be socially and economically disadvantaged.
  - a. “Black Americans,” which includes persons having origins in any of the Black racial groups of Africa;
  - b. “Hispanic Americans,” which includes persons of Mexican, Puerto Rican, Cuban, Dominican, Central or South American, or other Spanish or Portuguese culture or origin, regardless of race;
  - c. “Native Americans,” which includes persons who are American Indian, Eskimos, Aleuts, or Native Hawaiians;
  - d. “Asian-Pacific Americans,” which included persons whose origins are from Japan, China, Taiwan, Korea, Burma (Myanmar), Vietnam, Laos, Cambodia (Kampuchea), Thailand, Malaysia, Indonesia, the Philippines, Brunei, Samoa, Guam, the U.S. Trust Territories of the Pacific Islands (Republic of Palau), the Commonwealth of the Northern Marianas Islands, Macao, Fiji, Tonga, Kirbati, Juvalu, Nauru, Federated States of Micronesia, or Hong Kong;
  - e. “Subcontinent Asian American,” which includes persons whose origins are from India, Pakistan, Bangladesh, Bhutan, the Maldives Islands, Nepal or Sri Lanka;
  - f. Women;
3. Only those persons whose personal net worth does not exceed \$750,000 may be found to be economically disadvantaged.

**B. DBE/MBE and Good Faith Effort Requirements**

1. This contract includes a DBE participation goal for subcontracting and/or procurement of materials and/or services. Bidders (or offerors) must make a good faith effort to meet the DBE participation goal **before bids or proposals are due**, including outreach efforts. A bid or initial proposal must include both a completed and executed Certified DBE Utilization and Fair Solicitation Affidavit and DBE Participation Schedule. The failure of a bidder to complete and submit these documents shall result in a determination that the bid is not responsive. The failure of an offeror to complete and submit these documents shall result in a determination that the proposal is not susceptible of being selected for award.
2. In making a good faith effort to achieve the DBE goal, prior to completing the Certified DBE Utilization and Fair Solicitation Affidavit and the DBE Participation Schedule and prior to submitting a bid or initial proposal the bidders (or offerors) including those bidders or offerors that are certified DBEs must:

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- a. Identify specific work categories within the scope of the procurement appropriate for subcontracting and/or procurement of materials and/or services;
  - b. Solicit DBEs in writing at least 10 days before bids or initial proposals are due**, describing the identified work categories and providing instructions on how to bid on the subcontracts and/or procurement of materials and/or services;
  - c. Attempt to make personal contact with the DBEs solicited and to document these attempts;
  - d. Assist DBEs to fulfill, or to seek waiver of, bonding requirements; and
  - e. Attend prebid or other meetings the procurement agency schedules to publicize contracting opportunities to DBEs.
3. All firms bidding on a Federal-Aid Contract shall submit the name and address of all subcontractors, service providers and suppliers that submitted quotes on the Contract. All subcontractors, service providers and suppliers shall complete and submit the form entitled Contractor Information, to the Administration.
4. The bidder shall seek commitments from disadvantaged business enterprises by subcontracting and/or procurement of materials and/or services, the combined value of which equals or exceeds the appropriate percent (goal) of the total value of the prime contract. A bidder may count toward its DBE goals expenditures for materials and supplies obtained from DBE regular dealers and/or manufacturers provided that the DBEs assume the actual and contractual responsibility for the provision of the materials and supplies. The bidder may count its entire expenditure to a DBE manufacturer (i.e., a supplier that produces goods from raw materials or substantially alters them before resale). The bidder may count sixty (60) percent of its expenditures to a DBE regular dealer that is not a manufacturer, provided that the DBE supplier performs a commercially useful function in the supply process. The apparent low bidder shall submit to the Administration, within ten (10) business days after notification that it is the apparent low bidder, an acceptable Affirmative Action Plan for the utilization of Disadvantaged Business Enterprises in this Contract. The Contract will not be awarded without the Bidder's AAP being approved by the Administration.

The Affirmative Action Plan shall include as a minimum:

- a. The name of an employee designated as the bidder's liaison officer for minority affairs.
  - b. A complete DBE Subcontractor Project Participation Affidavit (MDOT-OP-019-2), using contractors whose names appear in the DBE/MBE directory or who are otherwise certified by MDOT as being a disadvantaged business enterprise. Except as permitted by law and approved by the Administration, this affidavit shall include all DBE firms identified on the DBE Participation Schedule with a percentage of participation that meets or exceeds the percentage of participation indicated in the bid or initial proposal.
  - c. A completed Outreach Efforts Compliance Statement (MDOT-OP 018-2).
5. When a bidder intends to attain the appropriate goal for disadvantaged business enterprise participation by use of a joint venture, the bidder shall submit a Joint Venture Disclosure Affidavit (Form D-EEO-006-A) showing the extent of disadvantaged business participation. If a bidder intends to use a joint venture as a subcontractor to meet its goal,

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the affidavit shall be submitted through the bidder by the proposed subcontractor and be signed by all parties. A DBE, even in a joint venture arrangement shall be certified as a DBE by MDOT prior to being included in the Affirmative Action Plan.

6. Where the proposed DBE participation does not meet the DBE contract goals, sufficient evidence to demonstrate that the bidder has taken all necessary and reasonable steps to make a good faith effort to meet these goals shall be required.

**7. Determination of Bid Responsiveness for Federal-Aid Contracts**

If the bidder is unable to secure from DBEs by subcontracting and/or by procurement of materials and/or services, commitments which at least equal the appropriate percent (goal) of the values of the prime Contract at the time of bid, he shall request, in writing, a waiver of the unmet portion of the goal. This request must be initiated by checking the appropriate box on the Certified DBE Utilization and Fair Solicitation Affidavit submitted with the bid or initial proposal.

The waiver may be granted by the Administrator. To obtain approval of a waiver, the bidder shall submit the following information:

- a. A detailed statement of efforts made prior to bid to contact and negotiate with DBEs including: (i) the dates, names, addresses, and telephone numbers of DBEs who were contacted; (ii) a description of the information provided to DBEs requesting the plans, specifications, and anticipated time schedule for portions of the work to be performed and (iii) a detailed statement of the reasons why additional prospective agreements with DBEs were not reached;
  - b. A detailed statement of the efforts made to select portions of the work proposed to be performed by DBEs in order to increase the likelihood of achieving the stated goals;
  - c. For each DBE that the Contractor considers not qualified, but from which a bid has been received, a detailed statement of the reasons for the bidder's conclusion; and
  - d. For each DBE contacted but unavailable, (i) a Minority Contractor Unavailability Certificate (Form OOC46) signed by the disadvantaged business enterprise, or (ii) a statement from the bidder shall be submitted that states that the DBE refused to sign the Certificate.
- 8. Guidance concerning good faith efforts.** The following is a list of the types of actions and factors that will be used to determine the bidder's or offeror's good faith efforts to obtain DBE participation. It is not intended to be a mandatory checklist, nor is it intended to be exclusive or exhaustive. Other factors or types of efforts may be relevant in appropriate cases.
- a. Soliciting through all reasonable and available means (e.g. attendance at pre-bid meetings, advertising and/or written notices) the interest of certified DBEs who have the capability to perform the work of the contract. The bidder must solicit this interest within sufficient time to allow the DBEs to respond to the solicitation. The bidder must determine with certainty if the DBEs are interested by taking appropriate steps to follow up initial solicitations.

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- b.** Selecting portions of the work to be performed by DBEs in order to increase the likelihood that the DBE goals will be achieved. This includes, where appropriate, breaking out contract work items into economically feasible units to facilitate DBE participation, even when the bidder or offeror might otherwise prefer to perform these work items with its own forces.
- c.** Providing interested DBEs with adequate information about the plans, specifications, and requirements of the contract in a timely manner to assist them in responding to a solicitation.
- d.**

  - (1)** Negotiating in good faith with interested DBEs. It is the bidder's or offeror's responsibility to make a portion of the work available to DBE subcontractors and suppliers and to select those portions of the work or material needs consistent with the available DBE subcontractors and suppliers, so as to facilitate DBE participation.
  - (2)** A bidder using good business judgment would consider a number of factors in negotiating with subcontractors, including DBE subcontractors, and would take a firm's price and capabilities as well as contract goals into consideration. However, the fact that there may be some additional costs involved in finding and using DBEs is not in itself sufficient reason for a bidder's failure to meet the contract DBE goal, as long as such costs are reasonable. Also, the ability or desire of a prime contractor to perform the work of a contract with its own organization does not relieve the bidder of the responsibility to make good faith efforts. Bidders and offerors are not, however, required to accept higher quotes from DBEs if the price difference is excessive or unreasonable.
- e.** Not rejecting DBEs as being unqualified without sound reasons based on a thorough investigation of their capabilities. The contractor's standing within its industry, membership in specific groups, organizations, or associations and political or social affiliations (for example union vs. non-union employee status) are not legitimate causes for the rejection or non-solicitation of bids in the contractor's efforts to meet the project goal.
- f.** Making efforts to assist interested DBEs in obtaining bonding, lines of credit, or insurance as required by the recipient or contractor.
- g.** Making efforts to assist interested DBEs in obtaining necessary equipment, supplies, materials, or related assistance or services.
- h.** Effectively using the services of available minority/women community organizations; minority/women contractors' groups; local, state, and Federal minority/women business assistance offices; and other organizations as allowed on a case-by-case basis to provide assistance in the recruitment and placement of DBEs.

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- i. In determining whether a bidder or offeror has made good faith efforts, you may take into account the performance of other bidders or offerors in meeting the contract goal. For example, when the apparent successful bidder or offeror fails to meet the contract goal, but others meet it, the Administration may reasonably raise the question of whether, with additional reasonable efforts, the apparent successful bidder or offeror could have met the goal. If the apparent successful bidder or offeror fails to meet the goal, but meets or exceeds the average DBE participation obtained by other bidders or offerors, the Administration may view this, in conjunction with other factors, as evidence of the apparent successful bidder or offeror having made good faith efforts.

**9. Bidder Use of DBE Special Services**

The bidder shall consider, whenever possible, utilizing the services of minority-owned banks. Most minority banks are full-service corporations that can provide an array of financial services such as Treasury and Tax Loan fund accounts, time and demand deposit accounts, payroll services, and if needed, organization investment counseling.

**10. Bidder Records**

The bidder shall maintain records showing actions which have been taken to comply with procedures set forth herein.

**11. Bidder Cooperation**

The bidder shall cooperate with the Administration Representative in any reviews of the Contractor's procedures and practices with respect to DBEs which the Administration Representative may from time to time conduct.

**12. Bidder DBE Modifications**

During the life of the Contract, all plans to modify the approved DBE participation program will require the approval of the Administrator or his authorized representative. This shall include any changes to the items of work to be sublet or materials and services to be obtained which differ for those in the original DBE participation program. Any such request for revisions shall be directed to the appropriate District Engineer for their disposition.

**C. RECORDS AND REPORTS**

1. The Contractor shall keep such records as are necessary to determine compliance with its Minority Business Enterprise utilization obligations. The records kept by the Contractor shall be designed to indicate:
  - a. The name of disadvantaged and non-disadvantaged subcontractors and suppliers, the type of work materials or services being performed on or incorporated in this project, and the monetary value of such work materials or services.
  - b. Documentation of all correspondence, contacts, telephone calls, etc., to obtain the services of disadvantaged business enterprises on this project.
  - c. The progress and efforts made in seeking out disadvantaged contractor organizations and individual disadvantaged contractors for work on this project.

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2. Information required to be submitted for Federally Assisted contracts in accordance with 49 CFR Part 26:
  - a. All bidders (not only the apparent successful bidder) shall provide the following information:
    - (1) The age of the bidding firm; and
    - (2) The annual gross receipts of the bidding firm.
  - b. All bidders (not only the apparent successful bidder) shall provide the following information for each firm quoting or considered as subcontractors:
    - (1) The name of firm; and
    - (2) The address of firm.
  - c. The Administration will contact each of the firms quoting or considered as subcontractors to obtain:
    - (1) The age of the firm; and
    - (2) The annual gross receipts of the firm

If this information already has been gathered by the Administration on a firm and it is current, it will not be requested.

3. The Contractor shall submit reports on a monthly basis of those contracts and other business transactions executed with disadvantaged business enterprises with respect to the records referred to in Subparagraph 1.a above, in such form, manner, and content as prescribed by the Administration. The reports shall be due monthly on the 15<sup>th</sup> calendar day of each month. If the Contractor cannot submit their report on time, they shall notify the Administration's Representative and request additional time to submit the report. Failure of the Contractor to report in a timely manner may result in a finding of noncompliance. Additional reports may be required by the Administration upon written request.
4. To ensure compliance with the certified DBE contract participation goals, the Contractor shall:
  - a. Submit monthly, a report listing unpaid invoices, over 30 days, from all certified DBE subcontractors and the reason payment has not been made;
  - b. Include in its agreement with certified DBE subcontractors a requirement that the DBE subcontractors are to submit monthly to the Administration, a report identifying the prime Contractor and listing the following:
    - (1) Payment received from the Contractor in the preceding 30 days; and
    - (2) Invoices for which the subcontractor has not been paid.

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5. All such records shall be retained for a period of three years following acceptance of final payment and shall be available for inspection by the U.S. Department of Transportation, the Maryland Department of Transportation, and the Administration.

**D. ADMINISTRATIVE PROCEDURES FOR ENFORCEMENT**

1. Whenever the Administration believes the prime Contractor or any subcontractor may not be operating in compliance with the terms of these provisions, the Administration Representative will conduct an investigation. If the Administration Representative finds the prime Contractor or any subcontractor not in compliance with these provisions, he will make a report of non-compliance and notify such Contractor in writing of the steps that will, in the judgment of the Administration, bring the Contractor into compliance. If the Contractor fails or refuses to comply fully with such steps, the Administration Representative will make a final report of noncompliance to the Administrator, who may direct the imposition of one or more of the sanctions listed below:

- a. Suspension of work on a project, pending correction;
- b. Withholding payment or a percentage thereof, pending correction;
- c. Referral of DBE/MBE to MDOT Office of MBE for review for decertification or minority business fraud investigation;
- d. Referral to MDOT Office of MBE for review/referral to the Attorney General's Office for review for initiation of debarment;
- e. Referral to the Attorney General's Office for review for debarment or for criminal prosecution through the MDOT Office of General Counsel; or
- f. Any other action as appropriate.

The Administrator will determine which sanction(s) should be imposed in order to promote the purpose of the MDOT DBE/MBE Program.

2. If the documents used to determine the status of a DBE contain false, misleading, or misrepresenting information, the matter may be referred to the MDOT Office of MBE for appropriate action.
3. Loss of DBE Certification
  - a. When a prime Contractor has made a commitment to use a DBE who has lost its certification but the subcontract has not been executed prior to the notice of loss of certification, the prime Contractor is required to obtain an eligible, certified DBE for the contract or demonstrate to MDOT that it has made a good faith effort to do so.
  - b. When a prime Contractor has executed a contract with a DBE subcontractor before the notice of loss of certification, the prime Contractor may continue to use the firm on the contract and may continue to receive credit towards its DBE goal, i.e., contract goal, for the work of that subcontractor.
  - c. The work carried out by a DBE Prime Contractor would be counted by MDOT up to the loss of certification. The work performed after the loss of certification would not be considered DBE participation.



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- d. When a DBE subcontractor has lost its certification, MDOT may not continue to count the DBE participation which takes place after the loss of certification as DBE work when counting participation towards the overall goal of the modal administration or the Department.
- e. If a DBE's loss of certification is the result of exceeding the size standards while performing on a contract, the DBE participation may be counted for both the contract goal and the overall goal.

**E. SUBCONTRACTING.**

**Subcontracting by the Prime Contractor.** Form B Request for Approval of Subcontractor shall be used by the Prime Contractor to request approval of a Subcontractor and also to ensure that a formal Subcontract has been or will be written and kept on file by the Prime Contractor. Completion and submittal of the form by the Prime Contractor acknowledges that the Administration's Contracting Officer may require the submission of the written Subcontract for review by the Administration and/or FHWA.

**Lower Tier Subcontracting by an Approved Subcontractor.** Form B Subcontractor's Request for Approval of Lower Tier Subcontractor shall be used by an Approved Subcontractor to request approval of a Lower Tier Subcontractor and also to ensure that a formal Subcontract has been or will be written and kept on file by the Subcontractor. Completion and submittal of the form by the Subcontractor acknowledges that the Administration's Contracting Officer may require the submission of the written Subcontract for review by the Administration and/or FHWA.

**Form Acquisitions.** Maryland State Highway Administration Form B may be acquired through the Administration's Contracts Award Team or District Office. All questions should be directed to the Office of Construction, Contracts Award Team.

It is the Administration's intention to randomly select during each calendar quarter a representative sample of written Subcontracts for review. This review will be conducted by the Office of Construction's Contracts Award Team.

**REQUIRED CONTRACT PROVISIONS  
FEDERAL-AID CONSTRUCTION CONTRACTS**

- I. General
- II. Nondiscrimination
- III. Nonsegregated Facilities
- IV. Davis-Bacon and Related Act Provisions
- V. Contract Work Hours and Safety Standards Act Provisions
- VI. Subletting or Assigning the Contract
- VII. Safety: Accident Prevention
- VIII. False Statements Concerning Highway Projects
- IX. Implementation of Clean Air Act and Federal Water Pollution Control Act
- X. Compliance with Governmentwide Suspension and Debarment Requirements
- XI. Certification Regarding Use of Contract Funds for Lobbying

**ATTACHMENTS**

A. Employment and Materials Preference for Appalachian Development Highway System or Appalachian Local Access Road Contracts (included in Appalachian contracts only)

**I. GENERAL**

1. Form FHWA-1273 must be physically incorporated in each construction contract funded under Title 23 (excluding emergency contracts solely intended for debris removal). The contractor (or subcontractor) must insert this form in each subcontract and further require its inclusion in all lower tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services).

The applicable requirements of Form FHWA-1273 are incorporated by reference for work done under any purchase order, rental agreement or agreement for other services. The prime contractor shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

Form FHWA-1273 must be included in all Federal-aid design-build contracts, in all subcontracts and in lower tier subcontracts (excluding subcontracts for design services, purchase orders, rental agreements and other agreements for supplies or services). The design-builder shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

Contracting agencies may reference Form FHWA-1273 in bid proposal or request for proposal documents, however, the Form FHWA-1273 must be physically incorporated (not referenced) in all contracts, subcontracts and lower-tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services related to a construction contract).

2. Subject to the applicability criteria noted in the following sections, these contract provisions shall apply to all work performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's

immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract.

3. A breach of any of the stipulations contained in these Required Contract Provisions may be sufficient grounds for withholding of progress payments, withholding of final payment, termination of the contract, suspension / debarment or any other action determined to be appropriate by the contracting agency and FHWA.

4. Selection of Labor: During the performance of this contract, the contractor shall not use convict labor for any purpose within the limits of a construction project on a Federal-aid highway unless it is labor performed by convicts who are on parole, supervised release, or probation. The term Federal-aid highway does not include roadways functionally classified as local roads or rural minor collectors.

**II. NONDISCRIMINATION**

The provisions of this section related to 23 CFR Part 230 are applicable to all Federal-aid construction contracts and to all related construction subcontracts of \$10,000 or more. The provisions of 23 CFR Part 230 are not applicable to material supply, engineering, or architectural service contracts.

In addition, the contractor and all subcontractors must comply with the following policies: Executive Order 11246, 41 CFR 60, 29 CFR 1625-1627, Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The contractor and all subcontractors must comply with: the requirements of the Equal Opportunity Clause in 41 CFR 60-1.4(b) and, for all construction contracts exceeding \$10,000, the Standard Federal Equal Employment Opportunity Construction Contract Specifications in 41 CFR 60-4.3.

Note: The U.S. Department of Labor has exclusive authority to determine compliance with Executive Order 11246 and the policies of the Secretary of Labor including 41 CFR 60, and 29 CFR 1625-1627. The contracting agency and the FHWA have the authority and the responsibility to ensure compliance with Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), and Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The following provision is adopted from 23 CFR 230, Appendix A, with appropriate revisions to conform to the U.S. Department of Labor (US DOL) and FHWA requirements.

**1. Equal Employment Opportunity:** Equal employment opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (28 CFR 35, 29 CFR 1630, 29 CFR 1625-1627, 41 CFR 60 and 49 CFR 27) and orders of the Secretary of Labor as modified by the

provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140 shall constitute the EEO and specific affirmative action standards for the contractor's project activities under this contract. The provisions of the Americans with Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR 35 and 29 CFR 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:

a. The contractor will work with the contracting agency and the Federal Government to ensure that it has made every good faith effort to provide equal opportunity with respect to all of its terms and conditions of employment and in their review of activities under the contract.

b. The contractor will accept as its operating policy the following statement:

"It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, pre-apprenticeship, and/or on-the-job training."

**2. EEO Officer:** The contractor will designate and make known to the contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active EEO program and who must be assigned adequate authority and responsibility to do so.

**3. Dissemination of Policy:** All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action, or who are substantially involved in such action, will be made fully cognizant of, and will implement, the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:

a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer.

b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.

c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minorities and women.

d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.

e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of

employees by means of meetings, employee handbooks, or other appropriate means.

**4. Recruitment:** When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minorities and women in the area from which the project work force would normally be derived.

a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minorities and women. To meet this requirement, the contractor will identify sources of potential minority group employees, and establish with such identified sources procedures whereby minority and women applicants may be referred to the contractor for employment consideration.

b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, the contractor is expected to observe the provisions of that agreement to the extent that the system meets the contractor's compliance with EEO contract provisions. Where implementation of such an agreement has the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Federal nondiscrimination provisions.

c. The contractor will encourage its present employees to refer minorities and women as applicants for employment. Information and procedures with regard to referring such applicants will be discussed with employees.

**5. Personnel Actions:** Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, national origin, age or disability. The following procedures shall be followed:

a. The contractor will conduct periodic inspections of project sites to insure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.

b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.

c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.

d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with its obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of their avenues of appeal.

## 6. Training and Promotion:

a. The contractor will assist in locating, qualifying, and increasing the skills of minorities and women who are applicants for employment or current employees. Such efforts should be aimed at developing full journey level status employees in the type of trade or job classification involved.

b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs, i.e., apprenticeship, and on-the-job training programs for the geographical area of contract performance. In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision. The contracting agency may reserve training positions for persons who receive welfare assistance in accordance with 23 U.S.C. 140(a).

c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.

d. The contractor will periodically review the training and promotion potential of employees who are minorities and women and will encourage eligible employees to apply for such training and promotion.

**7. Unions:** If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use good faith efforts to obtain the cooperation of such unions to increase opportunities for minorities and women. Actions by the contractor, either directly or through a contractor's association acting as agent, will include the procedures set forth below:

a. The contractor will use good faith efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minorities and women for membership in the unions and increasing the skills of minorities and women so that they may qualify for higher paying employment.

b. The contractor will use good faith efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, national origin, age or disability.

c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the contracting agency and shall set forth what efforts have been made to obtain such information.

d. In the event the union is unable to provide the contractor with a reasonable flow of referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, national origin, age or disability; making full efforts to obtain qualified and/or qualifiable minorities and women. The failure of a union to provide sufficient referrals (even though it is obligated to provide exclusive referrals under the terms of a collective bargaining agreement) does not relieve the contractor from the requirements of this paragraph. In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these

special provisions, such contractor shall immediately notify the contracting agency.

**8. Reasonable Accommodation for Applicants / Employees with Disabilities:** The contractor must be familiar with the requirements for and comply with the Americans with Disabilities Act and all rules and regulations established there under. Employers must provide reasonable accommodation in all employment activities unless to do so would cause an undue hardship.

**9. Selection of Subcontractors, Procurement of Materials and Leasing of Equipment:** The contractor shall not discriminate on the grounds of race, color, religion, sex, national origin, age or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment. The contractor shall take all necessary and reasonable steps to ensure nondiscrimination in the administration of this contract.

a. The contractor shall notify all potential subcontractors and suppliers and lessors of their EEO obligations under this contract.

b. The contractor will use good faith efforts to ensure subcontractor compliance with their EEO obligations.

## 10. Assurance Required by 49 CFR 26.13(b):

a. The requirements of 49 CFR Part 26 and the State DOT's U.S. DOT-approved DBE program are incorporated by reference.

b. The contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the contracting agency deems appropriate.

**11. Records and Reports:** The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following the date of the final payment to the contractor for all contract work and shall be available at reasonable times and places for inspection by authorized representatives of the contracting agency and the FHWA.

a. The records kept by the contractor shall document the following:

(1) The number and work hours of minority and non-minority group members and women employed in each work classification on the project;

(2) The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women; and

(3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minorities and women;

b. The contractors and subcontractors will submit an annual report to the contracting agency each July for the duration of the project, indicating the number of minority, women, and non-minority group employees currently engaged in each work

classification required by the contract work. This information is to be reported on [Form FHWA-1391](#). The staffing data should represent the project work force on board in all or any part of the last payroll period preceding the end of July. If on-the-job training is being required by special provision, the contractor will be required to collect and report training data. The employment data should reflect the work force on board during all or any part of the last payroll period preceding the end of July.

### III. NONSEGREGATED FACILITIES

This provision is applicable to all Federal-aid construction contracts and to all related construction subcontracts of \$10,000 or more.

The contractor must ensure that facilities provided for employees are provided in such a manner that segregation on the basis of race, color, religion, sex, or national origin cannot result. The contractor may neither require such segregated use by written or oral policies nor tolerate such use by employee custom. The contractor's obligation extends further to ensure that its employees are not assigned to perform their services at any location, under the contractor's control, where the facilities are segregated. The term "facilities" includes waiting rooms, work areas, restaurants and other eating areas, time clocks, restrooms, washrooms, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing provided for employees. The contractor shall provide separate or single-user restrooms and necessary dressing or sleeping areas to assure privacy between sexes.

### IV. DAVIS-BACON AND RELATED ACT PROVISIONS

This section is applicable to all Federal-aid construction projects exceeding \$2,000 and to all related subcontracts and lower-tier subcontracts (regardless of subcontract size). The requirements apply to all projects located within the right-of-way of a roadway that is functionally classified as Federal-aid highway. This excludes roadways functionally classified as local roads or rural minor collectors, which are exempt. Contracting agencies may elect to apply these requirements to other projects.

The following provisions are from the U.S. Department of Labor regulations in 29 CFR 5.5 "Contract provisions and related matters" with minor revisions to conform to the FHWA-1273 format and FHWA program requirements.

#### 1. Minimum wages

a. All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph 1.d. of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph 1.b. of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

b. (1) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(i) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(ii) The classification is utilized in the area by the construction industry; and

(iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(2) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(3) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for

determination. The Wage and Hour Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(4) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs 1.b.(2) or 1.b.(3) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

c. Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

d. If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

## 2. Withholding

The contracting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract, or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the contracting agency may, after written notice to the contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

## 3. Payrolls and basic records

a. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that

the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

b.(1) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the contracting agency. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee ( e.g. , the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <http://www.dol.gov/esa/whd/forms/wh347instr.htm> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the contracting agency for transmission to the State DOT, the FHWA or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the contracting agency..

(2) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(i) That the payroll for the payroll period contains the information required to be provided under §5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under §5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(ii) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(iii) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed,

as specified in the applicable wage determination incorporated into the contract.

(3) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 3.b.(2) of this section.

(4) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

c. The contractor or subcontractor shall make the records required under paragraph 3.a. of this section available for inspection, copying, or transcription by authorized representatives of the contracting agency, the State DOT, the FHWA, or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the FHWA may, after written notice to the contractor, the contracting agency or the State DOT, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

#### 4. Apprentices and trainees

##### a. Apprentices (programs of the USDOL).

Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice.

The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.

Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.

In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

##### b. Trainees (programs of the USDOL).

Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration.

The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration.

Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.

In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

c. Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity

requirements of Executive Order 11246, as amended, and 29 CFR part 30.

d. Apprentices and Trainees (programs of the U.S. DOT).

Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeymen shall not be greater than permitted by the terms of the particular program.

**5. Compliance with Copeland Act requirements.** The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

**6. Subcontracts.** The contractor or subcontractor shall insert Form FHWA-1273 in any subcontracts and also require the subcontractors to include Form FHWA-1273 in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

**7. Contract termination: debarment.** A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

**8. Compliance with Davis-Bacon and Related Act requirements.** All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

**9. Disputes concerning labor standards.** Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

**10. Certification of eligibility.**

a. By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

b. No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

c. The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

**V. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT**

The following clauses apply to any Federal-aid construction contract in an amount in excess of \$100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by 29 CFR 5.5(a) or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

**1. Overtime requirements.** No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

**2. Violation; liability for unpaid wages; liquidated damages.** In the event of any violation of the clause set forth in paragraph (1.) of this section, the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1.) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1.) of this section.

**3. Withholding for unpaid wages and liquidated damages.** The FHWA or the contracting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2.) of this section.

**4. Subcontracts.** The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (1.) through (4.) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (1.) through (4.) of this section.



## VI. SUBLETTING OR ASSIGNING THE CONTRACT

This provision is applicable to all Federal-aid construction contracts on the National Highway System.

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the contracting agency. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635.116).

a. The term "perform work with its own organization" refers to workers employed or leased by the prime contractor, and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor or lower tier subcontractor, agents of the prime contractor, or any other assignees. The term may include payments for the costs of hiring leased employees from an employee leasing firm meeting all relevant Federal and State regulatory requirements. Leased employees may only be included in this term if the prime contractor meets all of the following conditions:

(1) the prime contractor maintains control over the supervision of the day-to-day activities of the leased employees;

(2) the prime contractor remains responsible for the quality of the work of the leased employees;

(3) the prime contractor retains all power to accept or exclude individual employees from work on the project; and

(4) the prime contractor remains ultimately responsible for the payment of predetermined minimum wages, the submission of payrolls, statements of compliance and all other Federal regulatory requirements.

b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid or propose on the contract as a whole and in general are to be limited to minor components of the overall contract.

2. The contract amount upon which the requirements set forth in paragraph (1) of Section VI is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.

3. The contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the contracting officer determines is necessary to assure the performance of the contract.

4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the contracting agency has assured that each subcontract is

evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract.

5. The 30% self-performance requirement of paragraph (1) is not applicable to design-build contracts; however, contracting agencies may establish their own self-performance requirements.

## VII. SAFETY: ACCIDENT PREVENTION

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract.

2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and health standards (29 CFR 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3704).

3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C.3704).

## VIII. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, Form FHWA-1022 shall be posted on each Federal-aid highway project (23 CFR 635) in one or more places where it is readily available to all persons concerned with the project:

18 U.S.C. 1020 reads as follows:

"Whoever, being an officer, agent, or employee of the United States, or of any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 1, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined under this title or imprisoned not more than 5 years or both."

#### **IX. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT**

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

By submission of this bid/proposal or the execution of this contract, or subcontract, as appropriate, the bidder, proposer, Federal-aid construction contractor, or subcontractor, as appropriate, will be deemed to have stipulated as follows:

1. That any person who is or will be utilized in the performance of this contract is not prohibited from receiving an award due to a violation of Section 508 of the Clean Water Act or Section 306 of the Clean Air Act.

2. That the contractor agrees to include or cause to be included the requirements of paragraph (1) of this Section X in every subcontract, and further agrees to take such action as the contracting agency may direct as a means of enforcing such requirements.

#### **X. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION**

This provision is applicable to all Federal-aid construction contracts, design-build contracts, subcontracts, lower-tier subcontracts, purchase orders, lease agreements, consultant contracts or any other covered transaction requiring FHWA approval or that is estimated to cost \$25,000 or more – as defined in 2 CFR Parts 180 and 1200.

##### **1. Instructions for Certification – First Tier Participants:**

a. By signing and submitting this proposal, the prospective first tier participant is providing the certification set out below.

b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this

covered transaction. The prospective first tier participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective first tier participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.

c. The certification in this clause is a material representation of fact upon which reliance was placed when the contracting agency determined to enter into this transaction. If it is later determined that the prospective participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the contracting agency may terminate this transaction for cause of default.

d. The prospective first tier participant shall provide immediate written notice to the contracting agency to whom this proposal is submitted if any time the prospective first tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

e. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180 and 1200. "First Tier Covered Transactions" refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contract). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

f. The prospective first tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.

g. The prospective first tier participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transactions," provided by the department or contracting agency, entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the \$25,000 threshold.

h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (<https://www.epls.gov/>), which is compiled by the General Services Administration.

i. Nothing contained in the foregoing shall be construed to require the establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of the prospective participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

j. Except for transactions authorized under paragraph (f) of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

\*\*\*\*\*

## **2. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – First Tier Participants:**

a. The prospective first tier participant certifies to the best of its knowledge and belief, that it and its principals:

(1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency;

(2) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(3) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (a)(2) of this certification; and

(4) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

b. Where the prospective participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

### **2. Instructions for Certification - Lower Tier Participants:**

(Applicable to all subcontracts, purchase orders and other lower tier transactions requiring prior FHWA approval or estimated to cost \$25,000 or more - 2 CFR Parts 180 and 1200)

a. By signing and submitting this proposal, the prospective lower tier is providing the certification set out below.

b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department, or agency with which

this transaction originated may pursue available remedies, including suspension and/or debarment.

c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances.

d. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180 and 1200. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations. "First Tier Covered Transactions" refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contract). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.

f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the \$25,000 threshold.

g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (<https://www.epls.gov/>), which is compiled by the General Services Administration.

h. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the

department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

\* \* \* \* \*

**Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier Participants:**

1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency.

2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

\* \* \* \* \*

**XI. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING**

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts which exceed \$100,000 (49 CFR 20).

1. The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

3. The prospective participant also agrees by submitting its bid or proposal that the participant shall require that the language of this certification be included in all lower tier subcontracts, which exceed \$100,000 and that all such recipients shall certify and disclose accordingly.

**CONTRACT PROVISIONS**  
**MBE/DBE COMPLIANCE FIELD MEETING**

CONTRACT NO. BA0065172  
1 of 1

**MBE/DBE COMPLIANCE FIELD MEETING**

A MBE/DBE compliance Field Meeting will be conducted to review the responsibilities of the Administration and the Contractor's personnel relative to MBE/DBE Compliance and documentation. The meeting will be held within two weeks after starting work on the project.

The Construction Project Engineer, who will notify the following of the date, time and location, will arrange the meeting. At least one week advanced notice will be required.

**(a) Administrative Representatives.**

- (1) Director, Office of Equal Opportunity or Designee
- (2) District Equal Opportunity Officer
- (3) Regional Constructional Engineer
- (4) Construction Project Engineer
- (5) Construction Inspection Division Inspector

**(b) Contract Representatives.**

- (1) Superintendent - Prime Contractor
- (2) Equal Opportunity Officer - Prime Contractor
- (3) Owner/Superintendent/Foreman MBE/ DBE - Subcontractor

The Construction Project Engineer and Equal Opportunity Representative will jointly conduct the meeting. The Contractor shall notify the appropriate subcontractors and ensure their attendance.

**CONTRACT PROVISIONS**  
TRAFFIC CONTROL PLAN CERTIFICATION

CONTRACT NO. BA0065172  
1 of 1

**TRAFFIC CONTROL PLAN CERTIFICATION FOR DESIGN-BUILD**

PRIOR TO THE COMMENCEMENT OF WORK ON THIS PROJECT, THE SUCCESSFUL BIDDER WILL BE REQUIRED TO COMPLETE A TRAFFIC CONTROL PLAN CERTIFICATION, CONTAINING THE INFORMATION SHOWN BELOW. THE CERTIFICATION FORM WILL BE PROVIDED TO THE SUCCESSFUL BIDDER UPON AWARD OF THE CONTRACT.

The Administration's Traffic Control Plan (TCP) has been reviewed and the following course of action shall be followed:

**Option 1** See Note Below

The TCP is accepted and shall be used on this project.

**Option 2** See Note Below

The TCP is accepted; however, revisions and/or additions shall be submitted for approval in conformance with the Administration's Specifications 104.01.

**Option 3**

The TCP is not accepted and revision shall be submitted for approval in accordance with the Administration's Specifications 104.01.

It is understood that the effective implementation of the approved TCP is the responsibility of the Contractor. Minor modifications may be made by the Traffic Manager if field conditions warrant and prior concurrence is obtained from the Engineer. Significant changes to the TCP will be submitted to the Engineer in writing, for approval, in conformance with the Administration's Specifications 104.01.

\_\_\_\_\_  
(DATE)

\_\_\_\_\_  
(SIGNATURE)

\_\_\_\_\_  
(PRINT SIGNATURE)

\_\_\_\_\_  
(TITLE)

Note: Option 1 and 2 shall not be used on this project.  
This is a Design-build project and the Design-Build Team must prepare a TCP based on the requirements in the Administrations Specifications 104.01.

**CONTRACT PROVISIONS**  
**CONTRACTOR AND RAILROAD PUBLIC LIABILITY**

CONTRACT NO. BA0065172  
1 of 1

**CONTRACTOR AND RAILROAD PUBLIC LIABILITY  
AND PROPERTY DAMAGE INSURANCE**

**INCLUDED**

In addition to other forms or bonds required under the terms of the Contract and/or specifications, the Contractor shall obtain, furnish and keep in force insurance policies as follows:

**(A) CONTRACTOR'S PUBLIC LIABILITY AND PROPERTY DAMAGE INSURANCE**

Limits not less than \$2,000,000 for Bodily Injury and/or Death and Property Damage, per occurrence, within an aggregate limit of \$6,000,000 for the term of the policy.

**(B) CONTRACTOR'S PROTECTIVE PUBLIC LIABILITY AND PROPERTY DAMAGE INSURANCE**

If any part of the work is to be performed by a subcontractor the prime Contractor shall carry in his own behalf insurance in the same limits as set forth in paragraph (A).

**(C) RAILROAD PROTECTIVE PUBLIC LIABILITY AND PROPERTY DAMAGE LIABILITY INSURANCE**

This policy shall name the appropriate Railroad as "The Insured" to comply with the Standard Uniform Policy for Railroad Protective Liability and Property Damage Insurance developed and adopted in 1958 by AASHTO-AAR and by Federal Aid Policy Guide 646A Subchapter G, Subpart A, Sections 646.101 through 646.111. Limits in the following amounts:

Bodily Injury and/or Death and Property Damage Liability limit not less than \$2,000,000 per occurrence within an aggregate limit of \$6,000,000 for the term of the policy.

**GENERAL**

The original of policy (C) shall be furnished to and approved by the Railroad. For (A) and (B), the certificates shall be furnished to the Administration's Engineer and to the Railroad on request. In all instances, the Contractor shall furnish evidence to the Administration's Engineer and Railroad that the insurance has been purchased and is in force until the Contract is completed and accepted.

The Contractor is prohibited from entering Railroad Property until the Insurance Policies have been approved. Policies, certificates, notices of cancellation or changes, etc., shall be sent by the Contractor direct to the Engineering Officer of the Railroad. The Contractor and his insurance representative shall reconcile all policy requirements to the satisfaction of the Railroad and the Administration's Engineer.

For the Contractor's insurance broker's information, it is estimated that \_\_\_\_ percent of value of the subject Contract will be performed within 50 ft of the rails of the Railroad's track.

The cost for the insurance will not be measured but will be incidental to the Contract lump sum price for Mobilization, Section 108. If an item for Mobilization is not provided, the cost of the insurance will be incidental to the other items specified in the Contract Documents.

**CONTRACT PROVISIONS**  
**PREVAILING WAGE INSTRUCTIONS**

CONTRACT NO. BA0065172  
1 of 4

**PREVAILING WAGE**  
**INSTRUCTIONS FOR THE CONTRACTOR**

**PAYROLLS.**

**Non-Federally Funded Contracts.** The Division of Labor and Industry, Prevailing Wage Unit is requiring that all certified payroll records be submitted electronically. For instructions on how to register and submit go online to [www.dlr.state.md.us/prevwage](http://www.dlr.state.md.us/prevwage) and follow the instructions for registering. The regulation addressing this change can be found at COMAR 21.11.11.02. For Non-Federally funded projects, which include prevailing wage rates, the prime Contractor and each subcontractor, shall submit the certified payroll electronically and provide one hard copy to the Project Engineer. All wages shall be paid in conformance with the State Finance and Procurement Article, Section 17-201-17-226 of the Annotated Code of Maryland and the Fair Labor Standards Amendments of 1974 (P.L. 93259). If the award amount of a Non-Federally funded job is less than \$500,000, the project will be exempt from prevailing wage requirements.

A review has been made of the wage conditions in the locality and, based on the information available, the wage rates and fringe payments listed are determined by the Commissioner of the Department of Labor and Industry to be prevailing for the Contract for the described classes of labor in conformance with the law. It shall be the responsibility of the Contractor to fully comply with the law and to contact the Office of the Commissioner of Labor and Industry for interpretation of the provisions of the law.

**Federally Funded Contracts.** For Federally funded projects, the prime Contractor and each subcontractor shall submit one copy of the certified payroll to the Project Engineer.

**General Requirements for Federally and Non-Federally Funded Contracts.** All payrolls are subject to the following requirements:

- (a) All payrolls shall be numbered, beginning at No. 1, and consecutively numbered through the end of the Contract.
- (b) Contract and FAP numbers shall be shown on all payrolls (as applicable).
- (c) All payroll submissions shall include:
  - (1) Federally Funded – employees’ full name, classification, and Individual Identifying Number (IIN) e.g. (last four digits of social security number). Refer to FHWA 1273 (IV),(3),(b)1 for further requirements related to weekly payrolls.
  - (2) Non-Federally Funded – employees’ full name, classification, address and social security number.



**CONTRACT PROVISIONS**  
**PREVAILING WAGE INSTRUCTIONS**

CONTRACT NO. BA0065172  
2 of 4

- (d) All payrolls shall show the employee's basic hourly wage rate, overtime rate (if applicable), and the number of hours worked (tabulated both daily and weekly).
- (e) When fringe benefits are required, indicate separately the amount of employer contributions to fringe benefit funds and/or programs. The fringe benefits shall be individually identified, but may be tabulated on a separate sheet. When required fringe benefits are paid in cash, add the required fringe benefit amount to the basic hourly rate to obtain the total prevailing wage rate for the employee.
- (f) The employee's net pay and the itemized deductions shall be included in all payrolls.
- (g) A Contractor may make deductions that are required by law or required by a collective bargaining agreement (between the Contractor and a bona fide labor organization). Deductions are also permitted if they are identified in a written agreement between the employee and employer that was made at the beginning of employment, provided that the Contractor presents the agreement to the Administration before the employee begins working on the Contract. Each payroll shall also include the U.S. Department of Labor and Hour Public Contracts Division Statement of Compliance Form WH-347 (or its equivalent), signed by an appropriate official of the Contractor/subcontractor. The Contractor's name, address, and telephone number shall also be shown.
- (h) On Non-Federally funded projects, all apprentices shall be registered with the Maryland Apprenticeship and Training Council.
- (i) Contractors employing a classification of worker for which a wage rate was not included on the original wage decision, shall submit to either the Wage and Hour Team (Federally Funded) or Department of Labor and Licensing (DLLR), (Non-Federally Funded), a request for an additional classification and rate prior to the employee's employment at the project.
- (j) Payrolls for Non-Federally Funded projects shall be submitted within 14 calendar days after the end of each payroll period.
- (k) Payrolls for Federally Funded projects shall be submitted within 7 calendar days after the end of each payroll period.
- (l) Contractors and Subcontractors are required to maintain complete social security numbers and home addresses for employees. Government agencies are entitled to request or review all relevant payroll information, including social security numbers and addresses of employees. Contractors and Subcontractors are required to provide such information upon request.

**CONTRACT PROVISIONS**  
**PREVAILING WAGE INSTRUCTIONS**

CONTRACT NO. BA0065172  
3 of 4

**OVERTIME.**

**Non-Federally Funded Contracts.** Overtime rates shall be paid by the prime Contractors and subcontractors under their Contracts and agreements with their employees, which in no event shall be less than time and a half the prevailing hourly rate of wages for all hours worked in excess of ten hours in any one calendar day or forty hours in any one calendar week and work performed on Sundays and legal holidays.

Fringe benefits shall be paid for all hours worked, including the overtime hours. However, the fringe benefit amounts may be excluded from the half time premium due as overtime compensation.

**Federally Funded Contracts.** Overtime rates shall be paid as specified in Form FHWA 1273. Fringe benefits shall be paid for all hours worked, including the overtime hours. However, the fringe benefit amounts may be excluded from the half time premium due as overtime compensation.

**PENALTIES.**

**Non-Federally Funded Contracts.** When the Contractor is delinquent in submitting payroll records, processing of partial payment estimates will be held in abeyance, pending receipt of the records. The Contractor shall be liable to the Administration for liquidated damages in the amount of \$10.00 for each calendar day the records are late.

The Contractor shall be liable to the Administration for liquidated damages in the amount of \$20.00 for each day that an employee is paid less than the prevailing wage.

**Federally Funded Contracts.** When the Contractor is delinquent in submitting payroll records, processing of partial payment estimates will be held in abeyance pending receipt of the records.

**ADDITIONAL CLASSIFICATIONS.**

**Federally Funded Contracts.** If the wage determination lacks a necessary classification the Prime Contractor is responsible to submit the request for the additional classification, with a proposed rate, to the State Highway Administration's Wage and Hour Team. The request is to include a copy of the projects wage determination.

**Non-Federally Funded Contracts.** If the wage determination lacks a necessary classification the Prime Contractor is responsible to submit the request for the additional classification, with a proposed rate, to the Department of Labor and Licensing (DLLR).

**CONTRACT PROVISIONS  
PREVAILING WAGE INSTRUCTIONS**

CONTRACT NO. BA0065172  
4 of 4

**INQUIRIES.**

Request for information or questions shall be addressed to:

Maryland State Highway Administration  
Office of Construction  
Wage and Hour Team  
7450 Traffic Drive, Building #4  
Hanover, MD 21076  
or  
Email: [wageandhourteam@sha.state.md.us](mailto:wageandhourteam@sha.state.md.us)



IRONWORKER (Fence Erector).....	\$ 28.23	19.64
IRONWORKER, REINFORCING.....	\$ 27.98	18.89
IRONWORKER, STRUCTURAL.....	\$ 30.70	22.72
LABORER		
Air Tool Operator.....	\$ 18.54	6.41
Asphalt Paver.....	\$ 18.54	6.41
Asphalt Raker.....	\$ 17.00	6.14
Blaster-Dynamite.....	\$ 18.54	6.41
Burner.....	\$ 18.54	6.41
Common.....	\$ 17.00	6.14
Concrete Puddler.....	\$ 17.00	6.14
Concrete Surfacers.....	\$ 18.54	6.41
Concrete Tender.....	\$ 17.00	6.14
Concrete Vibrator.....	\$ 17.00	6.14
Density Gauge.....	\$ 17.00	6.14
Fireproofers-Mixer.....	\$ 17.00	6.14
Flagger.....	\$ 17.00	6.14
Grade Checker.....	\$ 17.00	6.14
Hand Roller.....	\$ 17.00	6.14
Hazardous Material Handler..	\$ 18.54	6.41
Jackhammer.....	\$ 17.00	6.14
Landscaping.....	\$ 17.00	6.14
Layout.....	\$ 17.00	6.14
Luteman.....	\$ 17.00	6.14
Mason Tender.....	\$ 18.54	6.41
Mortar Mixer.....	\$ 17.00	6.14
Pipelayer.....	\$ 18.54	6.41
Plasterer-Handler.....	\$ 17.00	6.14
Scaffold Builder.....	\$ 18.54	6.41
Tamper.....	\$ 18.13	5.51
MARINE BOAT OPERATOR.....	\$ 26.29	5.87
MILLWRIGHT.....	\$ 31.11	16.00
PAINTER: Bridge.....	\$ 36.13	11.49
PILEDRIVERMAN.....	\$ 30.18	15.15
POWER EQUIPMENT OPERATOR		
Backhoe.....	\$ 28.45	11.95
Belt Press.....	\$ 29.63	14.31+a+b
Boom Truck.....	\$ 20.00	3.07
Broom/Sweeper.....	\$ 27.55	11.95
Bulldozer.....	\$ 28.45	11.95
Concrete Curb and Gutter		
Pan.....	\$ 24.85	11.79+a
Crane.....	\$ 34.70	15.40
Drill-Rig.....	\$ 28.45	11.95
Excavator.....	\$ 28.45	11.95
Forklift.....	\$ 25.49	11.95
Gradall.....	\$ 29.45	11.95
Grader.....	\$ 29.45	11.95+a
Guard Rail Post Driver.....	\$ 20.00	6.30
Loader.....	\$ 28.45	11.95

Mechanic.....	\$ 28.45	11.95
Milling Machine.....	\$ 28.45	11.95
Paver.....	\$ 27.55	11.95
Roller-Asphalt.....	\$ 27.55	11.95
Roller-Earth.....	\$ 27.55	11.95
Screed.....	\$ 26.72	8.16
Skid Steer (Bobcat).....	\$ 25.49	11.95
Skidder.....	\$ 17.25	10.05
Trencher.....	\$ 24.00	7.71
Vaccum Truck.....	\$ 25.50	12.65
SHEET METAL WORKER.....	\$ 40.27	20.43
STEAMFITTER/PIPEFITTER.....	\$ 25.00	10.30
TRUCK DRIVER		
Dump.....	\$ 24.79	7.01
Flatbed.....	\$ 19.50	4.72
Lowboy.....	\$ 25.23	7.58
Tack/Tar Truck.....	\$ 24.94	7.58
Tandem.....	\$ 28.66	10.95
Tractor Trailer.....	\$ 26.95	11.55
Water.....	\$ 24.94	7.58

FRINGE BENEFITS:

- a. PAID HOLIDAYS: New Year's Day, Memorial Day, July 4th, Labor Day, Thanksgiving & Christmas Day.
- b. PAID VACATIONS: Employees with 1 year service - 1 week paid vacation; 2 years service - 2 weeks paid vacation; 10 years service - 3 weeks paid vacation.

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WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at [www.dol.gov/whd/govcontracts](http://www.dol.gov/whd/govcontracts).

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after

award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

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The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

#### Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

#### Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

#### Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

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#### WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- \* an existing published wage determination
- \* a survey underlying a wage determination
- \* a Wage and Hour Division letter setting forth a position on a wage determination matter
- \* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations  
Wage and Hour Division  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210



The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION"

**CONTRACT PROVISIONS**  
**NOTICE OF ACTIONS FOR AFFIRMATIVE ACTION**

CONTRACT NO. BA0065172  
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**NOTICE OF ACTIONS REQUIRED FOR AFFIRMATIVE ACTION TO  
ENSURE EQUAL EMPLOYMENT OPPORTUNITY (EXECUTIVE ORDER 11246)**

1. The Offeror's or Bidders attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Specifications" set forth herein.
2. The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate work force in each trade on all construction work in the covered area, are as noted in Appendix A and B:

These goals are applicable to all the Contractors' construction work (whether or not it is Federal or federally assisted) performed in the covered area. If the contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the contractor also is subject to the goals for both its federally involved and nonfederally involved construction.

The contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a), and its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of contract, and in each trade, and the contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the contractor's goals shall be a violation of the contract, the Executive Order and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

3. The Contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs within 10 working days of award of any construction subcontract in excess of \$10,000 at any tier for construction work under the contract resulting from this notification. The notification shall list the name, address, and telephone number of the subcontractor; employer identification number of the subcontractor; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the subcontract is to be performed.
4. As used in this Notice, and in the contract resulting from this solicitation, the "covered area" is noted on appendix B.

**STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY CONSTRUCTION  
CONTRACT SPECIFICATIONS (Executive Order 11246)**

1. As used in these specifications:
  - a. "Covered area" means the geographical area described in the solicitation from which this contract resulted;
  - b. "Director" means Director, Office of Federal Contract Compliance Programs, United States Department of Labor, or any person to whom the Director delegates authority;

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- c. "Employer identification number" means the Federal Social Security number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941.
- d. "Minority" includes:
  - (i) Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);
  - (ii) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish culture or origin regardless of race);
  - (iii) Asian and Pacific Islander (all persons having origins in any of the original people of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and,
  - (iv) American Indians or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).
- 2. Whenever the Contractor, or any Subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of \$10,000 the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.
- 3. If the Contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors must be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each Contractor or Subcontractor participating in an approved Plan is individually required to comply with its obligations under the EEO clause, and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other Contractors or Subcontractors toward a goal in an approved Plan does not excuse any covered Contractor's or Subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.
- 4. The Contractor shall implement the specific affirmative action standards provided in paragraphs 7.a through 7.p of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the Contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. The Contractor is expected to make substantially uniform progress toward its goal in each craft during the period specified.
- 5. Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the Contractor has a collective bargaining agreement, to refer either minorities or women shall excuse the Contractor's obligations under these specifications, Executive Order 11246, or the regulations promulgated pursuant thereto.

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- 6.** In order for the nonworking training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees must be employed by the Contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.
- 7.** The Contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the Contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully, and shall implement affirmative action steps at least as extensive as the following:

  - a.** Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the Contractor's employees are assigned to work. The Contractor, where possible, will assign two or more women to each construction project. The Contractor shall specifically ensure that all foremen, superintendents, and other on-site supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.
  - b.** Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.
  - c.** Maintain a current file of the names, addresses and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this shall be documented in the file with reason therefore, along with whatever additional actions the Contractor may have taken.
  - d.** Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.
  - e.** Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under 7.b above.
  - f.** Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the

**CONTRACT PROVISIONS**  
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policy with all management personnel and with all minority and female employees at least once a year and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

- g.** Review, at least annually, the company's EEO Policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination or other employment decisions including specific review of these items with on-site supervisory personnel such as Superintendents, General Foremen, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.
- h.** Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the Contractor's EEO policy with other Contractors and Subcontractors with whom the Contractor does or anticipates doing business.
- i.** Direct its recruitment efforts, both oral and written, to minority, female and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the Contractor shall send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.
- j.** Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer and vacation employment to minority and female youth both on the site and in other areas of a Contractor's work force.
- k.** Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.
- l.** Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.
- m.** Ensure that seniority practices, job classifications, work assignments and other personnel practices, do not have a discriminatory effect by continually monitoring all personnel and employment related activities to insure that the EEO policy and the Contractor's obligations under these specifications are being carried out.
- n.** Ensure that all facilities and company activities are nonsegregated except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.
- o.** Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

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- p.** Conduct a review, at least annually, of all supervisors' adherence to and performance under the Contractor's EEO policies and affirmative action obligations.
- 8.** Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations (7.a through 7.p). The efforts of a contractor association, joint contractor-union, contractor-community, or other similar group of which the contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under 7.a through 7.p of these specifications provided that the contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the Contractor's minority and female work force participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation to comply, however, is the Contractor's and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's non-compliance.
- 9.** A single goal for minorities and a separate single goal for women have been established. The Contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the Contractor may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner (for example, even though the Contractor has achieved its goals for women generally the Contractor may be in violation of the Executive Order if a specific minority group of women is underutilized).
- 10.** The Contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.
- 11.** The Contractor shall not enter into any Subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.
- 12.** The Contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any Contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.
- 13.** The Contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 7 of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.
- 14.** The Contractors shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out to submit reports relating to the provisions hereof as may be required by the Government and to keep records. Records shall at affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at

**CONTRACT PROVISIONS**  
**NOTICE OF ACTIONS FOR AFFIRMATIVE ACTION**

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which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.

- 15.** Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents

(a.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

- 16.** The Contractor will receive at the time of Award Federal Form CC-257 for his use in reporting monthly the Affirmative Actions for minority and female which he has employed.

**CONTRACT PROVISIONS**  
**NOTICE OF ACTIONS FOR AFFIRMATIVE ACTION**

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**APPENDIX A**

The following goals and timetables for female utilization shall be included in all Federal and federally assisted construction contracts and subcontracts in excess of \$10,000. The goals are applicable to the Contractor's aggregate on-site construction work force whether or not part of that work force is performing on a Federal or federally assisted construction contract or subcontract.

AREA COVERED: Nationwide

**GOALS AND TIMETABLES**

Timetable	Goals (percent)
From April 1, 1978 until March 31, 1979.....	3.1
From April 1, 1979 until March 31, 1980.....	5.0
From April 1, 1980 until further notice.....	6.9



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**APPENDIX B**

Until further notice, the following goals for minority utilization in each construction craft and trade shall be included in all Federal or federally assisted construction contracts and subcontracts in excess of \$10,000 to be performed in the respective geographical areas. The goals are applicable to each nonexempt contractor's total on-site construction work force, regardless of whether or not part of that work force is performing work on a Federal, federally assisted or nonfederally related project, contract or subcontract.

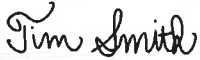
Construction contractors which are participating in an approved Hometown Plan (see 41 CFR 60-4.5) are required to comply with the goals of the Hometown Plan with regard to construction work they perform in the area covered by the Hometown Plan. With regard to all their other covered construction work such contractors are required to comply with the applicable SMSA or EA goal contained in this appendix B-80.

State	Goal (percent)
Maryland:	
019 Baltimore, MD:	
SMSA Counties:	
0720 Baltimore, MD.....	23.0
MD Anne Arundel; MD Baltimore;	
MD Carroll; MD Harford;	
MD Howard; MD Baltimore City	
Non-SMSA Counties.....	23.6
MD Caroline; MD Dorchester;	
MD Kent; MD Queen Annes;	
MD Somerset; MD Talbot;	
MD Wicomico; MD Worcester	
Washington, DC:	
020 Washington, DC:	
SMSA Counties:	
8840 Washington, DC.....	28.0
MD Charles; MD Montgomery;	
MD Prince Georges	
Non-SMSA Counties.....	25.2
MD Calvert; MD Frederick	
MD St. Marys; MD Washington	
Pennsylvania	
Non-SMSA Counties.....	4.8
MD Allegany; MD Garrett	

Maryland Department of Transportation  
State Highway Administration  
**High Visibility Safety Apparel Policy**

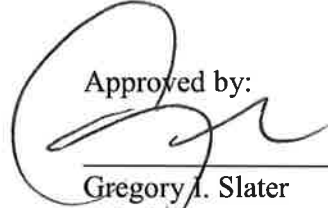
This policy replaces all pre-existing high visibility apparel policies.

Recommended by:



\_\_\_\_\_  
Tim Smith, P.E.  
Deputy Administrator  
Chief Engineer for Operations

Approved by:



\_\_\_\_\_  
Gregory A. Slater  
Administrator

Date:

Date:

1. BACKGROUND

- 1.1 Research demonstrates that high visibility safety apparel has a significant impact on the safety of employees who work on highways and rights-of-way.
- 1.2 In addition, high visibility safety apparel may help to prevent injuries and accidents and to make highway workers more visible to the motoring public, which ultimately improves traffic safety.

2. STATEMENT OF POLICY

- 2.1 The High Visibility Safety Apparel Policy provides a standardized apparel program.
- 2.2 The program seeks to improve the visibility of all persons who work on Maryland Department of Transportation State Highway Administration (MDOT SHA) highways and rights-of-way.
- 2.3 All safety apparel shall contain the appropriate label identifying the class.
- 2.4 Compliance with this policy was effective as of January 1, 2019.

3. APPLICABILITY

- 3.1 This policy applies to all MDOT SHA employees and all other persons who work on Maryland state highways and rights-of-way.
- 3.2 This policy exceeds the standards referenced in the Maryland Manual on Uniform Traffic Control Devices (MD MUTCD) 2011 Edition.
- 3.3 All workers shall wear, at a minimum, a single ANSI/ISEA 107/2015 Class 3 safety garment on the upper torso.
- 3.4 All ANSI Class 3 safety garments must be worn fully fastened to meet ANSI/ISEA 107/2015 specifications.
- 3.5 MDOT SHA employee garments shall have a fluorescent yellow-green background material color and be the outermost garment worn.
- 3.6 MDOT SHA employee garment retro-reflective material color shall be silver or white and shall be visible at minimum distance of 1,000 feet. The retro-reflective safety

apparel shall be designed to clearly recognize and differentiate the wearer as a person from the surrounding work environment. The retro-reflective material may be contrasted by fluorescent orange background material not to exceed one-and-one-half inches on either side of the retro-reflective material.

- 3.7 SPECIAL NOTE: A breakaway vest may be considered for certain tasks to prevent entanglement.
- 3.8 Non-MDOT SHA workers' garments shall be approved ANSI/ISEA 107/2015 Class 3 for wear on the upper torso that is either fluorescent orange-red or fluorescent yellow-green background material color and must be the outermost garment worn.
- 3.9 Non-MDOT SHA workers' garments retro-reflective material color shall be orange, yellow, white, silver, yellow-green, or fluorescent version of these colors, and be visible at a minimum distance of 1,000 feet. The retro-reflective safety apparel shall be designed to clearly recognize and differentiate the wearer as a person from the surrounding work environment.
- 3.10 For all MDOT SHA and non-MDOT SHA workers applicable to this Policy, it is recommended that all ANSI Class 3 safety garments under this Policy be cared for according to the manufacturer specifications.

#### 4. REFERENCES

- 4.1 ANSI/ISEA 107/2015 standard — American National Safety Institute/International Safety Equipment Association
- 4.2 MUTCD 2011 -Manual for Uniform Traffic Control Devices - Sections 6D.03 Paragraph 4 and 6E.02
- 4.3 Visibility Research — The VCTR 1989 report concludes that fluorescent colors, when compared with non-fluorescent colors, enhance the daytime conspicuity of worker clothing.

#### 5. DEFINITIONS

- 5.1 Highways — all Maryland roadways owned and maintained by MDOT SHA .
- 5.2 High Visibility Safety Apparel (HVSA) — Personal protective safety clothing intended to ensure roadside workers stand-out to drivers during both daytime and nighttime, and other low-light condition usage. The outermost high-visibility garment worn by MDOT SHA and non-MDOT SHA workers who work on MDOT SHA highways and rights-of-way.
- 5.3 Retro-reflective Material – Material that reflects and returns a relatively high proportion of light in a direction close to the direction from which it came.
- 5.4 Background Material – Colored fluorescent material intended to be highly visible, but when not used in conjunction with retro-reflective material as intended, are not compliant with the requirements of this standard for retro-reflective material.
- 5.5 Breakaway – A garment system that allows workers to quickly remove the vest for additional safety around extreme traffic hazards, moving machinery, or equipment.

**SPECIFICATIONS**

All work on this project shall conform to the Maryland Department of Transportation, State Highway Administration's Specifications entitled, "2019 Standard Specifications for Construction and Materials" dated July 2019 revisions thereof, or additions thereto, and the Special Provisions included in this Request for Proposals.

In the following sections of the "2019 Standard Specifications for Construction and Materials." Dated July 2019, the word "Engineer" shall be taken to mean "Design-Build Engineer."

Category 100 Preliminary

Section 101.03.02	¶ 1, Sentence 1
Section 109.01.01	¶ 7, Sentence 1
Section 109.01.01	¶ 10, Sentence 1

Category 200 Grading

Section 201.03.04	¶ 6, Sentence 1
Section 201.03.10	¶ 1, Sentence 3
Section 204.02.03	¶ 1, Sentence 1
Section 206.04.02	¶ 5, Sentence 1

Category 300 Drainage

Section 302.03	¶ 1, Sentence 2
Section 306.04.03	¶ 1, Sentence 1
Section 310.03.02	¶ 1, Sentence 3
Section 314.02.03	¶ 1, Sentence 3

Category 400 Structures

Section 402.03.04	¶ 2, Sentence 2
Section 405.03	¶ 3, Sentence 3
Section 411.03	¶ 2, Sentence 1,4
Section 430.03.14	¶ 1, Sentence 2

Category 500 Paving

Section 522.03	¶ 1, Sentence 1
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Category 600 Shoulders

Section 606.03.01	¶ 6, Sentence 1
Section 607.03.01	¶ 3, Sentence 2

Category 800 – Traffic

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SPECIFICATIONS**

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Section 804.03.03 ¶ 1, Sentence 5  
Section 804.03.03 ¶ 2, Sentence 1  
Section 810.03.04 ¶ 1, Sentence 1

Category 900 – Materials

Section 910.02.03 ¶ 1, Sentence 1

**PROJECT DESCRIPTION**

Refer to TC Section 2.07.02, Project Overview

**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 1, 2019, revisions thereof, or additions thereto, and the Special Provisions included in this Invitation for Bids.

**EMPLOYMENT AGENCY**

The Maryland Department of Labor, Licensing & Regulation (DLLR), Division of Employment & Training can be found on the Website at <http://www.dllr.state.md.us/county>.

**NOTICE TO CONTRACTOR**

**NOTICE TO BIDDERS.** The Proposal Form Packet in this Request for Proposals requires the following information be submitted for the Proposer and each firm quoting or considered as subcontractors:

- (a) Name of firm.
- (b) Address of firm.
- (c) MBE, Non-MBE, DBE, or Non-DBE.
- (d) Age of firm.
- (e) Annual gross receipts per last calendar year.

**AFFIRMATIVE ACTION PLAN (AAP) CONTRACT GOALS.** In order to be in compliance with the revised MBE/DBE laws effective September 27, 2011 or later, the bidder is required to complete the AAP information within the MDOT MBE/DBE Form A and Form B (Parts 2 and 3) of the Proposal Form Packet for State, Federal, and State Small Business Reserve Procurements. Failure to complete the information may be grounds for the bid to be declared non-responsive.

**HIGH VISIBILITY SAFETY APPAREL POLICY.** The Maryland Department of Transportation's State Highway Administration (MDOT SHA) has updated the High Visibility Safety Apparel Policy which is included in this Contract. Contractor shall comply to the policy fully for the parts Contractor is responsible for.

**BOOK OF STANDARDS.** The Book of Standards for Highway and Incidental Structures is only available on the Administration's Internet Site at [www.roads.maryland.gov](http://www.roads.maryland.gov). The Book of Standards can be located by clicking on Business; Business Standards and Specifications; Construction and Material Standards and Specifications; and Book of Standards for Highway and Incidental Structures.

**2019 STANDARD SPECIFICATION FOR CONSTRUCTION AND MATERIALS BOOK.** The 2019 Standard Specifications for Construction and Materials Book is only available on the Administration's Internet Site at [www.roads.maryland.gov](http://www.roads.maryland.gov). The 2019 Specification Book can be located by clicking on Business; Business Standards and Specifications; Construction and Material Standards and Specifications; and Standard and Supplemental Specifications for Construction and Materials.

**PAYMENT OF STATE OBLIGATIONS.** Electronic funds transfer will be used by the State to pay Contractor for this Contract and any other State payments due Contractor unless the State Comptroller's Office grants Contractor an exemption.

By submitting a response to this solicitation, the Bidder/Offeror agrees to accept payments by electronic funds transfer unless the State Comptroller's Office grants an exemption. The selected Bidder/Offeror shall register using the attached form COT/GAD X-10 Vendor Electronic Funds (EFT) Registration Request Form. Any request for exemption must be submitted to the State Comptroller's Office for approval at the address specified on the COT/GAD X-10 form and must include the business identification information as stated on the form and include the reason for the exemption.

**SPECIAL PROVISIONS**  
**NOTICE TO CONTRACTOR**

CONTRACT NO. BA0065172  
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An electronic form and additional information can be found at [http://comptroller.marylandtaxes.com/Vendor\\_Services/Accounting\\_Information/Electronic\\_Funds\\_Transfer/](http://comptroller.marylandtaxes.com/Vendor_Services/Accounting_Information/Electronic_Funds_Transfer/)

**BRIDGE UNDERCLEARANCE.** The minimum underclearances shall be maintained whenever resurfacing a roadway. This may require grinding the existing pavement prior to placing the resurfacing material. Immediately after completing the resurfacing operation and when the lane closures are still in the effect, the Contractor, in the presence of the Engineer, shall measure the minimum vertical underclearance. The Engineer will submit results to the Office of Structures. The cost of these measurements will be incidental to other pertinent items specified in the Contract Documents.

**REQUEST FOR INFORMATION.**

Refer to TC Section 2.08.02.3

**RIGHT-OF-WAY STATUS.**

No Right-of-way is being acquired for this project. All work shall be done within Maryland Department of Transportation State Highway Administration Right-of-way.



**RAILROAD STATEMENT.** Federal Aid Contract No. AC-NHPP-695-6(385)N

For this project, the Administration is providing the following statement of coordination (check one):

- No Railroad coordination required (no RR facilities are affected) (check this box when there is no railroad facility within or near the terminus of the project limits)
- All Railroad work has been completed prior to the project (check this box if traffic control devices within or near the terminus of the Federal-Aid project limits comply with the current edition of the Manual on Uniform Traffic Control Devices)
- The necessary arrangements have been made for all railroad work to be undertaken and completed as required for proper coordination with physical construction schedules. (Appropriate notification shall be provided in the PS&E for railroad coordination concurrent with the project construction)
- For AREAWIDE Contracts, the Administration will provide a Statement of Coordination when the Modification to the 25C is submitted, prior to NTP. (Check this box for all AREAWIDE Projects)



- This is a DESIGN-BUILD Contract. The Design-Builder shall notify the Administration of any anticipated work near a Railroad. The Administration will then coordinate any work with the affected Railroad.



**SPECIAL PROVISIONS**  
**NOTICE TO CONTRACTOR**

CONTRACT NO. BA0065172  
3 of 3

**REQUIRED ENVIRONMENTAL PERMITS, APPROVALS AND AUTHORIZATIONS.**

For permit information, please refer to TC Section 2.07.02.05.8 Permits.

**GENERAL PROVISIONS**

**GP SECTION 2**  
**BIDDING REQUIREMENTS AND CONDITIONS FOR DESIGN-BUILD –**  
**COMPETITIVE SEALED PROPOSALS**

16 **DELETE: GP-2.19 (a) General.** in its entirety.

**INSERT:** The following:

**GP-2.19 (a) General.** The Contract is to be awarded as outlined in the Instructions to Proposers of the Request for Proposals.

**DELETE: GP-2.19 (b) Determination of Lowest Bidder.**

**INSERT:** The following:

**GP-2.19 (b) Determination of Successful Proposer.**

**DELETE:** The first sentence in GP-2.19 (b) “Bids shall be...Invitation for Bids.”

**INSERT:** The following:

Proposals shall be evaluated as outlined in Instructions to Proposers of the Request for Proposals.

17 **DELETE: GP-2.19 (c) Award.** in its entirety.

**INSERT:** The following:

**GP-2.19 (c) Award.** Award of the Contract will be based on the criteria as outlined in Instructions to Proposers of the Request for Proposals.

**TERMS AND CONDITIONS**

**TC SECTION 2**  
**BIDDING REQUIREMENTS AND CONDITIONS FOR COMPETITIVE**  
**SEALED PROPOSALS (DESIGN-BUILD)**

**TC-2.03 VALUE ENGINEERING CHANGE PROPOSALS**

**DELETE:** This entire section.

**INSERT:** The following:

Value Engineering proposals will not be entertained on this project.

**TC-2.06 PARTNERING**

**DELETE:** This entire section.

**INSERT:** The following:

Partnering on this project will be mandatory. The partnership will be structured to draw on the strengths of each organization through open communication, teamwork and cooperative action to identify and achieve mutual goals. The objective is to create an atmosphere of trust and honest dialogue among all stakeholders. This partnership will not change the legal relationship of the parties to the Contract nor relieve any party from any of the terms of the Contract.

The Administration's Assistant District Engineer of Construction, the Project Design Engineer and the Design-Builder's management representative will organize a partnering project team. Persons recommended being on the team and guidelines for partnering are included in the Partnering Field Guide at [www.mdqi.org](http://www.mdqi.org).

The kick-off workshop meeting will be held soon after execution of the Contract. All stakeholders will attend the kick-off workshop to develop and commit to the Partnering Charter and Issue Resolution process. Follow-up meetings will be held monthly by the Design-Builder and the Administration, with other stakeholders attending as needed.

Measuring the partnering on the project is a key element to its success. All stakeholders will participate in the process. The Partnering Project Rating form will be completed monthly and then entered into the Administration's Partnering Database. Summaries of the ratings will then be shared with the team. The Administration's and Design-Builder's management team will review the partnering ratings and intervene if necessary on a monthly basis.



All costs of partnering meetings shall be shared equally between the Design-Builder and the Administration.

## **TC 2.07 REQUEST FOR PROPOSALS (RFP)**

### **2.07.01 Design-Build Concept**

The Administration is soliciting Technical Proposals and Price Proposals for the design and construction of improvements to IS-695 from IS-70 to MD 43. This project is located in Baltimore County, Maryland. The basis of payment for this work will be “lump sum” which price shall include all costs associated with design and construction of the project in accordance with the requirements of this RFP.

The use of the term “Contractor” or “Design-Builder” within the Contract Documents furnished by the Administration shall be taken to mean Design-Build (D-B) Contractor. These terms are interchangeable.

The use of the term "Designer" or "Design-Build Engineer," within the Contract Documents furnished by the Administration, shall be taken to mean the Engineer working for the Design-Build Contractor. The use of the term "Engineer," within the Contract Documents furnished by the Administration, shall be as defined in Section GP-1.03 of the General Provisions for Construction Contracts.

#### **2.07.01.1 Restrictions on Participation in Design-Build Contracts:**

An individual or entity that has received monetary compensation as the lead or prime design consultant under a contract with MDOT SHA to develop the concept plan and/or have been retained to perform construction phase services on behalf of the state, or a person or entity that employs such an individual or entity, or regardless of design phase responsibilities has received in excess of \$500,000 for services performed, may not submit a Proposal or assist or represent others who are submitting a Proposal in response to this RFP. If a Proposer utilizes such individual or entity for its Proposal, the Proposer is not a responsible offeror under COMAR 21.06.01.01. The SOQ, Technical Proposal or Price Proposal including such an individual or entity will be rejected pursuant to COMAR 21.06.01.01 and COMAR 21.06.02.03.

The following is a list of consultants and/or subconsultants that have received monetary compensation under a contract with MDOT SHA as the prime consultant to develop the concept plan, have been retained by MDOT SHA to perform construction phase services on the behalf of the state for this procurement, or has received payment more than \$500,000. MDOT SHA makes no representations regarding the completeness of the list:

- Whitman, Requardt & Associates, LLP
- RJM Engineering, Inc.
- NMP Engineering Consultants, Inc.

- Mahan Rykiel Associates, Inc.
- McCormick Taylor, Inc.
- Applied Research Associates, Inc.
- Wilson T. Ballard Company

§ 13-212.1 of the State Finance & Procurement Article contains various restrictions on participating in State procurements. Any questions regarding eligibility must be appealed to the Maryland State Board of Contract Appeals.

No official or employee of the State of Maryland, as defined under General Provisions Article of the Annotated Code of Maryland, whose duties as such official or employee include matters relating to or affecting the subject matter of this contract, shall during the pendency and term of this contract and while serving as an official or employee of the State become or be an employee of the Design-Build Team or an entity that is a subcontractor on this contract.

No Design-Build Team may use any persons meeting the above restrictions in any capacity, key staff or otherwise, on this Design-Build Contract. It is the responsibility of the Design-Build Team to identify any potential ethics issues concerning its former MDOT SHA employees and seek an opinion from the State Ethics Commission regarding any potential conflicts of interest. The Design-Build Team shall provide certification in its cover letter that it is in compliance with State Ethics Laws prohibiting work on a matter in which a former MDOT SHA employee participated significantly as a State Employee for the duration of this contract.

## **2.07.02 Project Overview**

### **2.07.02.01 Description of Work**

This is a Fixed Price/Best Value Design-Build contract. The contract will be awarded as a best value selection to the Proposer from the RCL that provides the best combination of qualifications in Phase One and technical solutions in Phase Two addressing the evaluation criteria established in the RFP for the Fixed Price.

The purpose of the project is to reduce recurring and non-recurring congestion and improve travel time reliability and safety along IS-695 between IS-70 and MD-43. The Design-Builder will be responsible for all work required to deliver the improvements that it proposes in its Technical Proposal for the Fixed Price.

### **2.07.02.02 Project History**

The project area is the IS-695 corridor from IS-70 to MD-43 along the west and north portions of the Baltimore Beltway, inner and outer loops, for a total distance of approximately 19 miles. The project area falls entirely within Baltimore County, Maryland, just outside the western and northern limits of Baltimore City, in primarily urbanized communities with dense population and commercial

centers. The Baltimore Beltway experiences congestion in the morning and evening peak commuting periods. Additionally, the facility frequently experiences non-recurring congestion as a result of incidents such as crashes, disabled vehicles, and other emergency events, such as adverse weather. As a result of this recurring and non-recurring congestion, travelers experience highly unreliable travel times on IS-695. Associated with the frequent congestion along the project area, safety is of an increasing concern, as congested conditions can often be attributed to increased crash frequencies, such as rear-end collisions.

#### 2.07.02.03 Project Goals

The following goals are listed in the descending order of importance to the Administration.

1. Part-Time Shoulder Use - Maximize the amount of static-dynamic median part-time shoulder use to maximize an increase in vehicle throughput and minimize vehicle travel times and delay along the inner and outer loops of IS-695 from IS-70 to MD 43.
2. Mobility - Provide improvements that maximize vehicle throughput, minimize vehicle travel times, and/or create a more reliable commuter trip along IS-695 from north of IS-70 to MD-43.
3. Safety - Provide for a safer IS-695 corridor between IS-70 and MD-43 and increase the ability of MDOT SHA to reduce, detect, verify, respond to, and manage non-recurring congestion causes, such as crashes, disabled vehicles, and adverse weather or other emergency events.
4. Operability/Maintainability/Adaptability - Provide improvements that minimize MDOT SHA operations and/or maintenance activities while being adaptable to future transportation technological advancements.

#### 2.07.02.04 Project Key Issues

##### Part-Time Shoulder Use

- Part-time shoulder use adds short-term capacity which may increase vehicle speeds to the point that there are noise impacts to adjacent properties. Any noise abatement required will need to be included in the fixed price and within existing Right-of-Way.
- There are known existing pinch points due to various constraints within the corridor, such as sign structures, bridge widths, retaining walls and noise barriers. Addition of a part-time shoulder use lane may be difficult to achieve at these locations while meeting or exceeding all MDOT SHA, AASHTO and other roadway design and safety guidelines.
- The shoulders of IS-695 were not originally geometrically designed as travel lanes. As such, allowing for part-time shoulder use lanes while ensuring all geometric aspects meet or exceed all MDOT SHA, AASHTO and other roadway design and safety guidelines will be key.

- IS-695 was built in many stages and has had several improvement projects of various types since that time. As such, the existing pavement section of both inside and outside shoulder is variable within the corridor and can be minimal in some areas. Proposed use of shoulders for part-time use to achieve a median part-time shoulder use lane will need to take into consideration any pavement rehabilitation or full depth reconstruction required for that improvement while balancing any Stormwater Management or other resulting needs within existing Right-of-Way.
- IS-695 was built in many stages and has had several improvement projects of various types performed on it over time. As such, not all of the existing median barrier meets current standards or is in acceptable condition. Though the goals of this project are not intended to solely upgrade or replace the median barrier, any median barrier where a part-time median shoulder use lane is proposed shall be evaluated by the Design-Builder and, if needed, improved by the Design-Builder to ensure a safe and acceptable final condition.
- MDOT SHA is not acquiring any Right-of-Way for this project and all proposed improvements must be contained within the existing Right-of-Way.
- Avoidance and minimization of impacts to adjacent environmental resources should be conducted during the development of the proposed improvements. Any mitigation due to impacts by the Design-Builder's improvements shall be included in the fixed price and within existing Right-of-Way.

#### Mobility

- Improvements in overall mobility may increase vehicle speeds to the point that there are noise impacts to adjacent properties. Any noise abatement required will need to be included in the fixed price and within existing Right-of-Way.
- Improvements for mobility for IS-695 roadway users shall be at no additional resultant delay to the local adjacent roadway network users.
- Any widening or other work that is a part of the Design-Builder's project to facilitate their mobility improvements may result in Stormwater Management or other resulting needs. Any Stormwater Management or other resulting needs shall be included in the fixed price and within existing Right-of-Way.
- The Administration has identified cultural, historical and/or archeological sites that have the potential to be impacted by the Proposer's project. If properties are impacted by the Design-Builder's improvements for visual, audible, or other impacts, mitigation will be required. Any mitigation required for impacts to cultural, historical and/or archeological shall be included in the fixed price and within existing Right-of-Way.

Safety

- The addition of part-time shoulder use and increased mobility may have a reduction in congestion related crashes, but increased mobility can also lead to increased safety risks. In development of the proposed improvements, consideration should be given to all existing and potential safety risks.
- Maintenance of Traffic should be implemented to minimize delay while ensuring safe passage of all roadway users.

Operability/Maintainability/Adaptability

- The goal of MDOT SHA is for IS-695 to be an interstate corridor that is maintainable, operable, and adaptable during all potential operating conditions, both normal and emergency. The proposed improvements shall not preclude operating procedures during such conditions as snow events, emergency pull-offs, traffic management during incident events, and future technological advancements.
- MDOT SHA understands that it will be taking on new systems, roles and responsibilities as a result of this project. However, those roles and responsibilities will need to be integrated into existing MDOT SHA systems and workforce. Additional support and education provided by the Design-Builder will be needed as part of this integration.
- Maintenance of facilities, especially on an interstate corridor, causes many issues. At a minimum all improvements must minimize impact to traffic during maintenance activities while maximizing the ability to adequately maintain and ensure the safety of the maintenance work force.

2.07.02.05 Project Status

The current status of aspects of the project is as outlined hereafter.

2.07.02.05.1 Survey

The mapping was created from aerial LiDAR and OrthoImagery with a 1" = 10' design scale accuracy and was processed at 30 scale. A contour surface model and topographic base map were prepared on the basis of this LiDAR mapping. Supplemental data collected surveys were performed along portions of the roadways to refine pavement elevations, ditch inverts, service access roads, stormwater management (SWM) facilities, and pipe culverts and processed at 50 scale. The data from these supplemental surveys was incorporated into the survey plan and the surface. This information will be available in electronic format on ProjectWise with the issuance of the RFP. All





surveys were performed in the Maryland State Plane Grid, NAD 83/2011 Adjustment and NAVD 88. The Design-Builder must obtain any additional survey data necessary for their design, construction, and verification of surface model for all design activities.

2.07.02.05.2 Plans

No conceptual plans are being provided as part of this request for proposals.

2.07.02.05.3 Cross-Sections

Field-surveyed cross-sections were not taken and conceptual cross sections were not prepared. The Design-Builder must perform field-run cross-sections to complete design and construction activities to address design and/or construction issues and provide clarification where necessary. Cross-sections showing existing and proposed ground must be prepared by the Design-Builder using the appropriate computer software.

2.07.02.05.4 Pavement & Geotechnical Explorations

The Administration is not obtaining any soil borings, performing laboratory testing, or performing any preliminary geotechnical survey. The Administration has provided soil borings previously conducted for other projects within the corridor. This information is available in electronic format on ProjectWise.

The Administration is providing Ground Penetrating Radar (GPR) data, and pavement cores taken in select areas for the median and outside shoulders. This information will be available in electronic format on ProjectWise.

The Design-Build Team is responsible for performing a complete pavement and geotechnical program including borings, sampling, in-situ and laboratory testing, analysis, design, and other pavement and geotechnical services as necessary to complete design and construction.

2.07.02.05.5 Utilities

The Administration has had a utility designating service locate underground utilities which identified the existence of utilities at their approximate horizontal locations from Utility Owner as-built plans, a Level C Designation. The utility designation will be provided on ProjectWise as supplemental information. The utility designation was developed from IS-70 to Lillian Holt Drive. The Administration does not certify horizontal or vertical accuracy for any utility provided in the designation. Additional utilities may be present in the area. The Design-Builder is responsible for obtaining all information that will be required to complete design and construction. The Design-Builder will be responsible for obtaining any utility data it determines necessary for design and construction of the project. The Design-Builder must coordinate and

cooperate with other contractors that are expected to be relocating utilities during the construction of this Project.

2.07.02.05.6 National Environmental Protection Act Compliance

In accordance with the requirements of National Environmental Protection Act (NEPA), MDOT SHA has completed a CE for this project. The Design-Builder is required to fulfill all commitments and requirements included in the NEPA document and its appendices.

The improvements proposed by the Design-Builder, which occur inside or outside of the project Right-of-way, shall be reviewed to determine if an environmental summary or reevaluation is required. Should the Design-Builder's improvements result in an environmental summary or reevaluation, it will be completed by MDOT SHA post Award with the Design-Builder providing any and all data and information required. It is the responsibility of the Proposer to account for the time to obtain approval of an environmental summary or reevaluation within their project schedule. If an environmental summary/reevaluation is needed, it must be approved by FHWA prior to construction starting.

a. Noise –

The NEPA selected alternative static-dynamic inside shoulder use that does not shift existing lanes of traffic closer to noise sensitive receptors is exempt from noise analyses.

The Design-Builders must analyze its improvements to determine if they meet the definition of a Type I Project in accordance with MDOT SHA Noise Policy and 23 CFR 772.5. If the Design-Builder's improvements meet the definition, the Design-Builder shall perform noise analyses based on their proposed improvements. **Site Constraint Assessment or Extra Cost Assessment shall not be utilized for this project.** The criteria to determine if noise abatement is reasonable and/or feasible shall be applied without consideration for site constraints or extra costs. If the Noise Analysis determines that noise abatement is reasonable and feasible, without use of Site Constraint Assessment or Extra Cost Assessment, the Design-Builder shall design and construct the noise abatement and all associated features as part of the Design-Builder's project. All cost for this work shall be included as part of the project Total Lump Sum Price.




Existing noise models were developed along IS-695 from IS-70 to MD-43 and are provided on ProjectWise.

b. Air Quality –

Summary report of qualitative Mobile Source Air Toxics (MSAT) analysis is included in the NEPA document.

c. Cultural Resources

 The Administration has identified historical and/or archeological sites that have the potential to be impacted by the project. If properties are impacted for visual, audible, or other impacts, mitigation will be required. All cost for any mitigation shall be included as part of the Total Lump Sum Price.

2.07.02.05.7 Right of Way

All construction must be contained within the Right-of-Way. No Additional Right-of-Way will be obtained by the Administration for this project.

The Design-Builder will be responsible for acquiring, at its expense, all other rights in land needed for construction staging, yarding, construction, or otherwise.

2.07.02.05.8 Permits

The following permits and/or approvals are anticipated to be required for this project:

- Stormwater Management Permit and Erosion and Sediment Control Approval (from SHA-Plan Review Division)
- National Pollutant Discharge Elimination System (NPDES) Permit (from MDE)

**Status of Stormwater Management and Erosion and Sediment Control Review:**

No Stormwater Management (SWM) design has been developed by the Administration. The Design-Build Team is responsible for the preparation of SWM Plans and obtaining final approvals.

No erosion and sediment control (ESC) design has been developed by the Administration. The Design-Build Team is responsible for the preparation of ESC Plans and obtaining final approvals.

**Status of National Pollutant Discharge Elimination System Permit:**

The Administration has not submitted a Notice of Intent (NOI) form to MDE. The Design-Build Team is responsible for submitting the NOI and to complete the public notice period and submitting any amendments thereto. Any delays resultant of obtaining NOI amendments will be the sole responsibility of the Design-Builder.






**2.07.03 RFP Package**

The following materials are being provided to all prospective proposers:

- A. Request for Proposals
- B. Questions and Responses

The following materials are being provided in electronic format on ProjectWise. This material is considered Engineering Data and the Administration will stand behind its accuracy unless otherwise specified in the contract documents.

- C. Survey/Topographic Files
  - Topographic files
  - Text files
  - Existing Contour files
  - Triangle files
  - Environmental Features file
  - Existing Surface files
- D. Right-of-Way
  - Existing Plats
  - Existing Right-of-Way Mosaic File
- E. Environmental Document
  - NEPA Document
- F. Appendices
  - Ground Penetrating Radar (GPR) and Pavement Cores
  - Existing Traffic Volumes
  - VISSIM Traffic Models
  - Existing Crash Data

-  ○ Noise – Information and Base Data
  - Natural Resources Inventory Report
  - CHART Program ATMS System Architecture
-  ○ MDOT SHA OOTS Traffic Engineering Design Division (TEDD) Shelf  
Typicals
-  ○ Intelligent Transportation Systems (ITS) Details
-  ○ Point of Presence (POP) Sign Details
  - Wetland Prohibitive Signage Detail
-  ○ Historical Borings

The following materials are being provided in electronic format on ProjectWise. The Administration makes no representation regarding its accuracy.

G. Utility Information

- Existing Utility designation files
- Utility plans and/or as-builts
- MDOT SHA Fiber Optic Communications Cable Map

H. I-270 Innovative Congestion Management Information

- Active Traffic Management Concept of Operations
- Ramp Metering Operational Concept
- I-270 Ramp Metering Default Database Information
- I-270 Ramp Metering – Proof-of-Concept – Test Plan
- ATM Decisions
- Ramp Metering Decisions
- CHART ATMS to I-270 ATM System Interface Control Document Final
- Proposed ATM Integration 1-10-18

I. Existing Data

- As-builts

- Inventory of Existing Structures



J. Existing Structure Inspection Reports

K. Existing Facility Investigations

- a. Surface Drainage
- b. Outfalls
- c. District 4 Identified Wet Areas
- d. Median Barriers

The following materials are being provided in electronic format on ProjectWise. This material is considered necessary for the Design-Build Team to submit a Technical Proposal, prepare a Price Proposal and/or finalize their designs.

L. I-695 Concept Evaluation Templates

M. Manuals and Guidance

- Structures Checklists
- Pavement and Geotechnical Design Guide Information
- VISSIM Modeling Techniques
- MDOT SHA Highway Noise Policy Amendment on Noise Analysis for Part-Time Shoulder Use, June 20, 2019
- Manual for Inspection of Highway Right of Way in Karst Area
- Interstate Access Point Approval Process for the Maryland Department of Transportation's State Highway Administration, Revised July 2017

In general, the Microstation files included on the ProjectWise are in conformance with the MDSHA Microstation V8 CAD Standards Manual.

It is likely that most Proposers will use plot drivers that differ from the drivers used to produce the provided plans. Some of the drawings screen existing features through level symbology color 250. The manipulation of the drawing files to produce any requirements

(as found elsewhere in the RFP) for as-built plans will be the responsibility of the selected Design-Builder.

Proposers are also provided with a file index provided on ProjectWise. The file is a Word Document describing all the files and files names as outlined above.

## **2.07.04 Description of Work**

### 2.07.04.1 Engineering/Construction Services

The required engineering and construction services to be provided by the Design-Builder shall include, if applicable based on the Design-Builder's improvements, but not be limited to:

- Roadway Design and Construction.
- Structural Design and Construction for All Culverts, End/Headwalls, Retaining walls, Noise walls, Drainage Structures, bridge/structure modifications/repairs and any and all other incidental structures specifically required for this project.
- Traffic analyses including but not limited to: preparation of Traffic Operations Analysis Report; preparation of an IAPA, if required for the project(s); safety analysis using the Highway Safety Manual (HSM) and submit to FHWA for approval, if required; in support of the preparation of the Maintenance of Traffic Alternative Analysis (MOTAA) and the Transportation Management Plan (TMP)
- Hydraulic Analysis, Design, Construction and Agency Approval for structures specifically required for this project.
- Temporary and Permanent Signing, Lighting, Signalization, Pavement Marking, and ITS Design and Construction.
- Active Traffic Management (ATM) software procurement, development, integration, and testing.
- Roadside Landscape Planting, Stormwater Management Landscape Planting, Reforestation Design and Construction of the aforementioned.
- Waterways and Wetland Permitting, As-built Certification and Design, Permitting and Construction of Mitigation.
- Utility Coordination for utility modifications regardless of whether designed and/or constructed by the Design-Builder or by others.
- Pavement and Geotechnical Engineering.
- Storm Water Management (SWM) Design, Approvals, Construction and As-Built Certification.

- Erosion and Sediment Control (ESC) Design, Implementation and Approvals (including NPDES Approvals).
- Engineering Studies and Reports required to meet the contract or permit requirements or to address any comments from the Administration or other agencies related to meeting or modifying the contract or permit requirements.
- Final Design Noise Analysis, should the Design-Builder's improvements meet the definition of a Type I Project.
- Reevaluation of NEPA, should design changes result in impacts not addressed in the Categorical Exclusion.
- General Coordination with Administration.
- Additional Data Collection (includes surveying, geotechnical, etc.).
- Produce Required Deliverables.
- Environmental Permit Activities (including obtaining permits as described herein).
- Community Relations as defined in TC 3.22 – Public Outreach Performance Specification.
- Temporary Traffic Control Design and Implementation including the preparation of a Transportation Management Plan (TMP).
- Maintenance of project site(s) including pavement maintenance, mowing, watering, and dust control.
- Obtaining all required permits from the appropriate regulatory agencies for any impacts to roadside trees, stormwater management, erosion and sediment control, or any other impacts.
- Implementation of any required mitigation or remediation.
- Any other items required to successfully complete the project.

**TC 2.08      PROPOSAL SUBMISSION REQUIREMENTS**

**2.08.01      Responsibilities of the Proposers**

2.08.01.1      Review of RFP

Before submitting a proposal, the Prospective Proposer is responsible for examining the RFP and materials furnished to each Prospective Proposer. The Prospective Proposer is responsible for all site investigation and preliminary design necessary to submit proposals and accept responsibility that their Price Proposal is



sufficient to complete all design and construction.

2.08.01.2 Site Investigation

The Administration is not acquiring any additional Right-of-Way for this project. The Design-Builder invited to submit a Price Proposal must first examine all of the project site that is under Administration control.

The Prospective Proposer is solely responsible for all site conditions discoverable from a reasonable site examination. A reasonable site examination includes all utility and/or geotechnical investigation that the Prospective Proposer determines is necessary to properly price the Work. If the Prospective Proposer determines, before submission of the proposals, that additional utility designation, geotechnical and/or subsurface investigation or analysis are necessary to properly price the Work; it is the responsibility of the Prospective Proposer to perform such investigation and analysis at its expense. The Administration is not obtaining any soil borings, performing laboratory testing, or performing any preliminary geotechnical survey. The Administration has provided soil borings previously conducted for other projects within the corridor. This information is available in electronic format on ProjectWise. The Administration has had a utility designating service locate underground utilities which identified the existence of utilities at their approximate horizontal locations from Utility Owner as-built plans, a Level C Designation. The utility information is included in the data provided on ProjectWise. It is the Proposer's responsibility to verify that information as part of its utility and/or geotechnical investigation. The Price Proposal submission will be considered conclusive evidence that the Prospective Design-Build Team has determined that it has performed a reasonable site investigation to submit Price Proposal, necessary to design and construct the project.

All subsurface investigations performed by the Prospective Proposer, including sampling and laboratory testing, shall be performed by a Geotechnical firm experienced in subsurface investigations and in accordance with the 1988 AASHTO Manual on Subsurface Investigations, AASHTO Standards, the Maryland State Highway Administration Standard Specifications for Subsurface Explorations, MSMT Standards, the Maryland State Highway Administration Book of Standards for Highway and Incidental Structures, and ASTM Standards. The Prospective Proposer shall be responsible for utility clearance and any traffic control required for his investigation. The Prospective Proposer shall submit all Maintenance of Traffic concepts related to site investigation to the SHA District 4 Traffic Division for approval. Any investigative methods that pose a safety threat to the traveling public shall not be used. Any borings taken in roadway or shoulder areas shall be backfilled before the area is re-opened to traffic. The Prospective Proposer shall restore to its current condition, any area of the site disturbed by his site investigation operations. If the Prospective Proposer encounters any abnormal conditions that indicate the presence of hazardous materials or toxic waste during his site investigation, he shall immediately suspend work in the area and notify the Administration. A Geotechnical Engineer who is registered in the State of Maryland shall supervise all subsurface investigations conducted by the Design-



Builder.

2.08.01.3 Utility Coordination

Prior to submitting a Price Proposal, the Prospective Proposer must conduct utility research and coordination with all utility companies along with additional site research to determine:

- a. What utility facilities actually exist within the project limits.
- b. What impact to existing utilities are required for the Proposer's project.
- c. What utility relocation must take place as a result of those impacts.
- d. What permitting results from any utility relocations required for the Proposer's project.
- e. The effect to the Proposer's schedule as a result of any utility relocations required for the Proposer's project.

The Price Proposal must represent a thorough consideration of these elements.

2.08.01.4 Additional Surveys

The Prospective Proposer may require additional survey or topographic information (including utility locations). The Design-Builder must account for these services within their project schedule and design submittals. It is the responsibility of the Prospective Proposer at its expense to obtain all additional information and the Administration accepts no responsibility for the lack of this information.

2.08.01.5 Duty to Notify if Errors Discovered

Proposers shall not take advantage of any error, omission, or discrepancy in the RFP or related materials, including all project information. If a Proposer discovers such an error, omission or discrepancy, he shall immediately notify the Administration in writing; failure to do so shall constitute a waiver of any claim based upon such error, omission, or discrepancy. After such notification, the Administration will confirm or modify the RFP in writing as the Administration determines may be necessary to fulfill the intent of the RFP.

**2.08.02 Pre-Submittal Requirements**

2.08.02.1 Intelligent Transportation Systems One-On-One Meeting

After the issuance of the RFP, the Administration will first hold a single one-on-one meeting with the Reduced Candidate List (RCL) on Intelligent Transportation Systems (ITS). The purpose of these meetings will be to discuss issues and clarifications regarding the RFP and/or the Proposer's Proposed Technical Concepts (PTC) submittals. The Administration reserves the right to disclose to all

Proposers any issues raised during the one-on-one meetings, except to the extent the Administration determines that, in its sole discretion, such disclosure would impair the confidentiality of a PTC or would reveal a Proposer's confidential business strategies. This meeting will be held independently with each Prospective Proposer on the RCL. The Administration will confidentially notify via email all proposers the potential dates for this ITS One-on-One meeting. A meeting agenda shall be provided by the Proposer to the Administration via the project specific email address at least one week prior to their scheduled meeting.

The one-on-one meetings are subject to the following:

- a. The meetings are intended to provide Proposers with a better understanding of the Administrations intent and needs as it relates to ITS.
- b. The Administration will not discuss any Proposal or PTC with any Proposer other than its own.
- c. Proposers are not permitted to seek to obtain commitments from the Administration in the meetings or otherwise seek to obtain an unfair competitive advantage over any other Proposer.
- d. No aspect of this meeting is intended to provide any Proposer with access to information that is not similarly available to other Proposers, and no part of the evaluation of Proposals will be based on the conduct or discussions that occur during these meetings.

The Administration reserves the right to disclose to all Proposers any issues raised during the ITS one-on-one meeting which require addenda to the RFP. The Administration, however, will not disclose any information pertaining to an individual Proposer's Proposal or PTCs to other Proposers.

#### 2.08.02.2 One-On-One Meetings


After the ITS One-On-One Meeting, the Administration will hold one-on-one meetings with the Reduced Candidate List (RCL). The purpose of these meetings will be to discuss issues and clarifications regarding the RFP and/or the Proposer's potential Alternative Technical Concept (ATC) submittals. The Administration reserves the right to disclose to all Proposers any issues raised during the one-on-one meetings, except to the extent the Administration determines that, in its sole discretion, such disclosure would impair the confidentiality of an ATC or would reveal a Proposer's confidential business strategies. Each meeting will be held independently with each Prospective Proposer on the RCL.

The one-on-one meetings are subject to the following:

- a. The meetings are intended to provide Proposers with a better understanding of the RFP.

- b. The Administration **will not** discuss any of the Proposer's ATCs that, at the time of the meeting, have been submitted and are under ATC review by the Administration.
- c. The Administration will not discuss any Proposal or ATC with any Proposer other than its own.
- d. Proposers are not permitted to seek to obtain commitments from the Administration in the meetings or otherwise seek to obtain an unfair competitive advantage over any other Proposer.
- e. No aspect of these meetings is intended to provide any Proposer with access to information that is not similarly available to other Proposers, and no part of the evaluation of Proposals will be based on the conduct or discussions that occur during these meetings.

The Administration reserves the right to disclose to all Proposers any issues raised during the one-on-one meetings which require addenda to the RFP. The Administration, however, will not disclose any information pertaining to an individual Proposer's Proposal, ATCs, or other technical concepts to other Proposers.


 2.08.02.3 Letter of Interest

A Letter of Interest (LOI), on official letterhead of the Design-Build Team, notifying the Administration whether or not the DB Team intends to submit a Price Proposal must be delivered no later than **September 2, 2020 prior to 12 noon** (EST). The LOI must be delivered to the following email address:

BA0065172\_I695\_TSMO@sha.state.md.us

The LOI must be signed by individual(s) authorized to represent the Major Participant firm(s) and the lead Constructor firm(s). A Major Participant is defined as the legal entity, firm or company, individually or as a party in a joint venture or limited liability company or some other legal entity, that will be a signatory to the Design-Build Contract with the Administration. Major Participant(s) will be expected to accept joint and several liability for performance of the Design-Build Contract. Major Participants are not design subconsultants, construction subcontractors or any other subcontractors to the legal entity that signs the Design-Build Contract.


If the Design-Build contracting entity will be a joint venture, or some other entity involving multiple firms, all Major Participant firms involved must have an authorized representative sign the LOI.

 2.08.02.4 Communications During Proposal Preparation

The Procurement Officer is the Administration's single contact and source of information for this procurement.

The following rules of contact will apply during the Contract procurement process, which begins upon the date of issuance of the RFP, and will be completed with the execution of the Contract. These rules are designed to promote a fair, unbiased, and legally defensible procurement process. Contact includes face-to-face, telephone, facsimile, electronic-mail (e-mail), or formal written communication.

The specific rules of contact are as follows:

-  1. Section 11-205 of the State Finance and Procurement Article, Annotated Code of Maryland, and 23 CFR 635.112 (f), prohibit and penalize collusion in the State procurement process.
2. Unless otherwise specifically authorized by the Procurement Officer, a Proposer may contact the Department and the Administration only through the Procurement Officer and only in letter format via e-mail and not orally. The Proposer's contacts with the Department and the Administration shall be only through a single representative authorized to bind the Proposer.
  3. The Procurement Officer normally will contact a Proposer in writing through the Proposer's designated representative.
  4. Neither a Proposer nor its agents may contact Department or Administration employees, including Department or Administration heads, members of the evaluation committee(s) and any other person who will evaluate proposals, regarding the project, except through the process identified above.
  5. Any contact by a Proposer determined to be improper may result in disqualification of the Proposer.
  6. The Administration will not be responsible for or bound by: (1) any oral communication, or (2) any other information or contact that occurs outside the official communication process specified herein, unless confirmed in writing by the Procurement Officer.

All requests for additional information or clarification of the RFP and any other communication concerning this project shall be submitted via e-mailed with return confirmation receipt. No verbal requests or personal visits will be honored. All written contacts shall be addressed to the Procurement Officer:

Eric E. Marabello, P.E.  
Director, Office of Highway Development  
Maryland Department of Transportation State Highway Administration  
e-mail address: BA0065172\_I695\_TSMO@sha.state.md.us

During the Proposal Phase, as discussed in GP 2.09, Prospective Proposers on the RCL may make inquiries up to 4:00 p.m. (EST) on **August 24, 2020**. Inquiries received after

that date and time will not be accepted. All responses to questions related to the Proposal Phase and any addenda to the RFP will be disseminated by email to the primary contact for those firms invited to submit Proposals.



2.08.02.5 Addenda

Interpretations, clarifications or modifications to this RFP will be made by Addenda. Only interpretations, clarifications and answers to the questions included in Addenda or such writings shall be binding on the Administration.



2.08.02.6 Request for Information (RFI)

Responses to all RFI's not part of an addendum, will be provided through email and shall be considered contractually binding. The Administration will provide a comprehensive list of questions and answers to the Reduced Candidate List 7 days prior to the Price Proposal due date.



2.08.02.7 Substitutions

Proposers are advised that, in order for a Proposer to remain qualified to submit a Price Proposal after it has been placed on the Reduced Candidate List, its organization, and Key Staff identified in the Technical Proposal, must remain intact for the duration of the procurement process. A Proposer may propose substitutions for participants after the Technical Proposal submittal; however, such changes will require written approval by the Administration, which approval may be granted or withheld in the Administration's sole discretion. Requests for changes must be made in writing no later than thirty (30) calendar days prior to the due date for submittal of Price Proposals.



2.08.02.8 Compliance with Applicable Law

In connection with this RFP and the Contract, Proposers shall comply with all applicable laws in all aspects in connection with the procurement process of this project and in the performance of the Contract.



2.08.02.9 Intelligent Transportation Systems Proposed Technical Concepts Submittal and Review



TC Section 2.08.02.9 through 2.08.02.13 sets the process for the submittal and review of Intelligent Transportation Systems (ITS) Proposed Technical Concepts (PTC). The process is intended to:

- Allow Proposers to incorporate innovation and creativity into the Proposals.
- Allow the Administration to consider Proposer ITS PTCs in making the selection decision.

- Avoid delays and potential conflicts in the design associated with deferring of reviews of ITS PTCs to the post-award period.
- Obtain the best-value for the public.

Because this project desires the Design-Builder to develop innovative ITS solutions, there may not currently be Administration approved equipment/hardware, software, guidelines, standards, and/or references for the systems the Design-Builder intends to propose. It shall be the Design-Builder's responsibility to propose via the ITS PTC process any equipment/hardware, software, guidelines, standards, and references to be utilized on this contract for those systems and system components, where Administration approved equipment/hardware, software, guidelines, standards, and references do not already exist.

Any equipment/hardware, software, guideline, standard, or reference proposed should be approved for usage by other transportation agencies, have been developed for the specific purpose of supporting intelligent transportation systems or other transportation technology, or have been developed through organizations such as, but not limited to, the American Association of State Highway and Transportation Officials (AASHTO), the Institute of Transportation Engineers (ITE), the Intelligent Transportation Society of America (ITSA), the Federal Highway Administration (FHWA), the National Operations Center of Excellence (NOCoe), and/or the Transportation Research Board (TRB).

Alternatively, if there is no published guideline, standard, or reference for the ITS that the Design-Builder intends to propose, the Design-Builder may submit an example project that serves as an example of the ITS that the Design-Builder intends to propose. It shall be the Design-Builder's responsibility to propose via the ITS PTC process any example projects of the ITS the Design-Builder intends to propose.

A concept is not eligible for consideration as an ITS PTC if, in the Administration's sole discretion:

- It is not directly related to ITS; if
- There already exists an applicable Administration approved equipment/hardware, software, guideline, standard, and/or reference; or if
- Specifications/requirements for the ITS solution are provided in the RFP

 2.08.02.9.01 ITS PTC Submittals

The Proposer may only submit up to 20 ITS PTCs on each of the following submittal dates:

- March 26, 2020
- May 14, 2020
- July 2, 2020



All ITS PTCs shall be submitted in writing and posted only to ProjectWise via the secure confidential ITS PTC folder under the “\_Procurement Data Drop\ BA0065172” folder using the unique username and password provided them with the issuance of this RFP. The Proposer shall create a new sub-folder for each ITS PTC under the ITS PTC folder. Each ITS PTC folder shall use the following folder naming convention “year-month-day- sequential PTC number”. An appendix folder may also be created by the proposer under each individual PTC sub-folder.

1 Once an ITS PTC has been posted the Proposer shall submit a notification via email to the project email address, BA0065172\_I695\_TSMO@sha.state.md.us, stating that an ITS PTC(s) has been made and clearly identifying the submittal as a request for review of an ITS PTC.

All ITS PTC submissions on ProjectWise shall have a cover letter clearly identifying the submittal as a request for review of an ITS PTC. If the Proposer does not clearly designate its submittal as an ITS PTC, the submission will not be treated as a PTC by the Administration. **Any ITS PTCs, up to 20 for each date, the Proposer wishes reviewed by the Administration shall be posted to ProjectWise and notification email submitted prior to 12 noon (prevailing local time) on that date.** The Administration will not begin the review of any ITS PTC until after 12 noon (prevailing local time) on each of the dates specified above.

If the Proposer submits more than 20 ITS PTCs, the Administration will notify the Proposer via the project email address. The Proposer will need to identify in writing via email which ITS PTCs they wish to withdraw from consideration to bring their total to 20 ITS PTCs only. The Proposer must submit this information on or before 12 noon (prevailing local time) on the next business day after the ITS PTCs submittal date noted above. If a response is not received by this time, all ITS PTCs for that Proposer will be withdrawn from consideration.

1 2.08.02.10 Content of PTC Submittal

Each PTC submittal shall include a sequential PTC number and shall include the following, as applicable:

- A) Description: Detailed descriptive information and other information as appropriate such as conceptual drawings, conceptual concept of operations, product details, standards, and specifications.
- B) Location and Use: The locations where, and an explanation of how, the PTC will be used on the Project to meet the Project’s goals and ITS performance requirements.



- C) Maintenance: Any change in routine maintenance requirements associated with the PTC, including increases or decreases in maintenance resources or cost.
- D) Design Life: A description of the anticipated design life of the item(s) comprising the PTC.
- E) Time Savings: Any reduction in the time period necessary to design and construct the Project resulting from implementing the PTC, including, as appropriate, a description of method and commitments.
- F) RFP References: References to requirements of the RFP that are inconsistent with the proposed PTC, an explanation of the nature of the deviations from said requirements, and a request for approval of such deviations. Any requested deviation from the requirements from the RFP related to the PTC must be listed in this section.
- G) Evaluation/Analysis: The evaluation/analysis justifying the use of the PTC and why the deviation, if any, from the requirements of the RFP should be allowed.
- H) Potential Impacts: A preliminary analysis of potential impacts (both during and after construction) including but not limited to user/operator/stakeholder impacts, Right-of-Way, geotechnical, utilities, environmental permitting, local community, safety, and life-cycle project and infrastructure costs, including impacts on the cost of repair, maintenance, and operation.
- I) Other projects: A description of other projects on which the PTC has been used, the degree of success or failure of such usage, and the names and contact information (including telephone numbers and e-mail addresses) of project owner representatives who can confirm such statements.
- J) Added Administration Risk: A description of added risk to the Administration or third parties associated with implementing the PTC.
- K) Added Design-Builder Risk: A description of added risk to the Design-Builder associated with implementing the PTC.
- L) Additional Costs: An estimate of any additional Administration, Proposer, or third-party cost associated with implementation of the PTC.
- M) Price Proposal Adjustment: An estimate of the Price Proposal adjustment should the PTC be approved and implemented.

- N) Equal or Better: An analysis of how the PTC is equal or better in quality and performance than the requirements of the Contract Documents and how it would advance the project goals, as applicable.
- O) Example projects submitted by the Design-Builder for consideration as a PTC shall include all of the above items as well as a write-up of the example project explaining the equipment/hardware, software, and systems/subsystems of the ITS and the concept of operations. The Owner and primary project contact's information and a design and construction cost summary shall also be provided for verification by the Administration.
- P) Reliability: The Design-Builder shall identify and discuss any known instances of repeated equipment/hardware, components of equipment/hardware, software, and/or systems/subsystems failure or defect and if the issues has been remedied and how.
- Q) Electrical/Communications: A description of the anticipated electrical and communications requirements of the item(s) comprising the PTC, as applicable.
- R) Infrastructure: A description of the anticipated infrastructure requirements of the item(s) comprising the PTC, as applicable.
- S) Subsystem/System: A description of how the PTC integrates with the various ITS subsystems and overall ITS system (as proposed by the Design-Builder and CHART's existing systems), as applicable.
- T) Control: A description of the anticipated control approach and requirements of the item(s) comprising the PTC, as applicable.
- U) Integration: A description of how the PTC will integrate within the overall ITS system and CHART's ATMS, as applicable.
- V) Cost/Benefit and Mitigation: For any potential negative or adverse impacts, a description of the Cost/Benefit and/or mitigation that can be undertaken to minimize the impact.

It shall be the Proposers responsibility to provide sufficient information in their responses to each of the bulleted sections A through U above for the Administration to make its determination on an ITS PTC.

The Proposer may, provide an appendix of additional clarification information. **This additional information is for clarification purposes only** and shall not alleviate the Proposer's responsibility to provide sufficient information solely in their responses to bullet sections A through U for the Administration to make its

determination. The Proposer may reference in their response the location in the appendix where relevant clarification information can be found if the Administration wishes to review it. The referencing of appendix information shall not alleviate the Proposer's responsibility to provide sufficient information in their responses to bullet sections A through U for the Administration to make its determination. The Administration makes no guarantee the appendix information provided will be reviewed, even when referenced by the Proposer, and review of clarification information is at the Administration's sole discretion.

 2.08.02.10.01 ITS PTC Format

ITS PTC shall be submitted in only Adobe PDF compatible files and formatted for printing on either 8.5"-by-11" or 11"-by-17" paper.

Type Font and Margins. The type face of all narrative text shall be at least 12-pt, either Arial or Times New Roman font, and all page margins must be at least ½" from sides and 1" from top and bottom. All pages shall be sequentially numbered not including the cover letter. Each page shall contain in the header or footer of each page shall clearly denote the sequential ITS PTC number

Finding tools, such as linked table of contents and/or PDF bookmarks shall be utilized to make the submittals easily usable.

 2.08.02.11 Review and Determination by The Administration

The Administration will review each ITS PTC submitted in accordance with these requirements. The Administration will return its written determination for each of the proposers ITS PTCs via email 28 days from the dates listed above in TC 2.08.02.8. The Administration will make one of the following determinations with respect to each properly submitted ITS PTC:

- A) The PTC is acceptable for inclusion in the Proposal.
- B) The PTC is not acceptable for inclusion in the Proposal.
- C) The PTC is conditionally approved in its present form and may be included in the Proposal upon satisfaction, in the Administration's sole discretion, of identified conditions, clarifications, or modifications.
- D) The PTC is not acceptable in its present form, but may be acceptable upon satisfaction, in the Administration's sole discretion, of certain identified conditions, clarifications, or modifications which must be made through a resubmittal of a revised PTC.

- E) The submittal is not eligible for considerations as a PTC based on the criteria outlined in TC 2.08.02.8.

If a re-submittal of an ITS PTC submittal is made, it shall follow the same requirements as an ITS PTC submittal and shall only be submitted on one of the submittal dates outlined in TC 2.08.02.8 and shall count towards the Proposer's ITS PTCs limit for that date. The required ITS PTC submittal cover letter shall clearly identify such submissions as an ITS PTC resubmitted for an additional review.

The Administration is under no obligation to approve an ITS PTC and approval of an ITS PTC is at the sole discretion of the Administration. The non-approval of any ITS PTC will not entitle the Proposer to an extension of the Proposal due date.

Each Proposer, by submittal of its Proposal, acknowledges that the opportunity to submit PTCs was offered to all Proposers, and waives any right to object to the Administration's use of the ITS PTC process as well as the Administration's determinations regarding the acceptability of the Proposer's PTCs.

 2.08.02.12 Incorporation Into Proposals


Proposer may incorporate zero, one or more approved or conditionally approved ITS PTCs into its Proposals. However, for any equipment/hardware, software, guidelines, standards, or references where the Administration currently does not have any equipment/hardware, software, guidelines, standards, or references approved, a copy of an approved or conditionally approved ITS PTC submittal and the associated Administration's ITS PTC approval letter shall be included in both the Technical and Price Proposals in order for the system to be incorporated into their Technical and Price Proposals. Except for incorporating PTCs and ATCs, the Technical and Price Proposals may not otherwise contain additions to, exceptions to, or deviations from the requirements of the RFP Documents.

Approval of an ITS PTC will constitute a change of the Contract Documents to include the equipment/hardware, software, guidelines, standards, or references associated with the approved ITS PTC. If the ITS PTC was conditionally approved it may be included in the Proposer's Proposals, however the conditions identified in the Administration's response must be satisfied prior to it becoming part of the Contract Documents. Should the Design-Builder be unable to satisfy those conditions for any ITS PTC, or if the concept otherwise proves to be infeasible, the Design-Builder will be required to conform to the original Contract Documents.

 2.08.02.13 PTC Confidentiality

PTCs properly submitted by a Proposer and all subsequent communications regarding its PTCs will be considered confidential. If a Proposer wishes to make any announcement or disclosure to third parties concerning any PTC, it shall first notify the Administration in writing of its intent to take such action, including details as to date and participants, and obtain the Administration's prior approval to do so.

 2.08.02.14 ATC Submittal and Review

 TC Section 2.08.02.14 through 2.08.02.19 set the process for the submittal and review of Alternative Technical Concepts (ATC) that conflict with the requirements for design and construction of the project, or otherwise require a modification to the technical requirements of the project. The process is intended to:

- Allow Proposers to incorporate innovation and creativity into the Proposals.
- Allow the Administration to consider Proposer ATCs in making the selection decision.
- Avoid delays and potential conflicts in the design associated with deferring of reviews of ATCs to the post-award period.
- Obtain the best-value for the public.

ATCs eligible for consideration hereunder are limited to those deviations to the requirements of the as-issued Contract Documents that result in performance and quality of the end product that equal to or better than the performance and quality of the end product absent the deviation, as determined by the Department at its sole discretion. **Equal to or better ATCs that include the application of practical design alternatives that will advance the project goals without compromising the performance, quality, and safety of the end product are encouraged.**

A concept is not eligible for considerations as an ATC if, in the Administration's sole discretion, it is premised upon or it would require:

- A reduction in project scope, performance, or reliability.
- The addition of a separate Administration project to the Contract (such as expansion of the scope of the project to include additional roadways).
- An increase in the amount of time required for Substantial Completion or Contract Time.

Any ATC that, if implemented, would require further environmental evaluation or permit modifications for the project, may be allowed, provided that the Proposer bears the schedule and cost risk associated with such additional environmental reevaluation or permit modifications. If the Proposer is not able to obtain the

approvals necessary to implement the ATC, the Proposer is obligated to develop the project in accordance with existing approvals and without additional cost or extension of time.

If a Proposer is unsure whether a concept is consistent with the requirements of the RFP or if the concept would be considered an ATC by the Administration, the Administration recommends that the Proposer submit such concept for review as an ATC. The Proposer is also encouraged to submit standards or specifications that are approved for usage by other state Departments of Transportation as ATCs. If a concept is submitted as part of the Technical Proposal that the Administration considers to be an ATC, and the Proposer has not received ATC approval prior to submission of the Price Proposal, the Proposer will be required to revert back to the RFP requirements if selected.

The Proposer may submit an ATC for review by the Administration on or before **August 11, 2020 at 4:00 p.m.** (prevailing local time). Inquiries received after that date and time will not be accepted.

All ATCs shall be submitted in writing and posted only to ProjectWise via the secure confidential ATC folder under the “\_Procurement Data Drop\ BA0065172” folder using the unique username and password provided them with the issuance of this RFP. The Proposer shall create a new sub-folder for each ATC under the ATC folder. Each ATC sub-folder shall use the following folder naming convention “year-month-day- sequential ATC number”. An appendix folder may also be created by the proposer under each individual ATC sub-folder.

Once a ATC has been posted the Proposer shall submit a notification via email to the project email address, BA0065272\_I695\_I70@mdot.maryland.gov stating that an ATC has been made and clearly identifying the submittal as a request for review of an ATC. If the Proposer does not clearly designate its submittal as an ATC, the submission will not be treated as an ATC by the Administration

The Administration will review each ATC submitted. If an ATC is summarily approved or not approved, the Administration's comments will inform the Proposer that its technical concept appears to be generally acceptable, or the Administration will identify areas in which the approach appears to be incompatible with the project goals and requirements. If the Administration needs more information to determine whether or not the ATC will be approved or not approved, the Administration will submit written questions to the Proposer and/or request a one-on-one meeting in order to better understand the details of the ATC. The Administration may conditionally approve an ATC based on required revisions to a portion or portions of the ATC.

If an ATC is not approved or conditionally approved and the Proposer feels that the non-approval or the conditions for approval were due to an incorrect conclusion on the part of the Administration, it may re-submit the ATC for one following the


above submittal process. If a re-submittal is made, it shall be accompanied by a cover letter clearly identifying such submission as an ATC submitted for an additional review. Resubmission of an ATC will not entitle the Proposer to an extension of the Proposal due date.

The Proposer shall advise the Administration in its ATC if it believes a one-on-one meeting is appropriate. Choosing to hold a one-on-one meeting for an ATC is at the sole discretion of the Administration.

The Administration will return its approval, non-approval, conditional approval, or additional questions pertaining to any specific ATC no later than three weeks after receipt of that ATC. If the Proposer does not receive a return response from the Administration within three weeks of the Administration's receipt of the ATC, the Proposer shall presume that the Administration has rejected the ATC. The non-approval of an ATC will not entitle the Proposer to an extension of the Proposal due date.

 2.08.02.15 Content of ATC Submittal


Each ATC submittal shall include a sequential ATC number and shall include the following:

-  A) Description: Detailed descriptive information and other appropriate information as appropriate, such as: conceptual drawings, production details, standards, specifications, and a traffic operations analysis.
- B) Location: The locations where, and an explanation of how, the ATC will be used on the Project.
- C) Maintenance: Any change in routine maintenance requirements associated with the ATC, including ease of maintenance.
- D) Design Life: Any change in the anticipated design life of the item(s) comprising the ATC.
- E) Time Savings: Any reduction in the time period necessary to design and construct the Project resulting from implementing the ATC, including, as appropriate, a description of method and commitments.
- F) RFP References: References to requirements of the RFP that are inconsistent with the proposed ATC, an explanation of the nature of the deviations from said requirements, and a request for approval of such deviations. Any requested deviation from the requirements from the RFP related to the ATC must be listed in this section.

- G) Analysis: The analysis justifying the use of the ATC and why the deviation, if any, from the requirements of the RFP should be allowed.
- H) Potential Impacts: A preliminary analysis of potential impacts (both during and after construction) including but not limited to user impacts, Right-of-Way, geotechnical, utilities, environmental permitting, local community, safety, and life-cycle project and infrastructure costs, including impacts on the cost of repair, maintenance, and operation.
- I) Other projects: A description of other projects on which the ATC has been used, the degree of success or failure of such usage, and the names and contact information (including telephone numbers and e-mail addresses) of project owner representatives who can confirm such statements.
- J) Added Administration Risk: A description of added risk to the Administration or third parties associated with implementing the ATC.
- K) Added Design-Builder Risk: A description of added risk to the Design-Builder associated with implementing the ATC.
- L) Additional Costs: An estimate of any additional Administration, Proposer, or third-party cost associated with implementation of the ATC.
- M) Price Proposal Adjustment: An estimate of the Price Proposal adjustment should the ATC be approved and implemented.
- N) Equal or Better: An analysis of how the ATC is equal or better in quality and performance than the requirements of the Contract Documents and how it would advance the project goals, as applicable.

The Proposer may, provide an appendix of additional clarification information. **This additional information is for clarification purposes only** and shall not alleviate the Proposer's responsibility to provide sufficient information solely in their responses to bullet sections A through N for the Administration to make its determination. The Proposer may reference in their response the location in the appendix where relevant clarification information can be found if the Administration wishes to review it. The referencing of appendix information shall not alleviate the Proposer's responsibility to provide sufficient information in their responses to bullet sections A through N for the Administration to make its determination. The Administration makes no guarantee the appendix information provided will be reviewed, even when referenced by the Proposer, and review of clarification information is at the Administration's sole discretion.



 2.08.02.16 Determination by the Administration

The Administration will make one of the following determinations with respect to each properly submitted ATC:

- A) The ATC is acceptable for inclusion in the Proposal.
- B) The ATC is not acceptable for inclusion in the Proposal.
- C) The ATC is conditionally approved in its present form and may be included in the Proposal upon satisfaction, in the Administration's sole discretion, of identified conditions, clarifications, or modifications.



- D) The ATC is not acceptable in its present form, but may be acceptable upon satisfaction, in the Administration's sole discretion, of certain identified conditions (such as additional information and/or a one-on-one meeting) which must be met or clarifications or modifications that must be made through a submittal of a revised ATC.
- E) The submittal does not qualify as an ATC but may be included in the Proposal because it appears to be within the requirements of the RFP.
- F) The Administration requires additional time to further review the ATC, and expects to provide a response to the Design-Builder on (Date).

Approval of an ATC will constitute a change in the specific requirements of the Contract Documents associated with the approved ATC and for that specific Proposer. Should the Design-Builder be unable to obtain required approvals for any ATC incorporated into the Contract Documents, or if the concept otherwise proves to be infeasible, the Design-Builder will be required to conform to the original RFP requirements. Each Proposer, by submittal of its Proposal, acknowledges that the opportunity to submit ATCs was offered to all Proposers, and waives any right to object to the Administration's use of the ATC process as well as the Administration's determinations regarding the acceptability of the Proposer's ATCs.

 2.08.02.17 Incorporation Into Proposal

Proposer may incorporate zero, one or more pre-approved ATCs into its Proposal including conditionally approved ATCs. If the Administration responded to an ATC by identifying conditions to approval, those conditions become part of the Contract Documents. Copies of the ATC submittal and the Administration's ATC approval letters for each incorporated ATC shall be included in the Price Proposal.

Except for incorporating PTCs and ATCs, the Technical and Price Proposals may not otherwise contain additions to, exceptions to, or deviations from the requirements of the RFP Documents.

 2.08.02.18 ATC Confidentiality

ATCs properly submitted by a Proposer and all subsequent communications regarding its ATCs will be considered confidential. If a Proposer wishes to make any announcement or disclosure to third parties concerning any ATC, it shall first notify the Administration in writing of its intent to take such action, including details as to date and participants, and obtain the Administration's prior approval to do so.

 2.08.02.19 ATC One-On-One Meetings

After submission of an ATC, the Administration may conduct one-on-one meetings with a Proposer to gain information or a better understanding regarding its ATC and to discuss issues and clarifications regarding the ATC. Determination of whether a meeting is needed or not is at the sole discretion of the Administration. The Administration reserves the right to disclose to all Proposers any issues raised during the one-on-one meetings. However, the Administration will not disclose any information pertaining to an individual Proposer's ATCs or other technical concepts to other Proposers.

**2.08.03 Proposal Delivery Formalities**

2.08.03.1 Organization of Proposal Submittals

Prospective Proposers shall organize submittal of their Technical Proposal to match the organization specified in this RFP.

a. Separate Proposal Packages

Proposal submissions shall consist of two separate sealed packages, a Technical Proposal as described in TC Section 2.09 and a Price Proposal as described in TC Section 2.10.

b. Technical Proposal

The Technical Proposal may be submitted in container(s) of the Prospective Proposer's choice provided that the material is neat, orderly, and incapable of inadvertent disassembly. Technical Proposal shall be submitted and bound using a three (3) ring binder with all pages are numbered consecutively. Each container shall be clearly marked as follows:

Prospective Proposer's Name

**Technical Proposal**

IS-695 from IS-70 to MD 43 Transportation Systems Management and Operations

Contract Number: BA0065172

Container \_\_\_\_ of \_\_\_\_

- c. Location and deadline for submittal of Technical Proposal Submittal

Technical Proposals must be delivered no later than **September 22, 2020 prior to 12 noon** (EST). The proposal must be delivered to the following location:

Office of Procurement and Contract Management  
Fourth Floor, C-405  
707 N. Calvert Street  
Baltimore, Maryland 21202

- d. Number of Copies

One original and eight (8) copies of the complete Technical Proposal shall be submitted along with one (1) electronic copy PDF file on CD or flash drive and copies of the Administration's ATC approval letters for each incorporated ATC

- e. Price Proposals

The Price Proposal shall be submitted on the Proposal Form supplied by the Administration and shall be delivered in a sealed envelope capable of holding 8½" x 11" documents without folding and clearly marked as follows:

Prospective Proposer's Name

**Price Proposal**

IS-695 from IS-70 to MD 43 Transportation Systems Management and Operations

Contract Number: BA0065172

Container \_\_\_\_ of \_\_\_\_

f. Proposal Guaranty

The Proposal Guaranty shall be delivered with the Price Proposal in a sealed business-sized envelope clearly marked as follows:

Prospective Proposer's Name

**Proposal Guaranty**

IS-695 from IS-70 to MD 43 Transportation Systems Management and Operations

Contract Number: BA0065172

g. Location and deadline for submittal of Price Proposal Submittal

Price Proposals must be delivered no later than **September 11, 2020 prior to 12 noon** (EST). The proposal must be delivered to the following location:

Director, Office of Procurement and Contract Management  
Fourth Floor, C-405  
707 N. Calvert Street  
Baltimore, Maryland 21202

h. Number of Copies



A single original of the Proposal Guaranty and a single original of the Price Proposal shall be submitted as specified in this section. The Total Lump Sum Cost Breakdown shall also be submitted as outlined in TC Section 7.10.

2.08.03.2 Effect of Submitting Proposal

Signing of the Design-Build Proposal Submission Form and Price Proposal Form, and delivery of the Proposal represents (a) an offer by the Proposer to perform the Work for the Price submitted within the time(s) specified in accordance with all provisions of this RFP and (b) the Prospective Proposer's agreement to all the provisions of the RFP and Contract governing requirements and procedures applicable through execution of the Design – Build Contract. **The Technical Proposal will become part of the Design – Build Contract.**

By so signing the above referenced terms and by delivering the Proposals, the Prospective Proposer makes the following affirmative representations.

- a. The Proposer has reviewed all documents and undertaken all investigations that could significantly impact the cost, timeliness, quality, or performance of the Work. Specifically, the Proposer has (a) carefully examined the RFP and all documents included or referenced therein, (b) carefully examined all available reports and data related to subsurface conditions, (c) become familiar with all

applicable federal, state and local laws and regulations, (d) visited the site and made all reasonable visual investigations, and (e) correlated the information obtained from the above examinations and investigations.

- b. The Proposer has given the Administration written notice of all errors, omissions, or discrepancies in the RFP in accordance with Section TC 2.08.01.



- c. The Proposer has determined that the RFP is generally sufficient to convey an understanding of all terms and conditions that could significantly impact the cost, timeliness, quality, or performance of the Work.

#### 2.08.03.3 Withdrawals and Resubmittals of Proposals

A Proposer may withdraw Proposals after delivery, provided the request for such withdrawal is made in writing or in person before the date and time set for submission of Proposals. The Proposer may revise and resubmit a Proposal so withdrawn before said date and time.

#### 2.08.03.4 No Public Opening

There will be no public opening of Proposals. After the Proposal Date, all Proposals will be opened in the presence of two or more Administration employees and reviewed for completeness. A register of Proposals will be prepared that identifies each Proposer.

Neither the identity of any Proposer nor the register of Proposals will be publicly disclosed until after the Procurement Officer makes a determination recommending award of the Contract.

### **TC-2.09 TECHNICAL PROPOSALS**

General: The Technical Proposal submittal shall contain concise narrative descriptions and graphic illustrations, drawings, charts, plans and specifications that will enable the Administration to clearly understand and evaluate the capabilities of the Design - Build team and the characteristics and benefits of the proposed technical solutions.

No Price Information: No price information of any kind shall be included in the Technical Proposal submittal.

Proposal Organization: Organization of the Technical Proposal shall comprise five parts, meet the specified page limitation, and correspond to the outline as follows:

- Cover Letter
- Part-Time Shoulder Use

- Mobility
- Safety
- Operability/Maintainability/Adaptability

**Format:**

- Paper. The Technical Proposal submittal shall be submitted on 8.5”-by-11” paper printed back to back where practical. Charts, exhibits, and other illustrative and graphical information may be on 11”-by-17” paper, but must be folded to 8.5”-by-11”, with the title block showing. Charts, exhibits, and other illustrative and graphical information on 11”-by-17” paper may not contain narrative text. An 11”-by-17” sheet shall be one-sided and will be considered only one page.
- Type Font, Line Spacing and Margins. The type face of all narrative text shall be at least 12-pt, either Arial or Times New Roman font, line spacing shall be no less than single space and all page margins must be at least ½” from sides and 1” from top and bottom. All pages shall be sequentially numbered not including the cover letter.
- Page Limits. The Technical Proposal submittal shall be limited to the number of pages defined below. No page limit will be imposed on the appendices, although the size of the appendix should be kept within reason.
- Finding tools, such as tables of contents and page dividers shall be utilized to make the submittals easily usable.

**2.09.01 Cover Letter (Limit 2 Pages)**

The cover letter includes mandatory information requirements. The Cover Letter will not be part of the evaluations.

The cover letter must be addressed to the Procurement Officer:

Mr. Eric E. Marabello, P.E.  
Director, Office of Highway Development  
MDOT State Highway Administration

The submittal cover letter must be signed by individual(s) authorized to represent the Major Participant firm(s) and the lead Constructor firm(s). A Major Participant is defined as the legal entity, firm or company, individually or as a party in a joint venture or limited liability company or some other legal entity, that will be signatory to the Design–Build Contract with the Administration. Major Participant(s) will be expected to accept joint and several liability for performance of the Design–Build Contract. Major Participants are not design subconsultants, construction subcontractors or any other subcontractors to the legal entity that signs the Design–Build Contract.

If the DB Contracting entity will be a joint venture, or some other entity involving multiple firms, all Major Participant firms involved must have an authorized representative sign the cover letter.

The cover letter shall include the following:

- a. Names, main role and license or certification information of all Major Participant firms and the lead constructor and design firms if not a Major Participant firm, and other firms that are now being committed to the design–build team. You must include at least your lead design firm and your lead constructor firm in the DB Team at this time.
- b. The primary and secondary individual contacts for the Major Participant firm(s) with address, phone number, and E-mail address where all communications from the Administration should be directed for this RFP phase.
- c. Include an affirmative declaration that indicates to the best knowledge and belief of each Major Participant Firm, including the lead design firm if not a Major Participant firm, the information supplied in the Technical Proposal is true and accurate.
- d. Include a declaration that each Major Participant firm(s) and the lead design and lead constructor firm, if not a Major Participant firm, are prepared to provide the necessary financial, material, equipment, labor and staff resources to perform the project.
- e. Include a declaration by the Major Participants that signatories are affirming their intent to enter into a legal organization that shall constitute the DB Team.
- f. Include a certification that the DB Team is in compliance with the general conditions prohibiting a former Administration employee from working on this contract for one year after leaving the Administration and is in compliance with State Ethics Laws prohibiting work on a matter in which a former State employee participated significantly as a State Employee for the duration of this contract.
- g. Include a general authorization for the Administration to confirm all information contained in the Technical Proposal submittal with third parties, and indicate limitations, if any, to such authorization.
- h. Statement including the proposed legal structure of the DB Contractor and Team.

As an attachment to the cover letter and excluded from the page limitation for this section, provide documentation that the lead Design Firm has Professional Liability Insurance.

**2.09.02 Part-Time Shoulder Use (20 Pages Maximum) - CRITICAL**

**Goal: Maximize the amount of static-dynamic median part-time shoulder use to maximize an increase in vehicle throughput and minimize vehicle travel times and delay along the inner and outer loops of IS-695 from IS-70 to MD 43.**

**Value Statement:** Static-dynamic median part-time shoulder use is use of the median shoulder for most vehicles as a through lane during predetermined hours of operation (i.e., during a static period of time each day) with the option by MDOT SHA of select use outside of the predetermined hours, based on emergency need or atypical traffic conditions. This use of a median shoulder will create added capacity to increase vehicle throughput and minimize vehicle travel times and delay along the inner and outer loops of IS-695 from IS-70 to MD 43.



- i. Discuss the locations, including limits and typical section(s) of these locations, that the Design-Builder will provide static-dynamic median part-time shoulder use on the outer-loop and inner-loop of IS-695 from IS-70 to MD 43 as part of this project. Discuss how you chose those locations. Discuss any features that do not meet or exceed the roadway design and safety guidelines referenced in TC 3.08 – **CRITICAL**
- ii. Discuss how the Design-Builder’s static-dynamic median part-time shoulder improvements will reduce recurring congestion in terms of travel time, vehicle throughput, density, intersection operations, queues and vehicle network performance, along the IS-695 outer-loop and inner-loop and on the connecting ramps and arterial roadways. – **SIGNIFICANT**
- iii. Discuss the performance life provided by the Design-Builder’s static-dynamic median part-time shoulder use, with the Design-Builder selected predetermined hours of operation; that is, the time it will take for congestion levels to return to pre-construction levels in these various locations if no modification of time of day use is made. – **IMPORTANT**

**2.09.03 Mobility (20 Pages Maximum) - SIGNIFICANT**

**Goal: Provide additional improvements that maximize vehicle throughput, minimize vehicle travel times, and/or create a more reliable commuter trip along IS-695 from north of IS-70 to MD-43.**

**Value Statement:** Effective and reliable traffic flow along IS-695 is necessary for its function as a primary commuter route and for the vitality of economic development.

- i. Describe what improvements, other than Static-dynamic median part-time shoulder, the Design-Builder’s will provide to maximize vehicle throughput and minimize vehicle travel times. – **IMPORTANT**
- ii. Discuss how the Design-Builder’s Total Project, including static-dynamic median part-time shoulder and other improvements, will reduce recurring congestion in terms of travel time, vehicle



network performance, along the IS-695 outer-loop and inner-loop and on the connecting ramps and arterial roadways. – **CRITICAL**

- iii. Discuss the performance life of the Design-Builder’s Total Project; that is, the time it will take for congestion levels to return to pre-construction levels and the basis for the Design-Builder’s assessment of performance for all improvements, including static-dynamic median part-time shoulder. – **SIGNIFICANT**

**2.09.04 Safety (20 Pages Maximum) - SIGNIFICANT**

**Goal: Provide for a safer IS-695 corridor between IS-70 and MD-43 and increase the ability of MDOT SHA to reduce, detect, verify, respond to, and manage non-recurring congestion causes, such as crashes, disabled vehicles, and adverse weather or other emergency events.**

**Value Statement:** The ability of MDOT SHA to reduce, detect, verify, respond to, and manage non-recurring congestion causes, such as crashes, disabled vehicles, and adverse weather or other emergency events will not only increase safety but reduce delay and increase travel reliability.

- i. Discuss how the Design-Builder’s project will detect and verify non-recurring congestion along the IS-695 outer-loop and inner-loop between IS-70 and MD-43. This discussion should include how the Design-Builder’s project will detect and verify that there are no obstructions in the static-dynamic median part-time shoulder areas prior to opening the shoulder for use and the Design-Builder’s proposed plan of action for MDOT SHA if an obstruction is detected. This discussion should also include how the Design-Builder’s project will detect and verify and the Design-Builder’s proposed plan of action for MDOT SHA if a crash or obstruction is detected during the static-dynamic median part-time shoulder’s scheduled operating window. – **CRITICAL**
- ii. Discuss how your improvements allow MDOT SHA CHART to better respond to and manage non-recurring congestion along the IS-695 outer-loop and inner-loop between IS-70 and MD-43 – **SIGNIFICANT**
- iii. Discuss the Design-Builder’s proposed plan of action for MDOT SHA to determine if the static-dynamic median part-time shoulder use should be activated outside its scheduled operating window to allow for additional capacity when there is an incident in one or more through lanes on IS-695, the Design-Builder’s proposed plan for how MDOT SHA operators should determine what portion of part-time shoulder should be used for the incident and the Design-

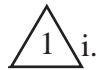
part-time shoulder should be used for the incident and the Design-Builder's proposed plan of action for how MDOT SHA opens and closes the shoulder.– **SIGNIFICANT**

- iv. Discuss how your improvements will reduce non-recurring congestion. – **IMPORTANT**

**2.09.05 Operability/Maintainability/Adaptability (Limit 10 Pages Maximum)**  
– **IMPORTANT**

**Goal: Provide improvements that minimize MDOT SHA operations and/or maintenance activities while being adaptable to future transportation technological advancements.**

**Value Statement:** The Administration values a project which will provide for ease of operations and maintenance that will emphasize safety for maintenance crews while also minimizing impacts to the efficient flow of traffic on IS-695. Provide improvements that minimize operations and maintenance requirements to the Administration while being adaptable to future transportation technological advancements.

-  i. Discuss how the Design-Builder's project will allow for maintenance to be performed safely while also minimizing impacts to the efficient flow of traffic on IS-695, including but not limited to snow removal, mowing, ITS equipment, and ITS communications. – **CRITICAL**
- ii. Address the maintenance personnel and equipment requirements of the proposer's improvements after construction is completed. Discuss the anticipated additional personnel needed to maintain the Design-Builder's project. Address how the Design-Builder will train existing maintenance forces to operate and maintain the improvements apart of the Design-Builder's project. – **SIGNIFICANT**
- iii. Discuss how will the Design-Builder's improvements be adaptable to future transportation technological advancements. – **IMPORTANT**

**2.09.06 Appendix**

Copies of all addenda letters and responses to RFIs issued by the Administration shall be included in the Appendix. Copies of the Proposer's PTCs and the Administration's PTC letters for each incorporated PTC shall be included in the appendix. Copies of the Proposer's ATCs and the Administration's ATC letters for each incorporated ATC shall be included in



the appendix. An electronic copy of the VISSIM traffic models for 2018 and 2040 build design years and Concept Evaluation Templates (.pdf and excel files) populated with the VISSIM traffic model results for 2018 and 2040 build design years shall be included. The Proposer shall use VISSIM Version 11.07, shall follow SHA's VISSIM Modeling Techniques, shall not modify calibration parameters, such as volumes, driving behavior, link behavior type, lane change distance, speed distributions and decisions without providing justification to the MDOT SHA and must use the simulation parameters and random seeds as provided in the VISSIM files when reporting results. MDOT SHA will review the information provided in the Proposer's justification and determine, in the Administration's sole judgement, whether the modification(s) is(are) justified. The Proposer may also include other supporting information related to its Technical Proposal in the Appendix. This supporting information, however, will not factor into the evaluation ratings and is considered additional reference information by the Administration

**TC-2.10 PRICE PROPOSAL**

**2.10.01 General**

Price Proposals will be accepted only from those Proposers invited by the Administration in writing to submit Price Proposals. Price Proposals must be submitted using the Proposal Form included in this RFP.

**Price Proposals shall be submitted on a lump sum basis, and shall include all engineering, design, research investigation, construction, labor, materials, and all incidentals necessary to complete the details and construction of this project.**

**Alternate bids utilizing foreign steel will not be allowed for this contract.**

**2.10.02 Price Proposal Irrevocable**

The Contractor's prices are irrevocable for 120 days following receipt of the Price Proposal or Best and Final Offer.

**2.10.03 Proposal Guarantee**

The Contractor's proposal guarantee shall represent 5% of the Price Proposal amount in accordance with the provisions of GP 2.07.

**2.10.04 Liquidated Damages**

In the event a complete project is not provided by the calendar date, a liquidated damage will be charged in accordance with the provisions of GP 8.09. The dollar amount of liquidated damages is stated on page 42 of 44 in the Proposal Form of the Request for Proposals. The Administration will be the sole approving authority in determining when the project is considered a usable facility.

## **2.10.05 Contract Time**

The Contract Time is the calendar date on page 42 of 44 in the Proposal Form of the Request for Proposals. The calendar date considers that the Notice to Proceed for the contract will be issued by the Administration on or before February 22, 2021. The calendar date will be the date where the Design-Builder will no longer require a presence within the highway Right-of-Way.

## **TC-2.11 EVALUATION OF PROPOSALS, OPENING AND SELECTION**

### **2.11.01 Best Value Process**

The Technical Proposal will be evaluated on the pass/fail and technical evaluation factors identified in TC Section 2.09. An evaluation committee (Committee) will determine the pass/fail status and overall technical rating of each Proposal. Once the overall technical rating is determined for each Technical Proposal, the Price Proposal results will be provided to the Committee and a tradeoff analysis will be performed. The Evaluation Committee will prepare a recommendation to the Selection Official indicating which Proposal is the most advantageous to the State (i.e., represents the best value). The Selection Official, together with the Selection Committee, will then assess the Evaluation Committee's recommendation and make a final determination as to which Proposal is the most advantageous to the State considering the technical and price factors set forth in this document.

**When determining which Proposer's submittal is the most advantageous to the State, the relative importance of the overall technical rating is substantially greater than the price.**

### **2.11.02 Evaluation of Technical Proposals**

The following elements of the Technical Proposal will be evaluated and rated on their content, accuracy and presentation.

- Part-Time Shoulder Use - CRITICAL
- Mobility - SIGNIFICANT
- Safety - SIGNIFICANT
- Operability/Maintainability/Adaptability– IMPORTANT

The relative importance of the technical evaluation factors and subfactors, when noted, will be weighted based on the following criteria:

- Critical – Factors or subfactors weighted as Critical are approximately three times the relative importance of Important.
- Significant – Factors or subfactors weighted as Significant are approximately two times the relative importance of Important.

While some factors and subfactors may have more relative importance than others, all of the Administration's goals are necessary for project success. Proposers are cautioned not to overemphasize an approach of certain goals at the expense of other goals.

2.11.02.1 Other

The pass/fail requirements include provision of all required forms included in the Proposal Package, properly completed and signed (if required).

2.11.02.2 Technical Proposal Evaluation Committee

The Administration will assemble Evaluation Teams and an Evaluation Committee consisting of key staff from appropriate offices within the Administration. The Evaluation Teams and Evaluation Committee will review the Technical Proposals to verify that all requirements of the RFP have been met, and to evaluate the proposals based on the evaluation factors.

2.11.02.3 Evaluation Process



Each Technical Proposal will be broken down into individual Evaluation Factor sections. Each Evaluation Team will only be given the section or sections for each specific Evaluation Factor or Factors they are rating and not the Technical Proposals in their entirety. Each Leader of the Evaluation Team will be part of the Evaluation Committee with other appropriate key staff within the Administration. This Evaluation Committee will review each Evaluation Factor and determine an overall Technical Rating for each Proposer.

2.11.02.4 Evaluation Results

The technical evaluation factors and the overall Technical Proposal will be rated by and adjectival (qualitative/descriptive) method. The following adjectival ratings shall be used in evaluation of each technical evaluation factor and the overall technical rating of the Proposal:

**EXCEPTIONAL** – The Proposer has demonstrated an approach that is considered to significantly exceed stated objectives/requirements in beneficial way to the Administration. This rating indicates a consistently outstanding level of quality, with very little or no risk that this Proposer would fail to meet the requirements of the solicitation. There are essentially no Weaknesses as defined below.

**GOOD** – The Proposer has demonstrated an approach that is considered to exceed stated objectives/requirements. This rating indicates a generally better than acceptable quality, with little risk that this Proposer would fail to meet the requirements of the solicitation. Weaknesses, if any, are very minor.

**ACCEPTABLE** – The Proposer has demonstrated an approach that is considered to meet the stated objectives/requirements. This rating indicates an acceptable level of quality. The Proposer demonstrates a reasonable probability of success. Weaknesses are minor and can be corrected.

**SUSCEPTIBLE TO BECOME ACCEPTABLE** – The Proposer has demonstrated an approach that fails to meet stated criteria as there are weaknesses and/or deficiencies, but they are susceptible to correction through Discussions. The response is considered marginal in terms of the basic content and/or amount of information provided for evaluation, but overall the Proposer is capable of providing an acceptable or better Proposal.


**UNACCEPTABLE** – The Proposer has demonstrated an approach that indicates significant weaknesses/deficiencies and/or unacceptable quality. The Proposal fails to meet the stated criteria and/or lacks essential information and is conflicting and/or unproductive. There is no reasonable likelihood of success. Weaknesses/deficiencies are so major and/or extensive that a major revision to the Proposal would be necessary.

In assigning ratings the Administration may assign plus(+) or minus (-) suffix to further differentiate the strengths or limitations within the technical ratings of EXCEPTIONAL, GOOD, and ACCEPTABLE.

The term “weakness,” as used herein, means any flaw in the proposal that increases the risk of unsuccessful contract performance. A significant weakness in the proposal is a flaw that appreciably increases the risk of unsuccessful contract performance. The term “deficiency” means a material failure of a proposal to meet an RFP requirement or a combination of significant weaknesses in a proposal that increases the risk of unsuccessful contract performance to an unacceptable level.

Any Proposal that receives a rating of Unacceptable in one or more technical evaluation factors will receive an overall technical proposal rating of Unacceptable.

The Technical Proposal will become part of the contract documents and all ideas provided to the Administration are expected to be included in the Price Proposals. The Administration or successful proposer may use ideas and approaches included in the technical proposal excluding proprietary or protected information.

 **2.11.03**

**Evaluation of Price Proposals**

Price evaluations will be performed based on the Proposal Price as reflected in the Schedule

of Prices, the Cost Breakdown as defined in TC Section 7.10, price accuracy, completeness and reasonableness.

1 Each Price Proposal shall specify the lump sum price for “DESIGN-BUILD A” and for “DESIGN-BUILD B” and those lump sum prices added together shall be the Total Lump Sum Price for the Work which will be performed according to the RFP. The lump sum price for “DESIGN-BUILD A” shall be fixed at \$70,000,000.00 and the lump sum price for “DESIGN-BUILD B” shall be fixed at \$73,316,249.00. The total of those two prices shall equal the Total Lump Sum Price for the Work that will be performed, which is fixed at \$143,316,249.00. Additionally, a lump sum breakdown for the Total Lump Sum Price will be required as part of the Price Proposal submittal as defined in TC 7.10. The lump sum breakdown shall be submitted in a format of the Design-Build Teams choice.

The Administration reserves the right to reject any Proposal if it determines that the Price Proposal is unacceptable, including a determination that the Proposal is significantly unbalanced or front end loaded to the potential detriment of the Administration.

An unbalanced Proposal is considered to be one (a) which is front-loaded or (b) for which the line item amounts or amounts shown in the Cost Breakdown do not reflect reasonable actual costs plus a reasonable proportionate share of the Proposer’s anticipated profit, overhead costs, and other indirect costs which are anticipated for the performance of the items in question.

A Price Proposal shall be deemed unacceptable if the Administration determines, in its sole discretion that it fails to conform to the conditions of the RFP in any manner. A Price Proposal may be unacceptable if it:

- A) Is significantly unbalanced relative to the scope of Work,
- B) Does not provide all information in conformance with the RFP, and/or
- C) Contains inaccurate, incomplete, and/or unreasonable prices on the Cost Breakdown.

1 **2.11.04 Communications**

The Administration may engage in communications with the Proposers after receipt of Proposals, allowing Proposers to provide clarifications to their Proposals or otherwise to address issues that might prevent the Proposal from being placed in the Competitive Range. This process will be initiated by delivery of a written request from the Administration to the Proposer identifying the information needed and a date and time by which the information must be provided. The Proposer shall provide the requested information in writing by the date and time indicated. If the requested information is not timely received, the Proposer’s ratings may be adversely affected and/or Proposal may be declared unacceptable.

The Administration may waive technical irregularities in the proposal of the Proposer that does not alter the quality or quantity of the information provided.

1 **2.11.05 Competitive Range**



The term “Competitive Range” means a list of the most highly rated Proposals, based on initial Technical Proposal ratings and evaluations of Price Proposals that are judged by the Procurement Officer to be reasonably susceptible of being selected for award. The Competitive Range is based on the rating of each Technical Proposal and evaluation of each Price Proposal against all evaluation criteria.


Proposals that would not be included in the Competitive Range and would be excluded from further consideration include:

- A) Any Proposal that, even after review of supplemental information or clarification provided by the Proposer in response to an Administration request does not pass the pass/fail evaluation factors;
- B) A Proposal that, after the initial evaluation, is rated lower than “ACCEPTABLE-” for any technical evaluation factor; and/or
- C) Any Proposal that includes a Price Proposal that is considered Unacceptable.

The Administration will determine the Competitive Range after a careful analysis of the Technical and Price Proposals.

 **2.11.06 Discussions**

The Administration reserves the right to make an award without Discussions. However, the Administration may, at its sole discretion, conduct Discussions (that is written or oral exchanges) with the Proposers in the Competitive Range, with the intent of allowing the Proposers to revise their Proposals.

 **2.11.06.1 Purpose**

If the Administration decides to engage in Discussions, the areas of Discussions may include the following:

- A) Attempting to resolve any uncertainties and obtaining any significant additional understanding concerning the Proposal;
- C) Resolving any suspected mistakes by calling them to the attention of the Proposers as specifically as possible without disclosing information concerning other competing Proposals or the evaluation process;
- D) Providing the Proposers a reasonable opportunity to submit any other supplemental information to their Proposals;
- E) Facilitating execution of a contract that is most advantageous to the State. Taking into consideration the technical and price factors discussed above

 **2.11.06.2 Procedures**

The following specific procedures will apply to Discussions:

- A) Discussions will only be conducted with Proposers in the Competitive Range. If Discussions are held, they will be held with all Proposers in the Competitive Range;



- B) Information disclosed by Proposers in the Competitive Range during Discussions will not be made public until after execution of the Contract;
- C) Discussions may be written and/or oral, and more than one round of Discussions may be conducted; and
- D) No disclosure will be made of any information derived from a Proposal of, or from discussions with, another Proposer.

2.11.06.3 Prohibited Contact

During Discussions, Administration personnel involved in the acquisition shall not engage in the following conduct:

- A) Revealing a Proposer's technical solution, including unique technology, innovative and unique uses of commercial items, or any information that would compromise a Proposer's intellectual property to another Proposer;
- B) Revealing a Proposer's price without that Proposer's permission. However, the Administration may inform a Proposer that its price is considered by the Administration to be unbalanced based upon the Scope of Work and may provide information regarding the analysis supporting that conclusion;
- C) Revealing the names of individuals providing references information about a Proposer's past performance; or
- D) Revealing selection information in violation of the Administration's procurement policies and the laws of the State.



**2.11.07 Proposal Revisions**

Although the Administration reserves the right to hold Discussions and request proposal revisions and Best and Final Offers (BAFO) when in the best interest of the State, the Administration is under no obligation to do so. The Administration may make its selection and award based on the initial Proposals as submitted.

At the conclusion of Discussions (if held), the Administration will request a proposal revision or BAFOs from all Proposers in the Competitive Range to provide Proposers an opportunity to revise their Proposals, including correction of any weaknesses, minor irregularities, errors, and/or Deficiencies identified to the Proposers by the Administration following initial evaluation of the Proposals. The request for proposal revision or BAFOs will allow adequate time, as determined by the Administration, for the Proposers to revise their Proposals. Upon receipt of the proposal revisions or BAFOs, the process of evaluation will be repeated. The process will consider the revised information and re-evaluate and revise ratings as appropriate.

The Administration may require more than one series of proposal revision submissions followed by a request for a BAFO submission, but only if the Administration makes a written determination that it is in the State's best interest to conduct additional Discussions following receipt of proposal revisions or to change the Administration's requirements and require another BAFO submission.



**2.11.08 Determination of Successful Proposer**

In accordance with COMAR 21.05.03.03(F), award of the contract is to the responsible offeror whose proposal is determined to be the most advantageous to the State, considering the evaluation factors set forth in the Request for Proposals and the Price. The Administration has determined that the most advantageous to the State will be the Proposer with the best combination of SOQ Rating from Phase One, Technical Proposal rating from Phase Two, and Price evaluations, which the Administration determines will provide the most successful project. The Technical Proposal will be approximately three times the relative importance of the SOQ. Once the overall technical evaluations have been completed and the Price revealed to the Evaluation Committee, a fully integrated tradeoff analysis will be performed by the Evaluation Committee. A tradeoff analysis can be as simple or complex as needed to differentiate which Proposer is the most advantageous to the State or provides the “Best Value.” In performing this tradeoff analysis, the Evaluation Committee, chaired by the Procurement Officer, will consider the facts and circumstances of the procurement and utilize its technical judgment and discretion in considering strengths, weaknesses, and deficiencies of each proposal to determine a recommendation of most advantageous to the State. When determining which Proposer’s submittal is the most advantageous to the State, the relative importance of the overall technical rating is substantially greater than the price. This recommendation will then be presented to the Selection Official who, along with the Selection Committee, will utilize their technical judgment and discretion to make a final determination of most advantageous to the State considering the technical and price factors and tradeoff analysis as set forth in the Request for Proposals. Award may be made to the offeror with a higher technical rating even if its Price Proposal is not the lowest. In the event that two overall technical ratings are the same (e.g. “GOOD” AND “GOOD”), price alone will not be used as the determining factor.

In order to be considered for award of the Contract, a Proposal must pass all the pass/fail factors, receive at least an “ACCEPTABLE” on all technical evaluation factors. Any Proposal that receives a rating of “ACCEPTABLE-” or “UNACCEPTABLE” in one or more technical evaluation factors will not be considered for award of the Contract. The Technical Proposal will become part of the contract documents and all concept ideas provided to the Administration are expected to be included in the Price Proposal, final plan, design and construction phases. The Administration or successful proposer may use ideas and approaches excluding proprietary or protected information.

NOTE: All materials, conferences, proposals, and other matters related to this project shall remain confidential until the contract is executed with the successful DB Team.

**TC-2.12 AWARD AND EXECUTION OF CONTRACT**

All conditions of award and execution procedures will be in accordance with GP-Section 3 of the Specifications.

The Design-Builder will be given Notice to Proceed after Execution of the Contract has been completed. At this point, additional field investigation may continue and design work may proceed with payment to be made as outlined in TC Section 7.11.

The Administration understands that the successful Proposer will need to start design activities as soon as possible after notification of selection and prior to the issuance of the Notice to Proceed. The Administration understands this approach is an effort to maximize the available time for construction activities. The Administration also recognizes the benefits to the public by providing an opportunity to accelerate project activities and project completion. It is reasonable that these design activities should not place the Design-Builder at risk should the Administration not award the contract and issue a Notice to Proceed for events outside of the control of the Design-Builder.

The Administration will diligently process contract documents and procedures to Award and issue a Notice to Proceed within the shortest time frame possible. In the event that the Administration does not issue a Notice to Proceed to the selected Proposer for reasons beyond the control of the Proposer, the Administration will reimburse all actual documentable design costs incurred by the Design-Builder after notification of selection. To receive reimbursement, the Design-Builder must submit all related work product including, but not limited to, design calculations, plans, surveys, boring data, updated electronic files, personnel time sheets and other materials to the Administration for its use.

Actual construction work may not begin until the additional requirements specified elsewhere in this RFP have been satisfied, including but not limited to receipt of permits, right-of-way acquisition, and pre-construction conference.

### **TC-2.13 STIPEND**

The Administration understands that firms invited to submit Price Proposals on Design-Build projects may incur higher than normal Price Proposal preparation costs in their engineering effort to submit responsive Price Proposals for the project. Such efforts are likely to involve geotechnical investigations, development of horizontal and vertical geometry, development of concept design plans, cross sections, field surveys, stormwater management investigation, preliminary storm drain design, development of extensive design details to establish materials and quantities to prepare and submit a price.

A stipend in the amount of \$725,000.00 will be paid to each Proposer meeting at least one of the following terms and conditions:

- (a) The Proposer (including any BAFO) was in the Competitive Range and was not the most advantageous to the State or was not selected for award;
- (b) The Proposer was selected for award, but the Contract was not executed or it was terminated by SHA for its convenience prior to issuance of a notice to proceed for events outside the control of the Design-Builder and the Design-

Builder is not seeking reimbursement for design activities undertaken after notice of selection;

- (c) The Proposer was not in the Competitive Range, but it submitted an Alternative Technical Concept (ATC) approved by the Administration and that the Administration wishes to utilize the ATC in the final design.

Those firms invited to submit Price Proposals will be required to sign a contract with the Administration for payment of the stipend in exchange for electronic copy and hard copy of all documents used to develop the Price Proposal. The firm submitting the Proposal considered the most advantageous to the State shall not be eligible to receive the stipend.

In payment for the services covered by this Agreement, the Design-Build Team agrees that all materials, electronic files, marked up drawings, cross sections, quantity lists and other material used in the development and submission of the Price Proposal will become the property of the Administration and may be used in any manner at their discretion without any additional compensation to the Design-Build Team.

**Three completed, signed originals of the enclosed Agreement must be submitted to Mr. Eric E. Marabello, P.E., Director, Office of Highway Development, in the time frame outlined in the Stipend Agreement, Section 2.2(a).**

**One original invoice signed (in blue ink) and two copies along with supporting engineering materials noted above must be submitted to Mr. Eric E. Marabello, P.E., Director, Office of Highway Development, in the time frame outlined in the Stipend Agreement, Section 2.3.**

*As noted in the Stipend Agreement, Section 2.3, Invoices and supporting engineering work for stipend payment shall not be submitted until notification from SHA that the contract has been awarded or there has been a cancellation of the procurement. Invoices must be received within 30 days of said notification by SHA to be honored for payment. Invoices received prior to notification from SHA will not be processed for payment.*

Invoices shall contain the following information:

Date -

Invoice # - created by the Design-Build Team

Bill To: Maryland State Highway Administration  
707 N. Calvert Street  
Baltimore, MD 21202

Federal Tax I.D. number

Remittance Address

FMIS # - BA006A51

**SPECIAL PROVISIONS**  
**SCOPE OF WORK FOR DESIGN-BUILD**

CONTRACT NO. BA0065172  
51 of 51

Contract Description – IS-695 from IS-70 to MD 43 Transportation Systems Management and Operations

Construction # - BA0065172

Payment Amount - \$725,000.00

Description of Work: example: "payment for Design-Build team to perform preliminary design work to prepare a proposal for contract"

**STIPEND AGREEMENT**

**Contract No. BA0065172**

**Project Description: IS-695 from IS-70 to MD 43 Transportation Systems Management and Operations**

**THIS STIPEND AGREEMENT** (the "Agreement") is made and entered into as of the \_\_\_\_ day of \_\_\_\_\_, 2020, by and between the STATE OF MARYLAND, acting by and through the Maryland Department of Transportation State Highway Administration (the "MDOT SHA"), and \_\_\_\_\_ ("Proposer"), with reference to the following facts:

**A.** On February 11, 2020, the MDOT SHA issued a Request for Proposals ("RFP") for design and construction of the IS-695 from IS-70 to MD 43 Transportation Systems Management and Operations Design-Build Project ("Project"), pursuant to procurement authority granted in State Finance and Procurement Article of the Annotated Code of Maryland and the Code of Maryland Regulations ("COMAR"), Title 21. The Project will be owned and operated by the Maryland Department of Transportation State Highway Administration (MDOT SHA or Administration), which owns all non-tolled state highways and bridges in the State of Maryland ("State"). The Administration is responsible for administration of design and construction of the Project.

**B.** The RFP requires each Proposer to complete and deliver a Stipend Agreement to the MDOT SHA within the time frame noted below in 2.2 (a).

**NOW, THEREFORE**, Proposer hereby agrees as follows:

**1. Work Product.**

**1.1** The MDOT SHA hereby retains Proposer to prepare and submit, in response to the RFP a price proposal that conforms in all material respects to the requirements of the RFP, as determined by the MDOT SHA, are timely received by the MDOT SHA, and satisfy the provisions set forth in the RFP.

**1.2** All work performed by Proposer and its team members pursuant to this Agreement shall be considered work for hire, and the Work Product (as defined below) shall become the property of the MDOT SHA without restriction or limitation on its use. Neither Proposer nor any of its team members shall copyright any of the material developed under this Agreement.

**1.3** Proposer agrees that all Work Product is, upon receipt by the MDOT SHA, the property of the MDOT SHA. The term "Work Product" shall mean all submittals made by Proposer during the RFP process, including the Proposal, exchanges of information during the pre-proposal and post-proposal period. However, the term "Work Product" shall specifically exclude patented rights in previously existing proprietary technology.

**1.4** In consideration for the MDOT SHA's agreement to make payment hereunder, Proposer agrees that the MDOT SHA shall be entitled to use all Work Product, without any further

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**Maryland Department of Transportation State Highway Administration**

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compensation or consideration to the Proposer, in connection with the RFP, the Contract Documents, the Project and future procurements by the MDOT SHA. Notwithstanding the foregoing, MDOT SHA

- 1.5** shall not be entitled to use information submitted by Proposer to the MDOT SHA in which the MDOT SHA determines is exempt from disclosure under the Maryland Public Information Act (“PIA”), Title 10, Subtitle 6, Part III of the State Government Article of the Annotated Code of Maryland, unless the RFP otherwise provides.
- 1.6** The MDOT SHA acknowledges that the use of any of the Work Product by the MDOT SHA or the Design-Builder is at the sole risk and discretion of the MDOT SHA and the Design-Builder, and shall in no way be deemed to confer liability on the unsuccessful Proposer.

**2. Compensation And Payment.**

- 2.1** Compensation payable to Proposer for the Work Product described herein shall be \$725,000.00 if any of the following conditions are met:

- (a) The Proposer was in the competitive range and was not the most advantageous to the State or was not selected for award;
- (b) The Proposer was selected for award, but the Contract was not executed or it was terminated by MDOT SHA for its convenience prior to issuance of a notice to proceed for events outside the control of the Design-Builder and the Design-Builder is not seeking reimbursement for design activities undertaken after notice of selection;
- (c) The Proposer was not in the competitive range, but it submitted an Alternative Technical Concept (ATC) and/or Potential Technical Concept (PTC) approved by the Administration and that the Administration wishes to utilize the ATC and/or PTC in the final design.

- 2.2** In its sole discretion, the MDOT SHA may pay compensation to Proposer, in an amount to be determined by the MDOT SHA, for the Work Product described herein under the following conditions:

- (a) For any Proposer meeting the criteria identified in Section 2.1, above.

Any amount paid under this subparagraph (a) will not exceed \$725,000.00 and will be subject to audit of the costs incurred by the Proposer in preparing its Technical Proposal and Price Proposal. Auditors shall have access to all books, records, documents and other evidence and accounting principles and practices sufficient to reflect properly all direct and indirect costs of whatever nature claimed to have been incurred. Failure of the Proposer or its team members to maintain and retain sufficient records to allow the auditors to verify all or a portion of the claim or to permit the auditors access to the books and records of

Proposer and its team members shall constitute a waiver of the right to be paid a stipend and shall bar any recovery hereunder.

Any Proposer wishing to apply for a stipend under this subparagraph (a) shall submit the completed Agreement to the MDOT SHA concurrently with the price proposals being submitted. Eligibility of receipt of a stipend is dependent upon meeting the conditions set forth in Section 2.1 of this Agreement and TC Section 2.11.04 - Competitive Range of the RFP.

- (b) If the procurement is cancelled prior to the Proposal Due Date, Proposers will be provided the opportunity, at their option, of delivering to the MDOT SHA the Work Product of their Proposal preparations to date. There is no specific format required for such Work Product. Those Proposers that choose to deliver their Work Product may be paid an amount that the MDOT SHA deems to be appropriate consideration for the Work Product. No portion of the stipend amount will be paid in the event a Proposer chooses not to deliver its Work Product. Any amount paid under this subparagraph (b) will not exceed the amount identified in Section 2.1 and will be subject to the audit criteria in Section 2.2 (a).

- 2.3 Any payment of compensation owing hereunder will be made (i) within 30 days after receipt of a proper invoice submitted to the MDOT SHA under this Section 2.3 or (ii) if an award is made. Such invoice and supporting engineering work shall not be submitted until one business day after the earlier to occur of (a) notice by MDOT SHA that award of contract has occurred, or (b) cancellation of the procurement. **Invoices must be received within 30 days of said notification by MDOT SHA to be honored for payment.**

### 3. Indemnities.

- 3.1 Subject to the limitations contained in Section 3.2, Proposer shall indemnify, protect and hold harmless the MDOT SHA and its directors, officers, employees and contractors from, and Proposer shall defend at its own expense, all claims, costs, expenses, liabilities, demands, or suits at law or equity arising in whole or in part from the negligence or willful misconduct of Proposer or any of its agents, officers, employees, representatives or subcontractors or breach of any of Proposer's obligations under this Agreement.
- 3.2 This indemnity shall not apply with respect to any claims, demands or suits arising from use of the Work Product by the MDOT SHA or its contractors.

### 4. Compliance With Laws.

- 4.1 Proposer shall comply with all federal, state, and local laws, ordinances, rules, and regulations applicable to the work performed or paid for under this Agreement and covenants and agrees that it and its employees shall be bound by the standards of conduct provided in applicable laws, ordinances, rules, and regulations as they relate to work performed under this Agreement. Proposer agrees to incorporate the provisions of this



paragraph in any subcontract into which it might enter with reference to the work performed pursuant to this Agreement.

- 4.2 The Proposer agrees (a) not to discriminate in any manner against an employee or applicant for employment because of race, color, religion, creed, age, sex, marital status, national origin, ancestry or disability of a qualified individual with a disability; (b) to include a provision similar to that contained in subsection (a) in any subcontract except a subcontract for standard commercial supplies or raw materials; and (c) to post and to cause subcontractors to post in conspicuous places available to employees and applicants for employment, notices setting forth the substance of this clause.
- 4.3

5. **Assignment.**

Proposer shall not assign this Agreement without the MDOT SHA's prior written consent. Any assignment of this Agreement without such consent shall be null and void.

6. **Miscellaneous.**

- 6.1 Proposer and the MDOT SHA agree that Proposer, its team members, and their respective employees are not agents of the MDOT SHA as a result of this Agreement.
- 6.2 All words used herein in the singular form shall extend to and include the plural. All words used in the plural form shall extend and include the singular. All words used in any gender shall extend to and include all genders.
- 6.3 This Agreement, together with the RFP, as amended from time to time, the provisions of which are incorporated herein by reference, embodies the entire agreement of the parties with respect to the subject matter hereof. There are no promises, terms, conditions, or obligations other than those contained herein or in the RFP, and this Agreement shall supersede all previous communications, representation, or agreements, either verbal or written, between the parties hereto.
- 6.4 It is understood and agreed by the parties hereto that if any part, term, or provision of this Agreement is by the courts held to be illegal or in conflict with any law of the State of Maryland, the validity of the remaining portions or provisions shall not be affected, and the rights and obligations of the parties shall be construed and enforced as if the Agreement did not contain the particular part, term, or provisions to be invalid.
- 6.5 This instrument may be executed in two or more counterparts, each of which shall be deemed an original, but all of which together shall constitute one and the same instrument.
- 6.6 This Agreement shall be governed by and construed in accordance with the laws of the State of Maryland.

**Maryland Department of Transportation State Highway Administration**

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**IN WITNESS WHEREOF**, the parties have executed this Agreement as of the date first written above.

**STATE OF MARYLAND by STATE HIGHWAY ADMINISTRATION**

WITNESS/ATTEST:

Approved for Execution:

\_\_\_\_\_

\_\_\_\_\_

Authorized Signature

\_\_\_\_\_

Director, Office of Highway Development

Date: \_\_\_\_\_

Approved as to form and legal sufficiency:

\_\_\_\_\_

Assistant Attorney General

**Maryland Department of Transportation State Highway Administration**

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[Signature for Corporations/LLCs]

WITNESS/ATTEST:

\_\_\_\_\_ Proposer Name

By \_\_\_\_\_ (Seal)

Title: \_\_\_\_\_

\_\_\_\_\_ Printed Name

\_\_\_\_\_ Printed Name

\_\_\_\_\_ Federal ID # or Social Security #

**TC 3.05 DESIGN-BUILD - DESIGN AND CONSTRUCTION SCOPE OF SERVICE**

This project includes, but is not limited to, the following items of work, which the Design-Build Team shall perform and provide. This section sets forth provisions that are design and construction related; however, this section also impacts construction activities and other work.

Specific design and construction criteria are discussed separately following this section.

**3.05.01 General Requirements**

The Design-Build Team shall complete all design and construction work in two phases, Phase IV - Final Design and Phase V – Partnering during design and construction, Review Shop Drawings, Revisions, Redesign Under Construction, As-Built Plans and provisions for expert court testimony.

The Design-Build Team shall provide the services and perform tasks described in this Request for Proposals in compliance with the policies and procedures of the Administration and requirements set forth in “Volume II -Specifications for Consulting Engineers’ Services,” dated April 1986, Sections as follows:

- A) Section V Highway Design - (Phase IV)
- B) Section VI Structure Design - (Phase IV & V) Parts I through III
- C) Section VII Surveys and Plats (Phase IV)
- D) Section VIII Traffic Engineering (Phase IV)
- E) Section IX Landscape Architecture
- F) Section XI Critical Path Method

The Design-Build Team shall comply with all Federal, State and local laws, ordinances and regulations applicable to the activities and obligations associated with this project.

**3.05.02 Design Personnel Identified in Proposal**

The designer and design subcontractors shall utilize the key personnel identified in their Statement of Qualifications (SOQ) to manage the project and supervise engineers and technicians in completing the design in a timely manner to permit construction activities. **Changes in key staff identified in the SOQ must be approved in writing by the Administration, and replacement personnel must have equal or better qualifications than the key personnel identified in the proposal.** The format for replacement staff resumes must be in the same format as required for the SOQ including requirements thereof. The Administration shall be the sole judge as to whether replacement staff members are acceptable.

**3.05.03 Qualified**

The Design-Build Team shall have experienced personnel qualified in the development of plans, specifications and estimates for the following: Highway Design; Hydrologic/Hydraulic Engineering (including stormwater management (SWM), erosion & sediment control (ESC)); Structural Engineering; Geotechnical/Pavement Engineering; Arboriculture and Landscape Architecture including roadside planting, SWM planting and Reforestation; NEPA Reevaluation, Wetland and Stream Mitigation and Restoration (including permitting); Noise Barrier Analysis and Design; Traffic Engineering including signing, pavement marking, lighting, signalization, Intelligent Transportation System (ITS), and traffic control. The Design-Build Team shall be knowledgeable in coordinating utility designs, utility connections, working with other agencies and the public as outlined in Terms and Conditions (TC) 3.15 and TC 3.22.

**3.05.04 Design Constraints**

The Design-Build Team shall construct the project within existing right of way. This includes the final Project, as well as any and all work required to maintain drainage and traffic during construction (including detour roads) and any and all work required to control erosion and sediment laden water. The Design-Build Team may have to use specialized equipment and/or features including but not limited to mechanically stabilized embankment slopes, retaining walls, drainage pipes, etc. to keep work in the right-of-way.



**3.05.05 Design Exceptions**

Any elements of design that fall below the design standards listed in TC 3.08 will require a design exception or design waiver.

The Design-Build Team shall submit the design exception or waiver request to the Administration's Director, Office of Highway Development. All design exception on federally funded project are subject to FHWA approval as well. The DBT must receive written approval from MDOT SHA and, if applicable, FHWA before proceeding with the design. Requests for design exceptions or waivers that affect construction underway or complete shall not be a basis for approval of the exception.

The request will explain and justify the use of the proposed design and include the following information (at a minimum):

- A description of existing conditions, including existing design values and design speeds.
- A description of AASHTO or other design standards that would normally be applied.
- A description of the actual design values proposed.
- A description of R/W impacts, environmental considerations or other factors that justify the exception.
- A 3-year crash history within the area an exception is being sought.
- A discussion on the safety analysis elements of design that fall below the design standards

listed in TC 3.08

- A description of any potential mitigating features.

The Administration reserves the right to deny design exceptions or waivers that, in its sole judgment, are unsafe, otherwise contrary to normal practice, and/or inconsistent with the project or community goals. Approval of any design exception or waiver is at the sole discretion of MDOT SHA and, if applicable, FHWA. Any non-approval shall not be basis for any additional cost to the Administration nor be cause for any contract claims or time extensions.

Prior to the submittal of any Design Exceptions a safety analysis shall be performed by the DBT for each location anticipated to be requested in a design exception. This shall include but not be limited to:

- A safety analysis evaluating the existing crash history to understand any existing safety issues in the area, how that may be affected by the element that an exception will be requested for and how any issues may affect the use of that element; and
- A predictive crash analysis for the area of each location anticipated to be requested shall be performed and for an RFP compliant design. The results of these predictive crash analysis shall also be compared.
- Discussion on any other aspects of the proposed condition that may impact or improve safety. This should include but not be limited to hydraulic spread, lighting, and/or signage if they are applicable.

A safety analysis report containing the safety analysis, results and a discussion at each location shall be submitted to the Administration for review and concurrence prior to submitting a Design Exception. Concurrence of any safety analysis report is at the sole discretion of MDOT SHA and shall not be basis for any additional cost to the Administration nor be cause for any contract claims or time extensions.

### **3.05.06 Quality Design and Construction**

It is the Design-Builder's sole responsibility to provide quality calculations, plans, specifications, reports, working drawings, and other technical documents to construct the project to provide a finished product in accordance and conformance with the Contract Documents.

#### **3.05.06.01 Design Quality Control**

The Design-Build Team's Lead Design Firm shall be fully responsible for performing a complete, coordinated, economical, timely, fully functional quality design, including all elements, all in compliance with the Contract Documents.

The Design-Builder is responsible for the Design Quality Management including Design Quality Control and Design Quality Assurance. This will include the Design-Builder providing both a Lead Design Firm and an Independent Design Quality Management (IDQM) Firm who

have no contractual relationship. The Lead Design Firm shall be responsible for the Design Quality Control and the IDQM Firm responsible for the Design Quality Assurance and review and certification that all submittals are in compliance with the Contract Documents.

1 The Design-Build Team shall develop a Design Quality Control Plan (DQCP) per TC 3.05.06.03 and follow the DQCP for the life of the project.

The Design-Build Team shall include a complete check of all deliverables including but not limited to design and other calculations, plans and specifications. This check shall include both the overall concept and various element coordination check and the detail check of the calculations for each plan and specification. The design and the check shall be performed by experienced design professionals, licensed in the State of Maryland that have not participated in any of the design up to the checking process. These individuals may be employed either by the Design Firm or by an independent design firm not a part of the Design-Build Team or the IDQM firm.

### **3.05.06.02 Design Quality Management**

The Design-Builder shall utilize the services of an Independent Design Quality Management (IDQM) Firm to review all submittals, unless specifically noted elsewhere in the RFP, to ensure they are in compliance with the Contract requirements and the DQCP. The IDQM Firm will be responsible to sign and certify that all submittals are in conformance with the Contract requirements prior to construction. This is in addition to the additional certifications and seals required of the Lead Design Firm. The IDQM Firm certifying compliance with the Contract requirements must hold similar Professional Licensure as required by TC 3.05.06.05.

Any information provided by the Design-Builder to the Administration that requires review for conformance with any part of the Contract Requirements shall be considered a submittal, unless specifically noted elsewhere in the RFP.

### **3.05.06.03 Design Quality Control Plan**

The Design-Build Team shall develop a Design Quality Control Plan (DQCP). The DQCP must be a complete and clear plan to achieve a high-quality design, including all related elements and lower tier subcontractors/Design-Build Teams. The DQCP shall present both the overall organization plan for design quality control and detailed plan elements to meet the CPM requirements for this project. The DQCP must include an organization structure and reporting requirements that demonstrate that quality control personnel have sufficient independence to allow them to be primarily concerned with quality, as opposed to the schedule and budget. At a minimum, the DQCP shall include calculations, plans, specifications, design coordination, construction coordination for material activity and document control.

The DQCP must include a quality assessment and improvement plan. This plan shall outline how the DBT will continuously review comments and issues, assess them to determine if there are common causalities or trends, how they will determine if an improvement is needed to remediate the causalities or trend and the plan for implementing those improvements.

The Design-Build Team must adhere to the approved DQCP throughout the duration of the project.

**The DQCP must be submitted and approved by the Administration prior to any other submittal being submitted to the IDQM and/or Administration for review.**

Any changes to the DQCP shall be provided to the Administration for review and must receive written authorization from the Administration for the modification to the plan.

The Design-Build Team shall request from the Administration, in writing, all exceptions to the DQCP, and the Administration will respond in a timely fashion to each request in writing.

**3.05.06.04 Certifications of with Design Quality Control Plan**

Once the Design-Builder's DQCP has been approved by the Administration the Design-Builder shall provide the following certifications:

**3.05.06.04.01 Transmittals**

On the transmittal for each submittal of calculations, plans, specification, working drawings, shop drawings, catalog cuts, as-builts and other technical documents, the Design-Build Team, Lead Design Firm (as appropriate) and the checker shall certify that the documents were prepared and checked in conformance with the DQCP.

**3.05.06.04.02 Conclusion of Work**

At the conclusion of the Work and with the transmittal of the Record Documents to the Administration, the corporate officer responsible for quality for the Design-Build Team, the Lead Design Firm, and all organizations that have checked the documents shall sign, seal, and certify in writing, that all calculations, plans, specifications and technical documents, for which they were responsible, were prepared in conformance with the DQCP.

**3.05.06.05 Professional Seals**

All calculations, plans, specifications, reports, other technical documents and revisions or modifications there to, transmitted to the Administration and/or proceeding toward construction shall be signed and sealed by both the Professional Engineer licensed in the State of Maryland responsible for the design and the Professional Engineer licensed in the State of Maryland responsible checking of that document. Other signatures and certifications may also be required as outlined elsewhere in this Request for Proposals.

Landscape plans shall be prepared, signed, and sealed by a Landscape Architect licensed in the State of Maryland. Reforestation plans and application shall be signed and sealed by either a Maryland Licensed Landscape Architect, Licensed Forester, or a qualified professional that is certified by the MD DNR/Forest Service.

**3.05.07 Highway Engineering**



The Design-Build Team shall prepare roadway, typical section, drainage, geometry, superelevation, profile, maintenance of traffic, erosion sediments control and special detail plans as part of the highway construction plans using the latest CADD Standards and as outlined in TC 3.09 – Roadway Performance Specification.

**3.05.08 Pavement Engineering**

The Design-Builder shall be responsible for all pavement engineering for all Roadway Elements for the Project as outlined in TC 3.10 – Pavement Performance Specification.

The Design-Builder will have the flexibility to make Project changes that produce benefits or savings to the Administration or for the Design-Builder without impairing the essential functions, characteristics, or quality of the Project, such as safety, traffic operations, ride, long term durability, desired appearance, maintainability, environmental protection, drainage, and other permitted constraints.

**3.05.09 Structural Engineering**

The Design-Build Team shall develop all structural calculations, ratings, details, reports, and plans for all the culverts (those meeting MDOT SHA criteria for classification of a Small Structure), retaining walls, sound barriers, bridges, and any other incidental structure specifically designed, modified, or rehabilitated for this project as outlined in TC 3.11 – Structural Design Performance Specification. All plans developed shall meet the prescribed CADD Standards and drafting requirements outlined in the Office of Structures Policy and Procedure Memorandums that are available online. All design and details shall utilize the MDOT SHA Structural Standards and Details to the maximum extent practical.

**3.05.10 Traffic Engineering**

The Design-Build Team shall prepare signing, pavement marking, lighting, signal, and ITS plans using the latest CADD Standards available from the MDOT SHA Office of Traffic & Safety (OOTS) as outlined in TC 3.12 – Traffic Performance Specification and TC 3.21 – Intelligent Transportation Systems Performance Specification.

All catalog cuts and working drawings pertaining to traffic and ITS items shall be reviewed and approved by the Design-Build Team. The primary review shall be undertaken by the Lead Design Firm with a secondary review undertaken by the IDQM Firm. Once reviewed and accepted by the Lead Design Firm and the IDQM Firm, they shall be stamped as accepted by each firm and submitted to the MDOT SHA. A final review will be undertaken by MDOT SHA. Comments or approval will be provided in no more than 7 calendar days, beginning the day after receipt of the submittal. Once reviewed and approved by MDOT SHA, the catalog cuts and working drawings pertaining to traffic and ITS items shall be stamped as approved with the stamped plans being designated as the documented approval. No construction activities are permitted in conjunction with any catalog cuts and working drawings pertaining to traffic and ITS items that have not been approved by MDOT SHA.

The Design-Build Team shall maintain all existing traffic control and ITS devices throughout the project limits. All traffic control and ITS device modifications (e.g. existing and/or temporary

signals) shall be reviewed and approved by the Office of Traffic & Safety Traffic Engineering Design Division or MDOT SHA CHART, as applicable.

**3.05.11 Roadside Landscape Planting and Reforestation**

The Design-Build Team shall prepare landscape and reforestation plans as outlined in TC 3.13 – Landscaping Performance Specification. Plans shall include schedules of all materials proposed for use.

**3.05.12 Geotechnical Engineering**

The Design-Build Team shall conduct supplemental subsurface explorations, analyses, design and construction for all geotechnical components of the Project in accordance with all applicable criteria and standards cited herein and in accordance with TC 3.14 – Geotechnical Performance Specification.

**3.05.13 Utility Relocations and Permits**

The Design-Build Team shall be responsible for coordination of all activities during design and construction with regard to utilities and permits as outlined in TC 3.15 – Utility Design and Relocation Performance Specification.

**3.05.14 Stormwater Management (SWM) Design and Erosion and Sediment Control Design and Approvals**

The Design-Build Team shall design SWM in accordance with the criteria established in TC 3.17 – Drainage, Stormwater Management, and Erosion and Sediment Control Performance Specification and TC 3.20 – Environmental Performance Specification.

The Design-Build Team shall ensure that copies of the most current approved plans are available to all personnel involved in the construction and inspection of the project. The Design-Build Team shall be responsible for coordinating all reviews and approval submissions with the appropriate review entities.

**3.05.14.01 Stormwater Management and Erosion and Sediment Control Review and Approval**

The Design-Build team is responsible for the SWM design and for all approvals. The final design shall be acceptable to the SWM/ESC approval authority.

The Design-Build Team shall design ESC in accordance with the criteria established in the Drainage, Stormwater Management, and Erosion and Sediment Control Performance Specification.

The Design-Build Team shall be responsible for producing a completed set of ESC plans for the roadway construction activity. These plans shall be submitted to the SWM/ESC approval authority in conformance with the contract requirements for review and final approval when deemed appropriate.

A Pre-Permitting meeting must be held once the notice of selection has been made. This meeting will be scheduled by the Administration upon request by the Design-Build Team and will include the Design-Build Team's H&H Engineer, Project Design Manager, Construction Manager, E&S Manager, IDQM Firm H&H Engineer; representative of the SWM/ESC authority, and Administration's Highway Hydraulics Division Project Manager and Design Project Manager. The purpose of the meeting is to preview and discuss the Design Build team's approach to completing SWM/ESC design and obtaining approvals, the SWM and erosion and sediment control concepts developed by the Design-Build Team, submission schedules proposed by the Design-Build Team, approval timeframes, submission requirements and the SWM/ESC approval authority's quality expectations.

The Design-Build Team's Lead Design Firm's Professional Engineer licensed in the State of Maryland must review and certify by signature that the Stormwater Management and Erosion and Sediment Control plans have met the SWM/ESC requirements prior to any submission to SWM/ESC approval authority for review.

Submissions for SWM/ESC approval must be delivered directly to the SWM/ESC approval authority with a copy to the MDOT SHA Highway Hydraulics Division and MDOT SHA Project Design Manager. Electronic copies of the submission including application, plans and reports as applicable must be provided through Projectwise along with a hard copy of all information delivered directly to the SWM/ESC approval authority. Comments or approval will be provided within 28 calendar days beginning the day after receipt of the hard copy submittal. A signed and sealed title sheet shall be submitted to the SWM/ESC approval authority prior to final approval. If a significant number of submissions are sent concurrently or overlap, the SWM/ESC approval authority may take 45-calendar days to return comments or approval and shall be at the SWM/ESC approval authority sole discretion. The Design-Builder will be notified if a 45-calendar day period is being instituted for any submission. Review time for submissions to the SWM/ESC approval authority shall not be the basis of a claim or time extensions against the Administration.

All SWM facilities shall meet all requirements of the MDE Maryland Stormwater Design Manual (per TC 3.08), all current guidance from MDE and the SWM approval authority, and must be approved by the Administration's Highway Hydraulic Division. Once approval is gained from the Administration, the Design-Build Team shall acquire all other approvals and necessary permits.

The Design-Builder shall be responsible for submitting a NOI form for this project and any amendments thereto. Any delays resultant of obtaining the NOI or any NOI modifications will be the sole responsibility of the Design-Build Team.

**3.05.14.02 MDE Dam Safety Division Small Pond Review and Dam Safety Approval**

All ponds, culvert crossings (in relation to the roadway embankment), and sediment basins/traps designed must be checked for MDE Dam Safety Division Review Criteria. Summary sheets for each pond and sediment basin/trap for Dam Safety requirements will be submitted to the SWM/ESC approval authority. Refer to section B.1.2 in the MDE Maryland Stormwater Design Manual (per TC 3.08). Any ponds or basins/traps that fall under MDE Dam

Safety Division Small Pond Review Criteria must be submitted to MDE Dam Safety Division. Approval from Dam Safety Division shall be required before any E&S or SWM package can be approved by the SWM/ESC approval authority that constructs, modifies, or impacts ponds or basins/traps that fall under MDE Dam Safety Division Small Pond Review Criteria. Submissions shall be made directly to MDE Dam Safety Division.

The creation of any significant or high hazard ponds, culvert crossings, or sediment basins/traps is strongly discouraged and shall require approval of the Administration prior to construction.

The MDOT SHA-HHD and the SWM/ESC approval authority shall be concurrently copied on all correspondence, including comment letters, phone conversation transcripts, transmittals, reports, plans revisions to plans and report, computations, and/or point-by-point response letters; delivered to MDE Dam Safety Division.

Review time for submissions to MDE Dam Safety Division shall not be the basis of a claim or time extensions against the Administration.

**3.05.14.03 MDE Plan Review Division Small Pond Review**

All ponds, culvert crossings (in relation to the roadway embankment), and sediment basins/traps designed must be checked for Pond Code 378 criteria. Summary sheets for each pond or sediment basin/trap of Code 378 requirements will be submitted to the SWM/ESC approval authority. Refer to section B.1 in the MDE Maryland Stormwater Design Manual (per TC 3.08). Ponds, culvert crossings, and sediment basins/traps that are categorized as exempt from Code 378 requirements due to being classified as excavated ponds must receive concurrence from the MDE Plan Review Division prior to approval by the SWM/ESC approval authority. Any ponds, culvert crossings, or sediment basins/traps that fall under Code 378 criteria must be submitted to MDE Plan Review Division. Approval from MDE Plan Review Division shall be required prior to approval from the SWM/ESC approval authority to construct, modify, or impact these ponds, culvert crossings, or sediment basins/traps.

The Administration and the SWM/ESC approval authority shall be concurrently copied on all correspondence, including comment letters, phone conversation transcripts, transmittals, reports, plans, revisions to plans and report, computations, and/or point-by-point responses delivered to MDE Plan Review. MDOT SHA will provide an expedited reviewer to help facilitate the small pond review, but Final approval will still be required from MDE staff.

Upon the implementation of an interagency agreement between MDE and MDOT SHA to allow MDOT SHA PRD to act as a designee of MDE on the review and approval of certain Code 378 Small Ponds, and if elected by the Design-Build Team, the review and approval of these certain Code 378 Small Ponds maybe transferred to MDOT SHA PRD.

Review time for submissions to MDE Plan Review Division shall not be the basis of a claim or time extension against the Administration.

**3.05.14.04 Stormwater Management (SWM) Site Development Criteria Review**

**and Approval**

All stormwater management facilities shall be designed in accordance with the MDOT SHA Stormwater Site Development Criteria Review Guidelines, prepared by the Administration's Highway Hydraulics Division.

The SWM facilities shall be designed with the input of a licensed landscape architect and shall adhere to the accepted standards for the profession concerning aesthetics and site planning. This includes not only planting but also grading, landforms, site layout, safety criteria and choice of materials.

The SWM facilities shall integrate well visually with the surrounding environment, developments, communities, roadways, and corridor landscaping. This means that facility types, outfall structure designs, detailing, colors, planting palette, landforms, surface area shapes, and fencing (if required) should be consistent or complementary.

**3.05.14.05 Stormwater Management (SWM) As-Built Certifications**

The Design-Build Team shall provide an SWM As-Built (AB) Inspector to inspect the various stages of construction for each SWM facility and provide documentation to the Administration that certifies that the SWM facilities have been constructed as specified in the Contract Documents including certification that the constructed SWM facilities provide the functionality as designed. The AB Inspector shall be a licensed Professional Engineer or Land Surveyor in the State of Maryland with experience in SWM design and construction.

The As-Built Certification Package shall be prepared according to the special provision, 300 – Stormwater Management Facility As-Built Certification, included in this package. Copies of As-built Certification shall be maintained at the Administration's field office at all times for verification and compliance until it is complete and submitted for approval. The As-Built Certification signature block, checklists and tabulations are also included on ProjectWise.

The Design-Builder shall submit the completed As-Built Certification Package to SHA's Construction Project Engineer and once concurred by the Construction Project Engineer, it shall be submitted via the MDOT SHA OED Toolkit system or mailed to:

Highway Hydraulics Division Chief, Mail Stop C-128  
Maryland State Highway Administration  
707 North Calvert Street  
Baltimore, Maryland 21202

Highway Hydraulics Division may provide comments or request additional information to suffice as necessary for submission to the SWM/ESC approval authority for final acceptance. MDOT SHA's construction engineer, Highway Hydraulics Division or SWM/ESC Approval Authority may require corrective action to the constructed facility prior to final acceptance in order to ensure the constructed facility functions as intended. Any and all corrections shall be completed and all updated information; including the updated as-built certification; shall be provided in a timely fashion for review and approval.



**3.05.15 Surface Storm Drainage Design**

The Design-Build Team shall design all surface drainage conveyances (including but not limited to open channels, stream relocations, inlets, closed storm drainage systems, cross culverts, and pipes under entrances and driveways) in accordance with the Drainage, Stormwater Management, and Erosion and Sediment Control Performance Specification.

If Waterway Construction (COMAR 26.17.04) review and approval is required, deliver submittals for MDE approval to the Administration for review and coordination with MDE. The Administration will review and comment on the Design-Builder's plans and, once satisfied that the plans will meet MDE requirements, the Administration will coordinate with MDE to obtain formal approval of the Design-Builder's Waterway Construction plans and calculations. Should MDE have comments, the Design-Builder shall provide a point-by-point response to comments. Review time for submissions to the Administration or MDE shall not be the basis of a claim or time extensions against the Administration.

**3.05.16 Noise Abatement**

The Design-Builder must analyze its improvements to determine if they meet the definition of a Type I Project in accordance with MDOT SHA Noise Policy and 23 CFR 772.5. If the Design-Builder's improvements meet the definition of a Type I Project in accordance with MDOT SHA Noise Policy and 23 CFR 772.5, the Design-Builder shall conduct a Final Design Noise Analysis, submit a Technical Noise Analysis Report, and prepare a NEPA Reevaluation per the requirements outlined in TC 3.20. The determination of Type I Project status, The Final Design Noise Analysis, and Technical Noise Analysis Report shall meet the requirements of the MDOT SHA Noise Policy and TC 3.18 and is subject to review and approval by MDOT SHA. **Site Constraint Assessment or Extra Cost Assessment shall not be utilized for this project.** The criteria to determine if noise abatement is reasonable and/or feasible shall be applied without consideration for site constraints or extra costs. If the Noise Analysis determines that noise abatement is reasonable and feasible, without use of Site Constraint Assessment or Extra Cost Assessment, the Design-Builder shall design and construct the noise abatement and all associated features as part of the Design-Builder's project in accordance with TC 3.18 - Noise Abatement Performance Specifications.

**3.05.17 Engineering Studies**

The Design-Build Team shall be responsible for engineering studies as required to determine solutions to any unforeseen situations or any issue that may be discovered or encountered during this project. The Design-Build Team shall provide these studies to the Administration for review and concurrence.

**3.05.18 Design Review and Coordination**

Any information provided by the Design-Builder to the Administration that requires review for conformance with any part of the Contract Requirements shall be considered a submittal, unless specifically noted elsewhere in the RFP.

Once a submittal package has gone through the Design Quality Control Review process as outlined in the Design-Builder's Design Quality Control Plan and found to be a quality package, the Lead

Design Firm shall then provide the submittal package to the IDQM Firm who will perform an independent review to confirm the submittal package meets the requirements of the Contract Documents. The IDQM Firm shall document all submissions from the Lead Design Firm and all reviews it performs on Projectwise.

In the event that there is an ambiguity in the interpretation of the Contract Requirements between the Lead Design Firm and the IDQM Firm, it shall be immediately raised to the MDOT SHA's project design manager for resolution.

Ready for Construction is defined as any package sealed by the Lead Design Firm, certified by the IDQM and for which the Design-Builder intends to begin construction on. Subsequent to the completion of a submittal package which is Ready for Construction, has been signed and sealed as required by the Lead Design Firm and signed and certified by the IDQM Firm, it shall be submitted to the Administration. All permits and modifications do not need to be received to submit to the Administration. The Administration will review this documentation to further ensure the submissions are in compliance with the DQCP and Contract Requirements.

The Design-Build Team must notify the Administration of the date they wish to make a submittal on and must do so at least 7 calendar days prior to the date of all intended submissions unless specified otherwise elsewhere in the RFP. The Administration will review the submission and will either provide concurrence that the submittal is in compliance with the DQCP and Contract Requirements or provide comments noting non-compliance with Contract Requirements within 21 calendar days, beginning the day after acknowledgement of receipt of the submittal, unless specified otherwise elsewhere in the RFP.

If the Design-Build Team does not submit the package on the date specified, the Design-Build Team must submit a new notification to the Administration of the new date they wish to make the submittal on and it must do so at least 7 calendar days prior to the new date of the intended submission.

At the sole discretion of the Administration, if the Design-Build Team submits the package earlier than or later than the date specified in the notification, instead of a new 7 day notification period, the Administration may accept the submittal for review but shall have the right to extend the review and comment period beyond 21 calendar days but not more than 28 calendar days after receipt of the plans.

Administration concurrence that a submittal package is in compliance with the DQCP and Contract Requirements will not be required to begin construction. However, all permits related to the design package must be received, any environmental reevaluation (if necessary) completed, and the Administration must have certified that any right-of-way required for the design package is in the possession of the Administration. Any changes required to submittal information or field adjustments or re-work, if construction has already commenced, to address any non-compliance with the Contract Requirements shall not be the basis of a claim or time extensions against the Administration.

The Design-Builder shall provide a maximum of 20 copies of each Ready for Construction design

package and any subsequent revisions for Administration field personnel.

**3.05.18.01 Title Sheets**

The DBT shall formally request, via letter, that the Administration sign a submittal title sheet. The signed and sealed title sheet, as required by TC 3.05.07.05, shall be attached by the DBT to that letter. This may be requested by the DBT at any time after a submittal has been certified by the IDQM as meeting all requirements. The DBT shall recognize and acknowledge in the request letter that they agree to the following:

- The Administration's signature on a submittal title sheet shall in no way constitute the Administration's concurrence that a submittal package is in compliance with the DQCP and/or Contract Requirements.
- The Design-Build Team understands that the Administration concurrence that a submittal package is in compliance with the DQCP and Contract Requirements will not be required to begin construction. However, all permits and approvals related to the design package must be received, any environmental reevaluation (if necessary) must have been completed, and the Administration must have certified that any right-of-way required for the design package is in the possession of the Administration.
- The Design-Build Team agrees that any changes required to the submittal information, and/or field adjustments and/or re-work for any construction that has taken place, to address any non-compliance with the Contract Requirements shall not be the basis of a claim or time extensions against the Administration.

The Administration will sign and returned to the DBT the title sheet within 7 calendar days, beginning the day after acknowledgement of receipt of the formal request and title sheet, as long as there are:

- No Administration audit comments that the Administration judges, in the Administration sole opinion, have the potential to create significant changes to a submittal;
- No SWM/ESC Approval Authority comments that the Administration judges, in the Administration sole opinion, have the potential to create significant changes to a submittal, even if the Administration has previously concurred that the submittal meets requirements; and/or
- No comments by any other agency or entity that the Administration judges, in the Administration sole opinion, have the potential to create significant changes to a submittal, even if the Administration has previously concurred that the submittal meets requirements.

If one or more of the above is judged by the Administration to be the case, the Administration shall respond in writing that the title sheet will not be signed until such time as the comments at issue have been resolved.

**3.05.19 Additional Services**



The Design-Build Team shall be responsible for all necessary field surveys required for the project, which shall conform to Maryland Grid System NAD 83/2011 and NAVD 88.

**3.05.20 Environmental Permits**

No permits have been obtained by the Administration. Agency coordination will be required to secure necessary permits for any environmental impact as part of the Design-Builder's project. The Design-Builder shall be responsible for providing all information required to obtain the permits, if required, identified in 3.20.01.05.A. The Design-Build Team shall pay all charges, fees and taxes, and give notices necessary or appropriate for the execution of the Work. This includes approvals for on-or off-site staging, stockpiling areas, disposal sites and borrow pits.

Though the Administration will coordinate with the regulatory agencies; it is the Design-Builder's sole responsibility for obtaining all required permits and providing sufficient and permittable information. The Design-Builder shall fully deliver (design, permit, and construct) wetland, waterways, forest, and stream mitigation, if required, as part of this Design-Build contract. The Design-Build Team shall also develop all required information and submittals as discussed in TC 3.20.03.

If the Design-Build Team determines that trees must be removed, the Design-Build Team shall develop all required information and submittals as discussed in TC 3.20.04. Mitigation shall be the responsibility of the Design-Builder, and may include a site search, agency reviews and approvals, design, and obtaining right of way and construction.

**3.05.21 Phase V Services**

Phase V services consist of partnering during design and construction, checking shop drawings, redesign under construction, revisions, as-built plans, and provisions for expert court testimony.

The Design-Build Team shall provide all services and perform tasks described in compliance with the requirement policies of Administration as stipulated throughout this resume and "Volume II - Specifications for Consulting Engineers' Services".

**3.05.22 Construction Personnel Identified in Proposal**

The Design-Build Team, all key staff and construction-related key personnel, and all other Major Participants identified in the proposal shall be utilized in the same manner and to the same extent set forth in the SOQ and for the duration of the project. **Changes regarding the Design-Build Team shall not be allowed. Changes regarding key staff, construction-related key personnel and all other Major Participants require prior written approval by the Administration.** Requests for such changes must be submitted to the Administration in writing and replacement personnel must have equal or better qualifications than the key personnel identified in the SOQ. The format for replacement staff must be the same format as required for the SOQ including the requirements thereof. The Design-Build Team acknowledges that any such changes are for the convenience of the Design-Build Team alone and shall not increase the Design-Build Team's Price or change the project schedule. The Administration will approve such requests only if it determines that such change will not detrimentally affect the long term quality, durability, maintainability, timeliness of the Work.

**3.05.23 Conformance with Contract and Proposal**

All construction, construction-related work, and all other work must conform to the Contract, to the Technical Proposal submitted by the Design-Build Team and to the construction plans prepared by the Design-Build Team.

**3.05.24 Check Shop Drawings**

The Design-Build Team shall check all shop drawings as outlined in TC 4.01

**3.05.25 Conformance with Approved Plans and Specifications**

**3.05.25.01 Construction Plans and Project Specifications**

All work shall be done in conformance with the details and dimensions shown on the Ready for Construction Plans and shall meet the requirements set forth in the RFP.

**3.05.25.02 Issues, Changes, and Plan Revisions after Ready for Construction Plans**

**3.05.25.02.01 Engineering Studies**

The Design-Build Team shall be responsible for engineering studies as required to determine solutions and alternatives to any unforeseen situations or issues that may be discovered during this project and submit these studies to the Administration for approval. These studies shall be prepared as per the “Volume II -Specifications for Consulting Engineers’ Services”.

**3.05.25.02.02 Request for Information**

Any clarification regarding any Ready for Construction package shall be submitted to the Design-Builder's Lead Design Firm as a Request for Information (RFI). All RFI's shall be submitted to the Administration, who will review and provide comments or concurrence on the RFI. Any RFI that results in the need to make any change to any Ready for Construction package shall follow the requirements outlined in TC 3.05.25.02.03 - Revisions.

 **3.05.25.02.03 Revisions**

Any revisions to any Ready for Construction submittal shall go to the to the Design-Builder's Lead Design Firm. The Design-Builder's Lead Design Firm shall perform Engineering Studies per TC 3.05.25.02.01 to determine solutions and alternatives in coordination with the Design-Build's constructor. The Design-Build Team shall then forward to the Administration the solutions and alternatives, their recommended solution or alternative The Administration will review and provide comments or concurrence on the recommended solution or alternative It is at the sole discretion of the Administration on if it will allow a revision

All Revisions shall be in accordance with the requirements of this RFP and the relevant

requirements in the TC 3.08 - Guidelines and References contained within.

 **3.05.25.02.03.01 Redlines**

Redline revisions to any Ready for Construction package shall be superimposed on the original Ready for Construction information in red. Old design details, dimensions and notes shall not be erased, but X'd out in red. Redline changes on each sheet shall be designated with a square and the revision number. The date that the revision was made shall be indicated in the title block of each revised plan sheet. Submission to the Administration shall follow the process outlined in TC 3.05.18.

Redline revisions to any Ready for Construction package that also make revisions that directly or indirectly impact SWM/ESC shall be submitted to the SWM/ESC Approval Authority. Submission to the SWM/ESC Approval Authority shall follow the process outlined in TC 3.05.14.01. Any concurrence submitted to the MDOT SHA QA OED Toolkit and approved as outlined in TC 3.19.04 sub-bullet b shall be incorporated into the next redline submitted.

Review times by SWM/ESC Approval Authority and/ or the Administration for revisions shall not be the basis of a claim of time extension against the administration.

For any redline revisions that involve changes in impacts to any regulated environmental resources, the Design-Builder shall be responsible for providing all required information to obtain all permit approvals or modifications for permits as outlined in TC 3.20. Any delays due to obtaining revision permit approvals or modifications to permits shall be at no additional cost to the Administration nor be cause for any contract claims or time extensions.

**3.05.25.02.03.02 As-Built Drawings**

Field changes/variances from the details and dimensions shown on the plans shall be superimposed on the approved set of drawings in green. Old details, dimensions and notes shall not be erased, but X'd out in green. Each revision must be identified with a Hexagon with the letter A in the center. This symbol is available in MD SHA's CADD Standards. The date that the revision was made shall be indicated in the title block of each revised plan sheet. The As-Built Plans shall reflect any field revision made during construction.

The Design-Build Team shall submit one comprehensive set of As-Built plans at the completion of the project that are signed and sealed by the Engineer. The comprehensive set of As-builts will include an index sheet and a key plan which graphically represents and annotates each phase of the plan submittal if there are multiple submittals. The comprehensive set of as-builts will be assembled and numbered consecutively, beginning with sheet one of the first submittal and ending with the last sheet of the final submittal. The index and key plan will allow for more easily understood and navigable drawings within the overall project limits in the future.

The Design-Build Team shall submit each structure on the job, that was reviewed by

MDOT SHA OOS, as its own As-Built plan set at the completion of the project that are signed and sealed by the Engineer. Each structure as-builts shall be assembled and numbered consecutively, beginning with sheet one of the individual structure submittal and ending with the last sheet of the structure submittal. The file names will be the structure number, followed by a dot (.), followed by a sequential number beginning with 1001. The sequential number must correspond with the plan sheet numbering. This number is followed by another (.) and then the TIF and PDF extension. All as-built plans shall be accompanied with signed and sealed as-built load ratings for all bridges and small structures, all completed SI&A files for all structures, complete signed and sealed as-built calculations and all associated reports (foundation, scour, hydrology/hydraulics, etc.) if different from previously submitted RFC documentation.

The Stormwater Management Facility As-Built Certification will be a separate submittal as described in TC 3.05.15.05.

The Wetlands and Stream Restoration As-Built Certification will be a separate submittal as described in Special Provision 300 Stream Restoration As-Built Certification and Inspector Design-Build.

#### **3.05.25.02.02.01 As-Built Computer Files**

The Design-Build Team shall also submit Black and White images, at 200 DPI-TIF and PDF files, of the As-Built Plans electronically via ProjectWise. The As-Built plans shall be scanned starting with the Title Sheet. The file names will be the Construction Contract Number, followed by a dot (.), followed by a sequential number beginning with 1001. The sequential number must correspond with the plan sheet numbering. This number is followed by another (.) and then the TIF and PDF extension. Example: BA0065172.1001.tif. All scanned TIF and PDF images will be scanned in such a way that they do not appear upside down upon opening.

#### **3.05.25.02.04 Permits**

No permits have been obtained by the Administration. The Design-Build Team shall obtain approvals from the appropriate regulatory agencies as required by the Design-Builder's project.

#### **3.05.26 Coordination with Other Contractors**

The Design-Build Team shall coordinate all design and construction, including that of any subcontractors, with other designers, contractors, the utility companies, governmental agencies, Baltimore County, Administration personnel, and operating personnel concerning site access, establishment and use of temporary facilities, work schedules, and other elements of the specified work, which require interfacing with others.

#### **3.05.27 Community Relations**

The Design-Build Team will establish a program of public contact for conducting effective

relationship with the community and businesses that are in proximity to construction areas. This program shall meet the requirements outlined in TC 3.22, submitted to the Administration within 45 days of Notice to Proceed and included as part of the Lump Sum Price for this Contract. As part of this program, the Design-Build Team shall establish and maintain continuing liaison with persons occupying property or doing business in the immediate area of the work site for the purpose of minimizing inconveniences resulting from construction. The plan will detail how the Design-Build Team intends to keep the property owners and businesses informed of the work schedule and include a program for notifying them at a minimum of every 30 days of what will occur within the next 30 days. The Design-Build Team's Technical Proposal shall also name a Public Relations Officer who is responsible for this work and who the Administration and citizens can contact for project information and answers to project related questions. See TC 3.22, Public Outreach Performance Specification, for all the requirements.

**3.05.27.01 Toll Free Telephone Number**

The Design-Build Team shall establish a toll free telephone number. This telephone number shall be used for the public to contact the Design-Build Team in the case of an emergency. The Design-Build Team shall maintain a log of all calls made to the number, including date, time, name of caller, reason for call, caller's address and phone number. These logs shall be accessible to MDOT SHA for review and submitted every two months once the phone line is made available to the public. The Design-Build Team shall respond in person or by telephone within one hour of the time of the call and shall arrange for resolution of any issues as soon as possible. The Design-Build Team shall post the toll free telephone number prominently within the project limits and the Administration project field office. The telephone number shall be shown on all flyers distributed on the project.

**3.05.27.02 Public Relations Materials**

All public relations materials, advertisement, flyers, and meeting handouts and graphics shall be approved by the Administration's Project Manager and Office of Customer Relations and Information prior to public release.

**3.05.27 Maintenance**

The Design-Build Team shall provide a facility that is able to be adequately maintained by the Administration. The Design-Build Team's design must take into account maintenance activities the Administration will need to perform and shall not put any undue burden on the Administration to perform maintenance activities on the constructed improvements.

**TC 3.06 Administration Services**

The Administration will provide the following services:

**3.06.01 General Administration Services**

- A. Provide CADD standards, engineering standards, design criteria, as-built plans, existing R/W plats and prints of other design projects for use as examples or guides.
- B. Provide erosion and sediment control standard sheets, traffic design standard details, Maintenance of Traffic (MOT) standard plates, etc.
- C. Provide accident statistics and other traffic data Average Daily Traffic (ADT), Design Hourly Volume (DHV), percentage of trucks, etc.
- D. Provide overall management and liaison services related to project phases.
- E. Coordinate times and places of all of the Design-Build Team's community and public meetings.
- F. Provide existing Right-of-Way plats and/or Right-of-Entry agreements.

**3.06.02 Traffic Services**

The Administration's Office of Traffic and Safety (OOTS) will provide the following:

- A. Design charts for ground mounted sign supports and foundations.
- B. Copies of existing standard sheets; however, these may require some revisions by the Design-Build Team.
- C. Engineering standards, design criteria, and copies of the past design projects for use as examples or guides.
- D. Functional operation and requirements for the traffic signals.



**3.06.03 Structural Services**

The Administration's Office of Structures (OOS) will provide the following:

- A. Copies of existing structural detail sheets; however, these may require some revisions by the Design-Build Team.
- B. Engineering details, design criteria, and copies of the past design projects for use as examples or guides.
- C. Structural detail plan sheets for inclusion in plans for submission by the Design-Build



Team based on the list of required details provided by the Design-Build Team.


**3.06.04 Construction Inspection**

The Administration will follow its normal construction inspection policies and procedures. However, measurement of quantities will serve to verify that the plan and specification requirements are met and for other purposes at the discretion of the Administration. The Design-Build contract does not alter the authorities of the Administration's District Engineer, Project Engineer, or construction inspection personnel in their Administration of the construction contract.

**3.06.05 Conduct Pre-Construction Conference**

The Administration will conduct the conference and take minutes. Representation at the conference shall include:

**3.06.05.01 Preconstruction Conference Attendees**

- A responsible officer of the Design-Build Team;
- A responsible officer from each of the Design-Build Teams' major design firms and subconsultant design firms;
-  • A responsible officer of any of the Design-Build Team's major subcontractors;
- MDOT SHA Construction Project Engineer;
- MDOT SHA Design Project Manager;
- MDOT SHA Public Affairs Representative;
- MDOT SHA Landscape Programs Division representative;
- MDOT SHA Environmental Programs Division (EPD) Independent Environmental Monitor (if applicable);
- MDOT SHA EPD Regional Environmental Coordinator;
- MDOT SHA EPD representative;
- MDOT SHA Highway Hydraulics Division representative;
- MDOT SHA Office of Structures representative;
- MDOT SHA QAD Quality Assurance Division representative;
- SWM/ESC Approval Authority representative;
- Maryland Department of Natural Resources representative;

- District Utility Engineer, and
- Baltimore County Representatives.

**3.06.05.02 Pre-Construction Conference Topics**

The Design-Build Team should be prepared to discuss the following issues at the conference (at a minimum):

- Designation of responsible personnel;
- Design Quality Control Plan;
- Correspondence/communication;
- Distribution of contract documents;
- Approval of subcontractors;
- Tree Impact Minimization and Avoidance Report;
- Locations and protection devices of forested areas and specimen and significant trees.
- Stake out and approval of tree protection devices and fence locations.
- Progress schedule (design and construction);
- Critical work sequencing;
- Permits and licenses;
- Plan submittal requirements;
- Submission schedule;
- Submittal of Shop Drawings, project data and samples;
- Itemized schedule listing dates by which other submissions will be forwarded to the Administration;
- Major equipment, deliveries and priorities;
- Site utilization plans;
- Office and storage area;
- Construction constraints;



- Coordination of all interface activities;
- Training;
- Availability of utilities/need for temporary services;
- Procedures for maintaining Record Documents;
- Material submittals and approvals;
- Processing of field decisions and change orders;
- Close-out procedures;
- Review of miscellaneous procedures;
- Safety;
- Utility relocations, and
- Utility connections to all existing and proposed Traffic Control Devices.

**3.06.06 Conduct Progress Meetings**

The Administration will conduct progress meetings on a regular basis, as scheduled at the project initiation meeting. The Design-Build Team shall prepare all meeting minutes and distribute them to attendees and team members for review and comment within one week. Additional progress meetings may be necessary at the discretion of the Administration to maintain coordination of design and construction activities. Representatives at the meetings shall be qualified and authorized to act on behalf of the entity each represents.

**3.06.06.01 Progress Meeting Attendees**

- The Design-Build Project Manager and associates as needed,
- The MDOT SHA Construction Project Engineer, MDOT SHA Design Project Manager and associates as needed,
- Subcontractors as appropriate to the agenda,
- Utility companies, and other concerned parties as appropriate.

**3.06.06.02 Progress Meeting Topics**

The meetings will serve as a forum to establish and maintain close coordination of work activities, resolve problem issues and expedite construction operations. Schedules, change orders, work activities, DQCP reviews, and other issues will also be addressed.

**3.06.07 Permits**

No permits have been obtained by the Administration. Agency coordination will be required to secure necessary permits for any environmental impact as part of the Design-Builder's project. The Design-Builder shall be responsible for providing all information required to obtain the permits, if required, identified in 3.20.01.05.A. Though the Administration will coordinate with the regulatory agencies; it is the Design-Builder's sole responsibility for obtaining all required permits and providing sufficient and permittable information.

**TC 3.07 Deliverables**

Deliverables will be produced in both the design and construction phases. They include construction documents, reports, public relations materials, design exceptions and property owner information.

**3.07.01 Plans**

At a minimum, the following separate plan sheets shall be produced for this project.

- Title Sheet
- Index of Sheets
- Abbreviations Sheet
- Typical Section Sheets
- Superelevation Sheets
- Pavement Detail Sheets
- Miscellaneous Detail Sheets
- Geometry Sheets
- Intersection Detail Sheets
- Gore Detail Sheets
- Roadway Plan Sheets
- Roadway Vertical Profile Sheets
- Maintenance of Traffic Plan Sheets

- Storm Drain Profiles with 25-year hydraulic gradeline shown and Structure Schedules Sheets
- Drainage Details Sheets, including ditch type/linings, outfall protection, and non-standard structures
- Stormwater Management Plans and Details
- Erosion and Sediment Control Plans and Details
- Stream Diversion Plans and Detail Sheets
- Wetland and Stream Mitigation Plan Sheets
- Landscape/Reforestation/SWM Planting Plan Sheets
- Structure Plans and Details
- Noise Abatement Plans and Details (if applicable)
- Culvert Extension Plans, Elevation and Details
- Retaining Wall Plans, Elevation and Details
- Traffic Signalization Plans
- Interconnect Plans (if applicable)
- Signing and Pavement Marking Plans
- Intersection/ Interchange Lighting Plan Sheets
- ITS Plans
- Grading Tables
- Cross Sections

**3.07.01.01 General Requirements**

The Design-Build Team shall deliver upon request and at no additional cost hard copies of maps, plans and drawings as well as electronic copies of all computer files. This includes Microstation files used to develop the design and drafting of this project. These files must be logically indexed and labeled to enable Administration personnel to use at any time.

**3.07.01.02 Contract Plans and Specifications**

The Design-Build Team shall provide contract plans and any required specifications, in

accordance with “Volume II Specifications for Consulting Engineers” and this RFP. The Design-Build Team will develop specifications for construction that identify the details of the proposed work. The intent is that the work will be done in accordance with the Standard Specifications, project specific Special Provisions, the “standard” Special Provisions, and the Special Provisions Inserts which are normally included in an Administration advertised RFP. All of these “standard” Special Provisions Inserts and Special Provisions are included in this RFP even though the work items to which they apply might not be included in this project. The intent is that if the item is included in the construction, then these “standard” Special Provisions and Special Provisions Inserts will apply.

The specifications to be prepared by the Design-Build Team and submitted to the Administration for review and approval will, in addition to all of the specifications mentioned above, include any specifications developed by the Design-Build Team that supplement or modify what is provided in the RFP.

Throughout the design phase, the Design-Build Team shall prepare and update 50 scale reproducible maps of the design to be used for meetings, briefings, etc. Where needed for added clarification, 20 scale reproducible maps shall be provided to the Administration. The scale of the roadway plans should be a scale appropriate for the project, but not less than 1”=50’. A scale of 1”=30’ or 1”=20’ should be used if more detail is needed on the plans. The scale of the plans shall be discussed with the Administration and final determination of plans scale shall be at the sole discretion of the Administration.

The Design-Build Team shall provide the Administration with sufficient data to answer property owners’ and other requests for information concerning the project's effects, status, etc.

### **3.07.01.03 Drafting and CADD Standards**

The Design-Build Team shall utilize MDOT SHA supplied Microstation files, including data collector survey and photogrammetry in their design and drafting. The Design-Build Team shall utilize the Microstation drafting software packages Version V8i or later, and/or Inroads/Geopak. All of the design and drafting will utilize all Administration CADD Standards including but not limited to feature tables, file-naming standards, parameter files, font libraries, cell libraries and color tables.

### **3.07.01.04 Stormwater Management (SWM) and Surface Drainage Plans**

The following items shall be included in the design plan documents:

- Pipe profiles and structure schedules for all storm drain systems and culverts.
- Profiles shall be at a scale of 1 in. = 30 ft. horizontal and 1 in. = 3 ft. vertical. The 25-year hydraulic gradient and existing and proposed ground, proposed pipe, existing and proposed utilities, proposed outlet protection, and existing structures shall be shown on all storm drain profiles.

- Details for all non-standard drainage structures.
- SWM Systems including details, profiles, grading and layout plans, planting plans and BMP ID numbers.
- Side, median and outfall ditch elevations, offsets, section geometry, and surface treatments.
- A BMP As-Built Certification sheet shall be developed for each SWM facility (see TC 3.05.15.05). Examples of the checklists and tabulations are included in this package and checklists for other types of facilities may be available from the Administration, Highway Hydraulics Division, upon request. The Design-Build Team may expand the checklist as necessary.
- Hazardous material spill containment plans as necessary.
- Underdrain connections, locations (including linear filter cleanouts), and outlets.
- Cross culvert locations, headwater pool areas, and channel changes required to adjust streams to culverts.
- Spring box and outlet locations and configurations.

**3.07.01.05 Erosion and Sediment Control (ESC) Plans**

The Design-Build Team shall develop ESC Plans that include the following in addition to the highway plan requirements.

- Plans for both initial and final phases of the construction are required. Plans for interim phases may also be required by the SWM/ESC approval authority to ensure adequate controls throughout project duration. These interim phase plans shall be coordinated with traffic control stages. The plans require one foot contouring for all phases at the same scale as the roadway plans.
- The initial phase plan shall detail the implementation of erosion and sediment control measures necessary to complete the clearing and grubbing and the initial stages of the Traffic Control Plan (TCP).
- The final phase shall detail the control measures required to move to final grade and accommodate interim traffic control phases.
- Plans shall provide a detailed description of the Limit of Disturbance (LOD). A schedule of stations and offsets shall be provided with stations and offsets established at a minimum of 50 foot intervals and at all break points in between.
- Larger scale drawings (1 in. = 200 ft.) shall be included in the plans depicting off-site drainage areas, sensitive environmental resource areas such as wetlands, woodlands,

streams, and locations of major diversions and sediment controls.

- Maintenance of stream flow and maintenance of storm drain flow plans as required.
- This plan will be coordinated with the MDE Non-Tidal Wetland and Waterways Division to ensure compliance with ESC measures in areas subject to waterway construction permits. The Design-Build Team shall be responsible for all revisions due to MDE review and comment.
- The plans shall be sealed and signed by a Maryland Registered Professional Engineer.

#### **3.07.01.06 Traffic Control Plans**

The Design-Build Team shall prepare detailed Traffic Control Plans (TCPs) as required for various stages of construction showing traffic patterns, signs, barricades, etc. These plans will be developed at a scale of 1 in. = 20 ft. or 1 in. = 50 ft. and shall layout in detail each phase of construction as coordinated with the erosion and sediment control and landscape plans. Final TCPs may include cross-sections, temporary signals and/or signal phasing modification plans and interim drainage. All existing highway lighting systems, sign lighting and traffic signals are to be kept fully operational throughout the construction period. In the event some or all of the existing lighting must be taken out of service, consideration should be given to temporary lighting systems and maximizing usage of new lighting systems. All lane closures shall be as outlined elsewhere in this RFP.

#### **3.07.01.07 Structure Plans**

All structure plans developed by the Design-Build Team shall conform to the following requirements:

Title Block information in accordance with MDOT Maryland State Highway, Office of Structures GPM P-79-16(G).

All views in accordance with MDOT Maryland State Highway, Office of Structures GPM P-75-7(4).

All lettering in accordance with MDOT Maryland State Highway, Office of Structures GPM P-76-9(G).

#### **3.07.01.08 Utility Map**

The Design-Build Team shall develop a color coded utility map graphically showing all existing utilities within the Project Limits. The map shall be at the scale of the roadway plans. Existing utilities are to be clearly indicated and labeled. Connections between valve boxes, manholes, poles, etc., are to be shown and labeled with the type of existing service (i.e. 2" electric, fiber optic, etc.). This map is to be kept current with all proposed utility relocations shown and made available for review and use by Administration and Utility Company staff. Existing utilities are to be shown and clearly labeled on plans, profile and cross-sections.

**3.07.01.09 Roadside Landscape and Reforestation Plans**

The Design-Build Team shall prepare landscape and reforestation plans with a scale appropriate for the project, but not less than 1"=30'. Plans shall include schedules of all materials proposed for use, and shall be submitted to the Administration, Landscape Architecture Division and Landscape Operations Division, for review and approval. Roadside Landscape and Reforestation plans should include the following information:

- Vicinity map of site location for both on-site and off-site reforestation areas
- Density and quantity of plantings area provided for mitigation
- Limit of Disturbance
- Tree preservation fence line
- Plans should include environmental/surface features, extending at least 100' beyond Property Line or Right-of-Way of adjacent parcels. Ownership and parcel numbers should be identified for each adjacent parcel
- A schedule of materials, indication plant quantities for each type and size of plant material, proper nomenclature for plant species, root of materials; B&B or Container Grown (CG), and proposed spacing
- Defined limits of mowing and limits of mulching where applicable
- Critical Root Zones for individual significant or specimen trees, as defined by the Maryland Department of Natural Resources: Measured from the center of the tree's trunk; 1.5 foot of radius per inch of DBH (Diameter at Breast Height)
- Tree preservation details including but not limited to fencing, fertilizing, root aeration, signage, and root pruning/sequencing of construction indicating any additional requirements for tree preservation not identified in the specifications.
- Tables for Planting zone calculations including but not limited to areas, linear feet and planting quantities by zone required. These shall be updated for each plan submission.

**3.07.01.10 Wetland and Stream Mitigation and Creation Plans**

The Design-Build Team shall prepare wetland and stream mitigation plans, if required, with a scale appropriate for the project. Plans shall be submitted to the Administration for review and concurrence. Wetland and Stream Mitigation Plans should include the following information:

- Vicinity map of site location
- Sheet layout

- Geometry
- Proposed conditions including but not limited to, proposed grading contours and structures
- Typical proposed cross sections
- Cross Sections every 50 feet along alignment
- Details – including but not limited to stream structures, bioengineering, planting, etc.
- Stream profile showing existing and proposed ground, proposed structures, existing structures and/or utilities, and any other pertinent information
- Density, and quantity of planting materials per stratum per planting area
- A schedule of materials, indication plant quantities for each type and size of plant material, proper nomenclature for plant species, root of materials; B&B or Container Grown (CG), and proposed spacing
- Limit of Disturbance
- Plans should include environmental/surface features, extending at least 100' beyond Property Line or Right-of-Way of adjacent parcels. Ownership and parcel numbers should be identified for each adjacent parcel
- Any additional requirements from the USACE or MDE needed for approval of the mitigation site including, but not limited to, the information in the Phase I and Phase II checklists.

### **3.07.02 Cross Sections**

The Design-Build Team shall prepare cross-sections cut at even 50 foot stations, at driveways, and at critical stations for clarity along the baseline of construction at a scale of 1 in. = 10 ft. horizontal and vertical. Cross sections shall be provided for the mainline and side roads. Cross-sections shall show: existing ground, proposed grade, roadway slope, curb/gutter, existing right-of-way and easements, traffic barrier, proposed and existing traffic control device and sign structure foundations, grading limits, pavement section and all existing and proposed storm drains, swales, storm water management facilities, noise walls, and all utilities. Cross-sections shall have the P.G.E.(s) and all proposed ditches and swale inverts labeled with offsets and elevations. Cross-sections shall have all existing and proposed (including relocated) utilities and storm drains drawn to scale at the correct offset and elevation, and have type, size, and invert elevation (if known) labeled. Cross-sections shall be placed on sheets measuring 22 in. x 34 in. with grid lines spaced at 0.1 in. horizontal and 0.1 in. vertical. Each section shall be identified by the baseline name, station and a datum elevation. Elevations shall be shown in the Maryland Grid System Datum, NAVD 88.



The cross sections should be annotated according to MDOT SHA Highway Design Policy and Procedures Manual including offset and elevation for all significant figures.

Existing and proposed utilities, proposed drainage conveyances including pipes, drainage structures, cross culverts and ditches shall be drawn on to the cross-sections. The cross-sections will be used by the Administration to verify adequate cover at pipes and clearance at utilities.

Interim and final cross sections containing drainage design components and annotations shall be submitted for use in the Administration's review of drainage design.

Cross-section will be needed for any Wetland and/or Waterways Mitigation per Maryland Nontidal Wetland Mitigation Guidelines and References outlined in TC 3.08. All baselines for Wetland and/or Waterways Mitigation shall be referenceable to the baseline of the roadway project.

### **3.07.03 Reports**

The Design-Build Team shall perform engineering computations and/or analysis and maintain all backup data. This data must be available to the Administration at all times; and clear, legible copies shall be furnished to the Administration upon request. Stormwater Management reports, drainage reports, ESC report, geotechnical report, pavement report, tree impact report, wetland and stream report, noise report, and field inspections reports, computations, and maps shall be submitted to the Administration for review and/or approval and placement in permanent files. These computations shall be for the total project and in accordance with Administration procedures. Design Exceptions shall be documented in report form and submitted to the Administration.

#### **3.07.03.01 Stormwater Management (SWM) Report**

Upon completion of the project, the Design-Build Team shall submit two (2) copies of the approved, final SWM Report to the SHA HHD. During the review and approval process, the report can be submitted in phases. Electronic and Hard Copies of all items within the report are required.

##### **3.07.03.01.01 SWM Report Format**

- The report and accompanying mapping shall be compiled according to the MDOT SHA HHD SWM Design Report Standard Format (included in this package).
- The report shall be written in a clear, well organized, and concise manner with all pages numbered and dated.
- The report shall be placed in 8½ by 11 inch, 3-hole binders that allow for insertion of revisions and removal of old data.
- Revisions to report as required. The date of the revision shall be placed on all pages and pages to be added, replaced or removed shall be designated. Revisions shall be 3-hole punched for easy placement in the reports. A document shall be submitted with each report detailing all of the changes.

- The final approved report, including all mapping and exhibits, shall be converted to PDF formatted file(s). The electronic file(s) shall be delivered to the Administration for their records.

### **3.07.03.01.02 SWM Report Contents**

The SWM report shall contain the following:

- A signed SWM/ESC Checklist for each phase of approval (i.e. site development approval, final approval) with all the available items
- A SWM/ESC transmittal form.
- A SWM/ESC submittal letter.
- A thorough discussion explaining the extent of improvements at each outfall and the proposed quantitative and qualitative control methods of SWM, including reasons why other methods were not selected.
- An explanation of hydrologic/hydraulic analysis methodologies used. Final supporting computations, maps, schematics, cross-sections, details and computer outputs shall be included for each outfall location.
- Outfall stability analysis, including photographs of each outfall and receiving channel.
- Computations for riprap sizing and outlet protection.
- Maps and schematics clearly showing the location of subareas, structures, existing land use, time of concentration paths, soil types and SWM facilities. Maps shall be included in pockets within the report.
- Computer printout sheets in 8½ inch x 11 inch format. These sheets shall be clearly labeled for cross-reference to the supporting data and points of analysis.
- MDE Pond Summary Sheets.
- MDOT SHA Water Quality Summary Sheet (WQSS) submitted per TC 3.17. Maps detailing the impervious areas added, impervious areas treated, pavement removed, redevelopment areas, and areas where existing treatment is lost.
- MDE SWM Waiver Applications that differ from those submitted with the Concept SWM Report. These shall be submitted to the Administration, Highway Hydraulics Division, for signature.
- MDOT SHA BMP Identification Forms (included in this package) with MDOT SHA BMP numbers indicated. The Design-Build Team is responsible to obtain BMP numbers for all SWM facilities from the Administration, Highway Hydraulics Division.

### **3.07.03.02 Surface Drainage Report**

Upon completion of the project, the Design-Build Team shall submit two (2) copies of the Surface Drainage Report to the MDOT SHA Highway Hydraulics Division. The Surface

Drainage Report shall include all drainage design computations performed according to the Administration's Highway Drainage Manual, drainage area mapping and schematics necessary to complete the design of the stormwater conveyances for the project.

All drainage computations shall be performed using the appropriate design charts within the Administration's Highway Drainage Manual and shall include clear references for all tables and charts used.

Culvert Analysis reports, when necessary for Waterway Construction Permit review and approval, shall be included as an attachment to the Surface Drainage Report and shall follow the format described below. The content shall be dictated by the MDE comment letter, approval or subsequent requirements issued by MDE in their review process.

#### **3.07.03.02.01 Surface Drainage Report Format**

- All the pages within the report shall be numbered and dated.
- The report shall be placed in an 8½ by 11 inch, 3-hole binder that allows for insertion of revisions and removal of old data.
- Revisions to report as required. The date of the revision shall be placed on all revised pages. Pages which are added or removed shall be indicated as such. Revisions shall be 3-hole punched for easy placement in the reports. A document shall be submitted with each report detailing all of the changes.
- The final approved report, including all maps and exhibits, shall be converted to PDF format file(s). The electronic file(s) shall be delivered to the Administration for their records.

#### **3.07.03.02.02 Surface Drainage Report Contents**

The report shall include, but not be limited to the following:

- Storm sewer design computations including schematics, inlet drainage area maps, 2 year inlet spacing, 10 year capacity, spread, 25 year hydraulic gradients, and structural design for non-standard drainage structures.
- Culvert analysis including 2, 10, 25 and 100 year frequency storms and design storms.
- Ditch computations and drainage area maps for ditch capacity, freeboard and lining stability.
- Evaluation of outfall stability, and outfall protection design, including photographs.
- Any deviations from the guidelines and Administration approvals for the deviations.
- Culvert service life verification.
- Inspection documentation and evaluation of existing drainage structures, storm drains and culverts not being replaced.

**3.07.03.03 Erosion and Sediment Control (ESC) Report**

The ESC Report shall contain all computations for the ESC design and can be either a separate report or can be included in the SWM report. The ESC Report shall conform to SWM Report formatting described above (TC 3.07.03.01.01).

The ESC Report shall contain the following:

- Drainage area maps to control devices for each phase.
- Computations for sizing control devices.
- Plans and procedures for converting sediment control devices into stormwater management facilities.
- Tracking of E&S quantities throughout the duration of the project.
- Identification of and placement of controls in sensitive areas.

**3.07.03.04 Geotechnical Reports**

The Design-Builder shall prepare Geotechnical Reports as described in TC 3.14 – Geotechnical Performance Specification.

**3.07.03.05 Pavement Report(s)**

Pavement Report(s) and FWD Result Report(s) shall be prepared as outlined in TC 3.10 – Pavement Performance Specification.

**3.07.03.06 Tree Impact Minimization and Avoidance Report**

A report shall be prepared that shows the tree and forest locations and describes the alternative measures that the Design-Build Team proposes to use to avoid or reduce impacts to these trees and forest, including alignment or typical section modifications or protective measures as stated in Administration's 2008 Standard Specifications, Section 120. This report will be reviewed and approved in conjunction with the grading plans.

**3.07.03.07 Wetland Creation and Stream Restoration Reports**

If wetland and/or stream mitigation is required, a final Phase I and Phase II report shall be prepared per USACE and MDE requirements.

If stream mitigation is required, a Stream Restoration Design Report shall also be provided. The Report shall include, but is not limited to, project description and background, watershed and stream existing conditions, mitigation design approach and techniques, design discharge analysis and determination, rock sizing and hydrologic and hydraulic modeling including FEMA requirements.

**3.07.03.08 Technical Noise Analysis Report**

If the Design-Builder's improvements meet the definition of a Type I Project in accordance with MDOT SHA Noise Policy and 23 CFR 772.5, as described in TC 3.18.01, the Design-

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Builder shall conduct a Final Design Noise Analysis, submit a Re-Evaluation, and submit a Technical Noise Analysis Report at its sole expense and cost. The Final Design Noise Analysis and Technical Noise Analysis Report shall meet the requirements of the MDOT SHA Noise Policy and this RFP and is subject to review and approval by MDOT SHA.

**TC 3.08 GUIDELINES AND REFERENCES**

All Project services shall be provided in accordance with these specifications and the relevant requirements of the Guidelines and References listed in Table 1 unless otherwise stipulated in these specifications. Unless noted, the most recent version as of the date of issuance of this RFP for each Guideline and Reference shall apply. Guidelines and references in Table 1 are listed alphabetically by Author or Agency and the order is not intended to imply a priority of one document over any other. Should the requirements in any Guideline conflict with those in another or any other requirement in the Contract Documents, the strictest requirement as determined by the Administration shall govern. It is the Design-Builder’s responsibility to obtain clarification for any unresolved or perceived ambiguity prior to proceeding with design or construction.

**Table 1**  
**Design-Build Guidelines and References**

1

<b>Author or Agency</b>	<b>Title</b>
AASHTO	A Guide for Transportation Landscape and Environmental Design
AASHTO	A Policy on Design Standards Interstate System
AASHTO	A Policy on Geometric Design of Highways and Streets, 7 <sup>th</sup> Edition
AASHTO	DARWin Pavement Design Software
AASHTO	Guide for Design of Pavement Structures, 1993
AASHTO	Guide for the Development of Bicycle Facilities
AASHTO	Guide for the Planning, Design, and Operation of Pedestrian Facilities
AASHTO	Guide Specifications for Structural Design of Sound Barriers
AASHTO	Guide Specifications for Wind Loads on Bridges During Construction
AASHTO	Guide Design Specification for Bridge Temporary Works
AASHTO	Highway Safety Design and Operations Guide
AASHTO	Highway Safety Manual
AASHTO	Standard Specifications for Highway Bridges, 17th Edition, 2002, with current interim specifications
AASHTO	LRFD Bridge Design Specification, 8th Edition
AASHTO	LRFD Bridge Construction Specification
AASHTO	M140 - Standard Specification for Emulsified Asphalt
AASHTO	M208 - Standard Specification for Cationic Emulsified Asphalt



AASHTO	M288 – Standard Specification for Geotextile Specification for Highway Applications
AASHTO	M316 - Polymer-Modified Emulsified Asphalt
AASHTO	M320 - Performance-Graded Asphalt Binder
AASHTO	M323 - Superpave Volumetric Mix Design
AASHTO	M332 - Standard Specification for Performance-Graded Asphalt Binder Using Multiple Stress Creep Recovery (MSCR) Test
AASHTO	Manual for Assessing Safety Hardware, 2nd Edition
AASHTO	Manual for Bridge Evaluation, 3 <sup>rd</sup> Edition
AASHTO	Manual for Bridge Element Inspection
AASHTO	Manual on Subsurface Investigations, 1st Edition
AASHTO	R35 - Superpave Volumetric Design for Hot-Mix Asphalt
AASHTO	Roadside Design Guide, 4th Edition
AASHTO	Roadway Lighting Design Guide
AASHTO	Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 2015 and 2019 Interim Revisions for signal structures (mast arm poles, strain poles, and pedestal poles), except as noted in Section 818 Special Provision; 4th Edition for sign structures (overhead, cantilever, and ground mounted) and lighting structures; and 6th Edition with 2015 Interim Revisions for CCTV camera poles and all other ITS device structures not covered by the previously noted Editions above.
AASHTO	Standard Specifications for Transportation Materials and Methods of Sampling and Testing, 2019 Edition
AASHTO	T 194 - Standard Method of Test for Determination of Organic Matter in Soils by Wet Combustion
AASHTO	T 88 - Standard Method of Test for Particle Size Analysis of Soils
AASHTO/AWS	D1.5M/D1.5: Bridge Welding Code
ACI	ACI 318 - Building Code Requirements for Structural Concrete
ACI	ACI 350 – Environmental Engineering Concrete Structures
ACOE	HEC-RAS Software, Version 5.0.7
ADA	Americans with Disabilities Act Accessibility Guidelines
AISC	Steel Construction Manual

ANSI	ANSI A300 (Part 1) - American National Standard for Tree Care Operations - Tree, Shrub and Other Woody Plant Management - Standard Practices (Pruning)
ANSI	ANSI A300 (Part 2) - American National Standard for Tree Care Operations - Tree, Shrub and Other Woody Plant Management - Standard Practices (Soil Management)
ANSI	ANSI A300 (Part 3) - American National Standard for Tree Care Operations - Tree, Shrub and Other Woody Plant Management - Standard Practices (Supplemental Support Systems)
ANSI	ANSI Z133.1 - Safety Requirements
ANSI	ANSI Z60.1 - American Standard for Nursery Stock
AREMA	Manual for Railway Engineering, latest revision
AREMA	Portfolio of Trackwork Plans, latest revision
ASTM	Annual Books of ASTM Standards
ASTM	D4694 - Standard Test Method for Deflections with a Falling-Weight-Type Impulse Load Device
ASTM	D6433 - Standard Practice for Roads and Parking Lots Pavement Condition Index Surveys
ASTM	E274 - Standard Test Method for Skid Resistance of Paved Surfaces Using a Full-Scale Tire
ASTM	E501 - Standard Specification for Standard Rib Tire for Pavement Skid-Resistance Tests
ASTM	E950 - Standard Test Method for Measuring the Longitudinal Profile of Traveled Surfaces within an Accelerometer Established Inertial Profiling Reference
ASTM	Standards in Building Codes
ATSSA	Quality Guidelines for Temporary Traffic Control Devices and Features
AWS	American Welding Society Standards
Baltimore County Department of Public Works	Baltimore County Design Manual
CFR	Code of Federal Regulations (CFR)
COMAR	Code of Maryland Regulations (COMAR)



COMAR	COMAR 09.12.91 – Railroad Safety and Health
COMAR	COMAR 09.13.06 – Minimum Standards of Practice
COMAR	COMAR 15.20.07 – Agricultural Operation Nutrient Management Plan Requirements
COMAR	COMAR 15.20.10 – Fertilizer Application Law
CSXT	Public Project Manual, latest revision
DNR	COMAR Article 5-103 – Reforestation Law
DNR	COMAR Article 5-401 to 5-423 – Roadside Tree Law
DNR	COMAR 08.07.02 - Roadside Tree Care
DNR	COMAR 08.19 - Forest Conservation
EPA	Clean Water Act Section 404 Compensatory Mitigation Requirements
FEMA	44 CFR Part 10 - Environmental Considerations
FEMA	44 CFR Part 9 - Floodplain Management and Protection of Wetlands, October 2011
FEMA	Conditional Letter of Map Revision (CLOMR)
FHWA	"Bridge Rails" Memorandum
FHWA	23 CFR 940.11 - Project Implementation
FHWA	FHQ-RD-01-050 Durability of Geosynthetics for Highway Applications
FHWA	FHWA NHI-01-031 - Subsurface Investigations (Geotechnical Site Characterization)
FHWA	FHWA-ED-88-053 Checklist and Guidelines for Review of Geotechnical Reports and Preliminary Plans
FHWA	FHWA-HI-97-013 - Design and Construction of Driven Pile Foundations – Volume I
FHWA	FHWA-HI-97-014 - Design and Construction of Driven Pile Foundations – Volume II
FHWA	FHWA-HI-98-034 - Geotechnical Instrumentation
FHWA	FHWA-HOP-07-001 – Developing and Using a Concept of Operations in Transportation Management Systems
FHWA	FHWA-HOP-15-023 – Use of Freeway Shoulders for Travel – Guide for Planning, Evaluating, and Designing Part-Time Shoulder Use as a Traffic Management Strategy

	FHWA	FHWA-NHI-00-043 - Mechanically Stabilized Earth Walls and Reinforced Soil Slopes Design and Construction Guidelines
	FHWA	FHWA-NHI-05-037 - Geotechnical Aspects of Pavements
	FHWA	FHWA-NHI-09-087 - Corrosion/Degradation of Soil Reinforcements for Mechanically Stabilized Earth Walls and Reinforced Soil Slopes
	FHWA	FHWA-NHI-10-016 - Drilled Shafts: Construction Procedures and LRFD Design Methods
	FHWA	FHWA-RD-03-031 - Distress Identification Manual for the Long-Term Pavement Performance Program
	FHWA	FHWA-SA-91-048 - Laterally Loaded Pile Analysis Program for the Microcomputer, (COM624P) Version 2.0
	FHWA	FHWA-SA-94-035 The Osterberg Load Cell for Load Testing Drilled Shafts and Driven Piles
2	FHWA	FHWA-SA-97-070 - Micropile Design and Construction Guidelines
	FHWA	FHWA-NHI-16-027 & NHI-16-028 - Geotechnical Engineering Circular No. 13: Ground Modification Methods Reference Manual Volume I & II
	FHWA	FHWA NHI-07-092 – Geosynthetic Design and Construction Guidelines,
	FHWA	Manual for Design & Construction of Soil Nail Walls
	FHWA	Geotechnical Engineering Circular No. 1: Dynamic Compaction
	FHWA	FHWA NHI-07-071: Earth Retaining Structures
	FHWA	Geotechnical Engineering Circular No. 4: Ground Anchors and Anchored Systems
	FHWA	Geotechnical Engineering Circular No. 5: Evaluation of Soil and Rock Properties
	FHWA	Geotechnical Engineering Circular No. 6: Shallow Foundations
	FHWA	Geotechnical Engineering Circular No. 7: Soil Nail Walls
	FHWA	Geotechnical Engineering Circular No. 8: Design and Construction of Continuous Flight Auger Piles
	FHWA	Interstate Access System Informational Guide
	FHWA	Manual on Uniform Traffic Control Devices (MUTCD)
1	FHWA	Model Systems Engineering Documents for Closed Circuit Television (CCTV) Systems, May 2018



FHWA	Model Systems Engineering Documents for Dynamic Message Sign (DMS) Systems
FHWA	Maryland Division Standard Operating Procedure (SOP) for the New or Revised Access Points
FHWA	NCHRP Report 350 - Recommended Procedures for the Safety Performance Evaluation of Highway Features
FHWA	NCHRP Report 553 - Crashworthy Work Zone Traffic Control Devices
FHWA	NCHRP Report 672 - Roundabouts: An Informational Guide, 2nd Edition
FHWA	NCHRP 07-20 Guidance For Implementation Of Traffic Incident Management Performance Measurement
FHWA	Policy on Access to Interstate System
FHWA	Standard Highway Signs
FHWA	Systems Engineering For Intelligent Transportation Systems
FHWA	Traffic Noise Model, Version 2.5.
IEEE	Guide for Concept of Operations Document
IEEE	Guide for Developing System Requirements Specifications
IEEE	Independent Verification and Validation
IEEE	National Electric Safety Code
IES	DG-5-94 Recommended Lighting for Walkways and Class 1 Bikeways
IES	RP-19-01 Roadway Sign Lighting
IES	RP-22-11, American National Standard for Tunnel Lighting
IES	RP-8-00, American National Standard Practice for Roadway Lighting
ITE	Manual of Transportation Engineering Studies, 2nd Edition
ITE	Traffic Engineering Handbook, 7th Edition
ITS MD	Maryland Statewide ITS Architecture
MDE	2000 Maryland Stormwater Design Manual, Appendix A, Landscaping Guidance for Stormwater BMPs
MDE	2000 Maryland Stormwater Design Manual, Volumes I and II
MDE	2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control

MDE	Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated - Guidance for National Pollutant Discharge Elimination System
MDE	COMAR 26.08.02 - Water Quality
MDE	COMAR 26.08.02.10 - Water Quality Certification
MDE	COMAR 26.17.01 - Erosion and Sediment Control
MDE	COMAR 26.17.02 - Stormwater Management
MDE	COMAR 26.17.04 - Construction on Nontidal Waters and Floodplains
MDE	COMAR 26.23 – Nontidal Wetlands
MDE	COMAR 26.24 – Tidal Wetlands
MDE	Dam Safety Guidelines and Policies: Policy Memorandum No.1 - Maintenance and Repair, Trees and Woody Vegetation
MDE	Dam Safety Guidelines and Policies: Policy Memorandum No. 2 - Roadway and Railroad Embankments with Culvert Crossings
MDE	Dam Safety Guidelines and Policies: Policy Memorandum No. 3 - Impoundments Adjacent to Steep Slopes
MDE	Dam Safety Guidelines and Policies: Policy Memorandum No.4 - Hazard Classification: Small Impoundments
MDE	Dam Safety Guidelines and Policies: Policy Memorandum No. 7 - Impoundment Filling Plans
MDE	Dam Safety Guidelines and Policies: Policy 93-2: Landscape Plantings on Dam
MDE	Dam Safety Guidelines and Policies: Policy: Roadway Embankment Design Criteria
MDE	Embankment Retrofit Design
MDE	Environmental Site Design Process & Computations
MDE	Environmental Site Design Redevelopment Examples
MDE	Guidance for Completing a Dam Breach Analysis for Small Ponds and Dam in Maryland
MDE	Maryland Nontidal Wetland Mitigation Guidance
MDE	Maryland’s Waterway Construction Guidelines
MDE	National Pollutant Discharge Elimination System General Permit for Construction Activity

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MDE	Navigating Maryland’s Resource Access and Permitting Process for Broadband Projects
MDE	Performance Standards and Monitoring Protocol for Permittee-Responsible Nontidal Wetland Mitigation Sites
MDE	Phase II Mitigation Plan – Required Information
MDE	Stormwater Design Guidance – Addressing Quantity Control Requirements
MDE	Stormwater Design Guidance – Submerged Gravel Wetland
MDE	Stormwater Design Guidance – Green Roofs & Runoff Curve Numbers
MDE	Environmental Site Design and Innovative Technology
MDE	Unified Innovative Technologies Policy
MDE	MDE’s List of Reviewed Alternative/Innovative Technology
MDE	Sediment and Stormwater Plan Review Division, Water and Science Administration Technical Memorandum #1: Standard Items to Include on Erosion & Sediment Control Plans
MDE	Sediment and Stormwater Plan Review Division, Water and Science Administration Technical Memorandum # 2 - Alternative Surfaces and Artificial Turf
MDE	Sediment and Stormwater Plan Review Division, Water and Science Administration Technical Memorandum #3 - Stormwater Management and Erosion and Sediment Control Review and Approval Process for State/Federal MS4 Restoration Projects
MDE	Sediment and Stormwater Plan Review Division, Water and Science Administration Technical Memorandum #4 - What is meant by "Redevelopment", "Reconstruction", "New Development", and "Maintenance"
MDE	Sediment and Stormwater Plan Review Division, Water and Science Administration Technical Memorandum # 5 - Determination of Approval Authority
MDE	Sediment and Stormwater Plan Review Division, Water and Science Administration Technical Memorandum # 6 - Stormwater Management for Bridge Decks

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MDE	Sediment and Stormwater Plan Review Division, Water and Science Administration Technical Memorandum # 7 - Soils Investigation Requirements
MDE	Sediment and Stormwater Plan Review Division, Water and Science Administration Technical Memorandum # 9 - Maintenance Schedules
MDE	Sediment and Stormwater Plan Review Division, Water and Science Administration Technical Memorandum # 10 - SWM Overview
MDE	Sediment and Stormwater Plan Review Division, Water and Science Administration Technical Memorandum # 11 - MDE Spreadsheet Instructions
MDE	Sediment and Stormwater Plan Review Division, Water and Science Administration Technical Memorandum # 12 - Grass Swales
MDE/USACE	MDSPGP – 5 and Nationwide #27
MTA	Design Criteria Manual
MTA	Design Development Manual
MTA	Facilities Inspection Manual
NCHRP	Geotechnical Instrumentation for Monitoring Field Performance
NEMA	National Electrical Manufacturers Association Standards
NFPA	502: Standard for Road Tunnels, Bridges and Other Limited Access Highways
NFPA	70: National Electrical Code
NFPA	National Fire Protection Association
NRCS	Pond Code MD-378
NTCIP	National Transportation Communications for ITS Protocol
OSHA	29 CFR 1910 - Occupational Safety and Health Standards
OSHA	29 CFR 1926 - Safety and Health Regulations for Construction
SHA	2035 LOS Wiring Diagram – Design Forecast Volumes
SHA	ABSCOUR Program
SHA	Accessibility Policy and Guidelines for Pedestrian Facilities Along State Highways
SHA	Accessible Pedestrian Signals Design Guidelines
SHA	Advance Street Name Sign Policy and Guidelines
SHA	Approved Proprietary Noise Barrier Systems
SHA	Articulating Traffic Detector Mount

SHA	Advance Street Name Sign Policy and Guidelines
SHA	Approved Proprietary Noise Barrier Systems
SHA	Articulating Traffic Detector Mount
SHA	Bicycle Policy and Design Guidelines
SHA	Book of Standards for Highways, Incidental Structures and Traffic Control Applications
SHA	Design Request Form Instructions and Guidelines
SHA	DMS Signface Layouts: CCTV
SHA	Exit Gore Sign Guidelines
SHA	Field Guide for Erosion and Sediment Control
SHA	Field Procedure Manual
SHA	Flagger Policy at Signalized Intersections
SHA	Form Single Lane Application Guidelines
SHA	Guidance for the Use of Portable Changeable Message Signs (PCMS) in Work Zones
SHA	Guidance on Maintenance of Traffic Alternatives Analysis (MOTAA)
SHA	Guidelines for Application of Rumble Strips and Rumble Stripes
SHA	Guidelines for the Use of Dynamic Lane Merging Strategies
SHA	Guidelines for Traffic Barrier Placement and End Treatment Design
SHA	High Visibility Apparel Policy
SHA	Highway Design Policy and Procedure Manual
SHA	Highway Drainage Manual Design Guidelines
SHA	Highway Drainage Manual
SHA	Integrated Vegetation Management Manual for Maryland Highways, February 28, 2012
SHA	Intelligent Transportation Systems (ITS) Design Manual
SHA	Landscape Design Guide, December 2016
SHA	Landscape Construction Cost Estimating Manual – Category 700, December 2016
SHA	Lighting Guidelines
SHA	Line Striping Material Selection Policy
SHA	List of Qualified Detectable Warning Surface
SHA	List of Qualified Loop Sealants

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SHA	List of Qualified Removable Preformed Pavement Marking Material for Maintenance of Traffic
SHA	Manual for the Inspection of Highway Right of Way in Karst Areas
SHA	Maryland High Voltage Line Act
SHA	Maryland Manual on Uniform Traffic Control Devices- (MD MUTCD)
SHA	Maryland Standard Sign Book
SHA	Maryland State Police Criteria for Use in Work Zones
SHA	Maryland Statewide ITS Architecture
SHA	MSMT 410 – Laboratory and Field Strip Test for HMA
SHA	MSMT 412 – Design Procedure for Asphalt Mixes Containing RAP and RAS
SHA	MSMT 416 – Laboratory Method of Predicting Frictional Resistance of A Blend of Aggregates
SHA	MSMT 563 – Operation of the Inertial Profiler
SHA	MSMT 732 – Geotextile Acceptance and Quality Assurance Procedures
SHA	MSMT 735 – Statistical Analysis of Material Using Quality Level Analysis Determination for Pay Factors And Mix Design Verification
SHA	NEMA Size 5 UPS Battery Cabinet Details (ITS-24 and ITS-25)
SHA	Office of Highway Development, Plans and Surveys Division Field Procedures Manual 2018 Consultant Version
SHA	Office of Structures Guide for Completing Structure Asset Management Input Forms
SHA	Office of Structures Manual on Hydrologic and Hydraulic Design
SHA	Office of Structures Guidelines and Procedure Memorandums (GPMs) and Draft Manuals found online at time of FINAL RFP, including Draft GPMs included which shall be considered final for this Contract
SHA	Office of Structures Structural Details found online at time of FINAL RFP, including Draft Details included which shall be considered final for this Contract
SHA	Structures Inventory and Appraisal Input Forms
SHA	Office of Traffic and Safety Approved Product List for Temporary Traffic Control Devices and Miscellaneous Items



SHA	Office of Traffic and Safety Approved Product List for Temporary Traffic Control Devices and Miscellaneous Items
SHA	Office of Traffic and Safety Capacity/Queuing Analysis Procedures for Intersections
SHA	OOTTS TEDD Traffic Control Devices Design Manual
SHA	Overhead DMS Structure and Access
SHA	Pavement and Geotechnical Design Guide, July 2018
SHA	Pavement Marking Material Selection Guidelines & New Snowplowable Raised Pavement Marker Guidelines
SHA	Pedestal DMS Access System
SHA	Policy for the Use of Temporary Traffic Barrier in Work Zones
SHA	Preferred Plants List (PPL), 2018
SHA	Quality Assurance Toolkit Field Manual
SHA	Recommended Procedure for Determining Types of Left Turn Phasing
SHA	Roadway Delineation Policy
SHA	Roundabout Design Guidelines
SHA	Roundabout Traffic Design Manual
SHA	Sediment and Stormwater Guidelines and Procedures for MDOT State Highway Administration
SHA	Highway Noise Abatement Planning and Engineering Guidelines, Final April 16, 2020
SHA	SHA-MSP InterAgency Work Zone Service Agreement
SHA	Special Provisions and Special Provision Inserts to the Standard Specifications
SHA	Specifications for Consulting Engineer's Services, Volume II, Section VIII
SHA	Standard Office of Traffic and Safety Shelf Typical
SHA	Standard Specifications for Construction and Materials, July 2019
SHA	Standard Specifications for Subsurface Explorations
SHA	Stormwater Management Site Development Criteria
SHA	Stormwater NPDES Program – Standards Procedures Manual
SHA	Transportation Management Plans: Guidelines for Development, Implementation and Evaluation



SHA	Type 332/334 Cabinet Details
SHA	Type 332/334 Cabinet Foundation Detail
SHA	Turfgrass Management Guidelines, February 28, 2012 (excerpt of Integrated Vegetation Management Manual for Maryland Highways)
SHA	Utility Policy
SHA	V004-10 Surveyor
SHA	VISSIM Modeling Guidance
SHA	Work Zone Lane Closure Analysis Guidelines
SHA	Work Zone Safety and Mobility Policy
SHA	Work Zone Safety Policy
SHA	Work Zone Safety Tool Box
SHA	Work Zones on 65/60 mph Roadways
SHA	Highway Noise Policy & Implementation Guidelines, Final
SHA	Highway Noise Policy Amendment on Noise Analysis for Part-Time Shoulder Use, June 20, 2019
SHA/MDE	Application of Hydrologic Methods in Maryland
SHA/MDE	Stormwater Management Process Agreements and Interpretations
SHA/MDE	Stormwater Quality Management Banking Agreement
TRB	Accessible Pedestrian Signals: Synthesis and Guide to Best Practices, June 2007
TRB	Highway Capacity Manual, 5th Edition
TRB	TCRP Report 19 - Guidelines for the Location and Design of Bus Stops
USACE	33 CFR Part 332 Compensatory Mitigation Requirements
USACE	Clean Water Act Section 404 Permit Application and Authorization
USACE	ETL No. 1110-2-307 Flotation Stability Criteria for Concrete Hydraulic Structures
USACE	National Wetland Plant List
USACE	Regulatory Guidance Letter – Minimum Requirements for Compensatory Mitigation Projects Involving Restoration, Establishment, and/or Enhancement of Aquatic Resources
USACE	Regulatory Sourcebook
USDA	The PLANTS Database <b>Error! Hyperlink reference not valid.</b> ( <a href="https://plants.sc.egov.usda.gov/java/">https://plants.sc.egov.usda.gov/java/</a> )

**SPECIAL PROVISIONS**  
SCOPE OF WORK FOR DESIGN-BUILD

CONTRACT NO. BA0065172  
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USDOT	National ITS Architecture
US F&WS	Native Plants for Wildlife Habitat and Conservation Landscaping Chesapeake Bay Watershed

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**TC 3.09 Roadway Performance Specification**

**3.09.01 General**

Design and construct roadways in accordance with the requirements of this specification, including performance requirements, standards and references, design and construction criteria, and required submittals.

This section is also intended to allow the flexibility to make Project changes that produce benefit of savings to the Administration and Design-Builder without adversely affecting the essential functions and characteristics of the Project in terms of safety, traffic operations, desired appearance, durability, ease of maintenance, environmental protection, drainage, and other permitted constraints.

**3.09.02 Guidelines**

Roadway design and construction shall be in accordance with this Roadway Performance Specification and the relevant requirements of TC 3.08 Guidelines and References.

**3.09.03 Performance Requirements**

Design and construct all roadways to meet the following performance requirements:

- A. Meet or exceed all Maryland Department of Transportation State Highway Administration, AASHTO, Authority Having Jurisdiction (AHJ) and other roadway design and safety guidelines as referenced in TC 3.08, outlined in these specifications, and in accordance with sound engineering principles.
- B. All roadway components shall be constructed within the defined right of way and easements.
- C. Ramp or interchange modifications require the Design-Builder to coordinate with FHWA through MDOT SHA. The Design-Builder shall prepare an Interstate Access Point Approval (IAPA) Coordination Letter or full scale IAPA submission as directed by MDOT SHA including coordination and approval by FHWA. Reference the IAPA Guidelines for Maryland documents dated July 2017. Approval is not guaranteed, and all investigations and studies required for IAPA approval shall be conducted by the Design-Builder.

**3.09.04 Design and Construction Criteria**

The Design-Builder shall design and construct all roadway geometrics including horizontal alignment, vertical alignment, superelevation, cross slopes, lane widths, shoulder widths, medians, and clear zone grading in accordance with the requirements of this section and the applicable guidelines for roadway design.

**3.09.04.01 Design Criteria**

<b>I-695 (Baltimore Beltway) Criteria</b>	
Design Speed	55 mph
Posted Speed	55 mph

Functional Classification	Urban Interstate
Terrain	Rolling
Maximum Superelevation	6%
Average Daily Traffic (ADT) in 2040	213,225
Design Hour Volume (DHV)	7%
Directional Distribution of DHV	53%
Percent Trucks - ADT	9%
Percent Trucks - DHV	7%

<b>Interchange Ramp Criteria</b>	
Design Speed	45 mph (30 mph for loops)
Posted Speed	N/A
Functional Classification	N/A
Terrain	Rolling
Maximum Superelevation	8%

Any proposed work by the Design-Builder on roadways not detailed in this specification shall follow the relevant guidelines for functional classification and jurisdiction of the roadway.

The presence of roadway lighting shall not reduce the requirements for vertical sight distance on sag curves.

**3.09.05 Typical Section**

Traffic barrier protection shall be provided along the outside of all roadways, and along the median of roadways where applicable, when clear zone requirements cannot be met. Refer to TC 3.09.08 for traffic barrier requirements.

Typical section elements shall be in accordance with the following criteria:



**I-695** – The existing number of lanes and lane configuration shall be maintained. A 12’ hard shoulder running lane shall be located in the-median shoulder, where feasible. A minimum offset

from edge of travel lane to the existing median barrier shall be provided at all times per AASHTO requirements. Lane and shoulder widths shall conform to AASHTO requirements. Rumble strips shall be provided on the inside and outside shoulders except on the inside shoulder in areas where a hard shoulder running lane is provided.

**Interstate Ramps** – The typical section shall be a one-lane or a two-lane ramp with inside and outside paved shoulders. Lane and shoulder widths shall conform to AASHTO requirements. Where two-lane ramps are proposed, an alternate merge shall be used to taper back to the existing typical section.

### **3.09.06 Design Exception**

The Administration has identified one Design Exception for shoulder width when the shoulder is converted to a part-time travel lane or hard shoulder running; however, the Administration has not applied for any Design Exceptions. The Design-Builder is responsible to meet the design standards listed in TC 3.08 and identify any other Design Exceptions. The Design-Builder is responsible for preparing all the necessary documentation, as outlined in TC 3.05.05, for applying for all design exceptions, including any for shoulder width when the shoulder is converted to a part-time travel lane or hard shoulder running. All design exceptions will be submitted to the Administration. The Administration reserves the right to deny design exceptions or design waivers that, in its judgment, are unsafe, otherwise contrary to normal practice, and/or inconsistent with the project or community goals.

### **3.09.07 Design Vehicle**

The design vehicles shall be in accordance with the Maryland Department of Transportation Policy Manual:

**Interstate** – WB-67 (large semi-trailer, 53 ft. trailer). The design vehicle shall be considered for through movements as well as turning movements at all interchanges along interstates.

**Freeways/Arterials** – WB-62 (large semi-trailer, 53 ft. trailer). The design vehicle shall be used on all State routes (excluding interstates). If there is a state to state (MD and US Routes) intersection/interchange, turning movements should be designed to allow for a WB-62 to make all movements through the intersection/interchange. If truck volumes are high, wheel paths through the intersection should be paved.

**Adjacent Public Roadways** – Use a WB-50 design vehicle for a state route to county roadway (or vice-versa) movement, unless otherwise specified or approved by the Administration.

**Commercial and Residential Access** – Use a WB-40 design vehicle, at a minimum, unless otherwise specified or approved by the Administration. All access should be coordinated with the property owners.

**Static-Dynamic Inside Hard Shoulder Running** – Use a SU-30 design vehicle. All vehicles greater than an SU-30 shall be prohibited from using the Inside Hard Shoulder Running.

**3.09.08 Roadside and Median Barriers**

I-695 has been built in many stages and has had many improvement projects of various types over time. As such, not all of the existing median barrier meets current standards or is in acceptable condition. Though the goals of this project are not intended to solely upgrade or replace the median barrier, any median barrier where a part-time median shoulder use lane is proposed shall be evaluated by the Design-Builder and, if needed, improved by the Design-Builder to ensure a safe and acceptable final condition.

Use of any type of roadside barrier shall be minimized to the extent practicable in favor of a clear zone graded typical section. Where a roadside barrier or median barrier is warranted, traffic barrier protection shall be provided as required per the relevant requirements of the Guidelines and References in TC 3.08.

Use of single face concrete barrier is subject to Administration approval and is generally to be avoided. Flaring of the barrier such that it reduces the width of the roadway including the shoulder is not permitted. All concrete barrier shall include two 3” diameter PVC conduits.

Permanent Sand Filled Barrels will not be allowed for permanent end treatments. Traffic barrier end treatments shall match the finish of the adjacent traffic barrier.

**3.09.09 Access to SWM facilities**

Maintenance vehicle access shall be provided to SWM and other facilities in accordance with TC 3.13 – Landscape and Reforestation Design and TC 3.17– Drainage, Stormwater Management, and Erosion & Sediment Control.

**3.09.10 Construction Stakeout**

Refer to SP – Section 107 – Construction Stakeout for Design-Build Projects.

**3.09.11 Right-Of-Way and Easement Lines**

The Design-Builder shall define right-of-way and easement lines of the Project for adjacent property owners, promptly upon request. The Design-Builder shall reset any disturbed or destroyed property corner(s) adjacent to the project upon request from the owner. The Design-Builder shall provide fencing for any properties which have an existing fence disturbed by construction. The Design-

Builder shall reset the existing fence or provide black vinyl coated chain link fence. The fence shall be reset or replaced on the same day it is taken down. Any existing fence damaged shall be replaced by the Design-Builder in-kind with the new fence of the same material and aesthetics. Removal, relocation, or replacement of an existing fence shall be coordinated with the owner of the fence and adjacent property owners who may be affected by the fence construction. Every effort should be made to accommodate the scheduling needs of the property owners during fence construction, especially those who have animals on the property.

**3.09.12 Property Access**

The Design-Builder shall not create any situation with their improvements that denies lawful access to any adjacent property. If the Design-Builder's improvements affect lawful access to any adjacent property, it shall be the Design-Builder responsibility to provide improvements to ensure undue burden has not been created for property access. The Design-Builder shall consider any special access needs of property owners and tenants, such as property usage and circulation patterns. The Design-Builder shall provide any studies and/or alternatives as required to create solutions to address any undue burden that has been created. These shall be coordinated with the Administration and property owners for concurrence. This shall all be at no additional cost to the Administration.



**TC 3.10 PAVEMENT PERFORMANCE SPECIFICATION**

**3.10.01 General**

The Design-Builder shall design one or more pavement sections. The Design-Builder's pavement sections must be determined by the Administration, at its sole discretion, to be satisfactory for the project conditions. The design and construction of the pavement sections shall be at no additional cost to the Administration.

The Design-Builder shall develop pavement sections for any Roadway element that is needed.

It is the responsibility of the Design-Builder to determine patching quantities in the determination of their Price Proposal and assume all risks associated.

**3.10.01.01 Guidelines and References**

Design and construction of all pavements shall be in accordance with this Pavement Performance Specification and the relevant requirements of the Guidelines and References listed in TC 3.08.

**3.10.02 Use of Pavement Sections Provided by SHA**

Pavement sections are not provided for this contract. All pavements must be designed per 3.10.03.

**3.10.03 Use of Pavement Sections Developed by the Design-Builder**

**3.10.03.01 General**

The Design-Builder shall design one or more pavement sections. The pavement section(s) shall not impair the essential functions, characteristics, or quality of the Project, such as safety, traffic operations, ride, long term durability, desired appearance, maintainability, environmental protection, drainage, and other permitted constraints.

The Design-Builder's pavement sections must be submitted to and determined by the Administration, at its sole discretion, to be satisfactory for the project conditions. It is recommended, but not required, that the pavement sections are submitted to the Administration as an Alternative Technical Concept. Deferring approval until after award will be at the sole risk of the Design-Builder.

Auxiliary lanes shall be designed for mainline traffic, unless otherwise provided in Section 3.10.06. Ramp sections end at the gore, unless otherwise provided in Section 3.10.06. All new shoulders not supporting traffic loads shall use the design traffic per the Pavement & Geotechnical Design Guide section 6.01.02. All existing shoulders that will carry traffic, full-time or part-time, shall be designed and improved as necessary to perform under the given loading and environmental conditions for the specified service life periods for mainline traffic, as determined by the Design-Builder and approved by MDOT SHA. All existing shoulders that will not carry traffic shall receive the same surface as the adjacent lane.

**3.10.03.02 Requirements**

**3.10.03.02.01 Pavement Engineering**

The Design-Builder shall be responsible for all pavement engineering for Roadway Elements for which Section 3.10.03.01 applies. The pavement engineering for the Project shall include, but is not limited to, the pavement investigation, pavement type selection, new pavement design, pavement rehabilitation design, and material selection.

All of the pavement engineering functions shall be directed, supervised, signed and sealed by a Maryland Registered Professional Engineer with a minimum of 5 years of experience in pavement engineering. The Administration reserves the right to request a resume to verify qualifications.

**3.10.03.02.02 Pavement Investigation**

**3.10.03.02.02.01 Preliminary Pavement Investigation**

Any preliminary pavement investigation performed by the Administration is contained in Section 3.10.06. These studies, if performed, were completed in accordance with applicable standards and with reasonable care. The Administration assumes no responsibility with respect to the sufficiency of the studies for design, or their accuracy in representing actual pavement and subsurface conditions or existing thicknesses over the entire Project limits other than at the specific locations identified or sections tested.

**3.10.03.02.02.02 Complete Pavement Investigation**

The Design-Builder shall prepare and perform a complete pavement investigation program to obtain the data needed to fulfill any design requirements of the Project. The Design-Builder is responsible for supplementing the preliminary data with pavement data collected, tested and analyzed as part of the complete pavement investigation program. The pavement investigation shall be done with knowledge about and complimentary to the geotechnical subsurface exploration program. The complete pavement investigation shall be performed per the data requirements of the SHA Pavement Design Guide. The Design-Builder's complete pavement investigation may include, but is not limited to, the following items:

- A) Review and evaluation of as-builts, existing construction and performance records;
- B) Visual survey performed on all existing roadways following Standard ASTM D 6433 - Standard Practice for Roads and Parking Lots Pavement Condition Index Surveys;
- C) Pavement and soil borings;
- D) Mainline and shoulder pavement cores of existing roadway elements;
- E) In-situ sampling and test results;
- F) Laboratory test results of field samples;
- G) Complimentary data and results from the geotechnical subsurface exploration program;

- H) Non-destructive structural deflection testing;
- I) Data analysis of any and all field data collection; and
- J) Pavement patching survey and estimate.

The complete pavement investigation shall be done under the direction and responsibility of the pavement engineer for the Design-Builder.

**3.10.03.02.03 Pavement Type Selection**

The Design-Builder shall provide either a rigid or flexible pavement structure for all new pavement construction according to the criteria set forth in this performance specification. The pavement shall have an initial structural design service life not less than what is specified in Section 3.10.06. The Design-Builder shall maintain a consistent pavement type throughout each Roadway Element.

**3.10.03.02.04 Pavement and Subgrade Materials**

All materials used on the Project shall meet or exceed the requirements established in the documents noted in Section 3.10.01.01 of this Pavement Performance Specification. No structural coefficient or pavement layer moduli improvement or structural benefit shall be considered through the incorporation of geosynthetic materials in the pavement structure. Geosynthetic Stabilized Subgrade may be used to improve the subgrade and is encouraged as a good foundation for construction of the pavement section.

**3.10.03.02.04.01 Drainable Granular Pavement Base Materials**

Capping Borrow and Graded Aggregate Base (GAB) are acceptable materials to be used for a drainable granular pavement base material.

In addition to the above materials, materials meeting the following criteria are acceptable as a drainable granular pavement base material:

- 1) A crushed aggregate with less than 8% passing the No. 200 sieve, a Plasticity Index (PI) of 7 or less, and meeting the aggregate quality requirements for Graded Aggregate Base; and
- 2) Natural soils with less than 20% passing the No. 200 sieve, a PI of 7 or less, and meeting the aggregate quality requirements for Bank Run Gravel - Base.

**3.10.03.02.04.02 Non-Specification Pavement and Subgrade Materials**

The Design-Builder may elect to propose a pavement section that utilizes a pavement material not identified in the current 2019 Standard Specifications for Construction and Materials book. In this case, the Design-Builder shall submit the following items in the form of ATC (prior to Contract award) or as part of their Interim Pavement Report (after Contract award) with a copy to the Office of Materials Technology's Pavement & Geotechnical Division:

- A) Material design specification;
- B) Material strength and engineering properties;

- C) Construction and placement specification;
- D) Material quality control plan specification;
- E) Long-term performance history; and
- F) Where the material will be used, in the subgrade or part of the pavement section.

Justification and an explanation of the structural value coefficients shall be provided for a pavement material not identified in the Standard Specifications for Construction and Materials. Construction of the pavement sections using the subject material shall not occur until the design, material and construction specifications, and material quality control plan have been through the Design-Builder's Design Quality Control Plan.

**3.10.03.02.04.03 Restricted Materials**

The following materials shall not be used on the Project:

- A) Rubber asphalt in asphalt mix materials;
- B) Bottom ash; and
- C) Slag, with the exception of blast furnace slag cement.

**3.10.03.02.04.04 Recycled Materials**

The Design-Builder may use Recycled Concrete Aggregate (RCA) or Recycled Asphalt Pavement (RAP) in conformance with the Recycled Materials Specification (SP 900.03) contained elsewhere in the documents.

Other recycled materials may be submitted for proposed use following the Non-Specification Pavement and Subgrade Materials requirements above with the following additional documentation:

- A) Certification and test data demonstrating compliance with all MDE and EPA requirements for use of recycled materials.
- B) Material Safety Data Sheets from the material supplier.

**3.10.03.02.05 Pavement Analysis and Design**

The Design-Builder shall design pavement sections in accordance with the requirements set forth in TC 3.08. In the SHA Pavement and Geotechnical Design Guide July 2018 edition, refer to chapters with "AASHTO 1993" for pavement design. In the SHA Pavement and Geotechnical Design Guide July 2018 edition, the use of the 2008 AASHTO Mechanistic-Empirical Pavement Design Guide (MEPDG) is not allowed for pavement design.

The Design-Builder may elect to use either flexible or rigid pavement sections, unless otherwise restricted in 3.10.06. The Design-Builder shall maintain a consistent pavement type and pavement section in terms of pavement materials and layer thickness for each Roadway Element throughout the limits of the Project. The pavement section is defined as the aggregation of the individual pavement layers. The pavement type and pavement section shall also be consistent for any given ramp and ramp

shoulders. The Design-Builder shall design and provide a positive drainage system for either pavement type to adequately drain the entire pavement structure.

No flexible/rigid combination pavement (composite) shall be constructed for the Project, except as needed for narrow base-widening (less than 4' wide) or for replacement of curb and gutter that does not involve base-widening. If a rigid pavement is selected by the Design-Builder, the pavement shall be constructed with Jointed Plain Concrete Pavement (JPCP) with load transfer devices or with Continuous Reinforced Concrete Pavement (CRCP). The pavement constructed shall address surface and subsurface drainage giving due consideration to the prevention of water becoming trapped in the granular base/subbase of the pavement.

The pavement section for the widening of any existing roadway element shall be designed to support the mainline traffic for that roadway element. In the case that the existing mainline pavement structure is composite, the pavement type for the widening shall match the existing surface type and be designed to support the mainline traffic for that roadway element.

Any construction on roadways not to be maintained by the State shall be designed and constructed in accordance to the standards and guidelines of the governing local municipality or other entity. The MDSHA Pavement Design Guide provides standard pavement sections that shall be used for driveways and bike paths.

**3.10.03.02.05.01 Traffic**

Refer to Section 3.10.06 for all traffic data to be used for pavement design purposes.

**3.10.03.02.05.02 Pavement Design Criteria - General**

The general design criteria necessary to develop the pavement design for each roadway element shall be in conformance with the criteria in Section 3.10.06. The Design-Builder shall design all pavements utilizing the "Desired Structural Coefficient" and the Drainage Coefficient as specified in the "SHA Pavement Design Guide" in Section 4.07. The Structural Coefficient for Cement Treated Base Course shall be based on the 7-day Unconfined Compressive Strength (psi) per Figure 2.8 of the AASHTO Guide for Pavement Structures 1993.

**3.10.03.02.05.02.01 New Flexible Pavement Design Criteria**

The Design-Builder shall design and construct all flexible pavement sections with Superpave asphalt mix layers developed using the Superpave mix design criteria.

The Design-Builder shall design and construct each flexible pavement layer based on the minimum thicknesses allowed using the layered design analysis approach per Part II, Section 3.1.5 of the "1993 AASHTO Guide for Design of Pavement Structures." For purposes of determining the minimum layer thickness, the following maximum layer moduli shall be used:

- 1) Select Borrow, Capping Borrow, or Modified Select Borrow,  $M_r = 10,500$  psi;
- 2) Cement Modified Subgrade,  $M_r = 10,500$  psi;
- 3) Graded aggregate base,  $M_r = 25,000$  psi;

- 4) Any bound pavement layer,  $M_r = 40,000$  psi;

**3.10.03.02.05.02.02 New Rigid Pavement Design Criteria**

The Design-Builder shall design and construct all rigid pavement sections using JPCP or CRCP. The Design-Builder shall design all rigid JPCP pavements with the following design requirements:

- A) Utilizing a Portland Cement Concrete (PCC) mix with equivalent or better long-term performance than SHA Mix #7 per Section 902;
- B) An unreinforced rigid pavement with load transfer devices (dowels);
- C) A maximum transverse joint spacing of 15 feet;
- D) Dowel bars shall be placed at the transverse joint 12 inches on center;
- E) Longitudinal joint tie bar design based on the other rigid pavement design parameters; and
- F) A single  $\frac{1}{8}$ " wide saw cut one quarter the depth of the PCC layer shall be made to form the location for the transverse joint. No joint reservoir shall be formed, use MD 572.92 as a reference.
- G) A joint spacing slab layout including the location of contraction and expansion joints shall be prepared and submitted to the Administration for review and approval.

The shoulders shall be rigid pavement and be tied to the mainline roadway. No more than three lanes shall be tied together in the longitudinal direction. If the mainline adjacent to the shoulder is paved two feet wider than the lane stripe (essentially putting the longitudinal joint in the shoulder), no tie bars are required.

**3.10.03.02.05.02.03 Pavement Rehabilitation Design Criteria of Existing Roadways**

The Design-Builder shall provide pavement improvements for all existing roadway elements. All pavement improvements must meet all design criteria.

All existing State roadways that are identified by the Design-Builder as roadway widening shall be designed in the same manner as new construction roadways. All existing State roadways that are identified by the Design-Builder for reconstruction may instead be rehabilitated provided that all design criteria are met. All existing State roadways that are identified by the Design-Builder for resurfacing shall be designed with an appropriate rehabilitation strategy in accordance with SHA Pavement Design Guide. The depth and materials of all permanent patches shall match the depth and materials of the existing pavement and in accordance with the SHA Pavement Design Guide. All non-state roadways shall be designed in accordance with the local agency standards or per the SHA Pavement Design Guide if no standards exist.

The Design-Builder shall perform a complete pavement investigation for all existing roadway elements that will be impacted by the proposed improvements within the limits of the Project. The Design-Builder shall provide the rehabilitation strategy and design for all existing pavement sections of roadway identified for resurfacing within the Project.

All proposed patching locations or criteria shall be submitted to the Office of Materials Technology for approval 5 business days prior to beginning patching work. The depth and materials of all permanent patches, including utility patches, shall match the depth and materials of the existing pavement and in accordance with the Book of Standards and the SHA Pavement Design Guide.

**3.10.03.02.05.02.04 Temporary Pavement Sections for Maintenance of Traffic**

The Design-Builder shall provide a roadway pavement section capable of safely and structurally supporting mainline traffic. All temporary roadways shall be free of all medium or high severity distress during their operation. All distress and severity levels shall be as identified in D 6433-Standard Practice for Roads and Parking Lots Pavement Condition Index Surveys. Any distress reaching medium or high severity level shall be repaired with 24 hours.

The Design-Builder shall evaluate the condition of any roadway or shoulder to be used to support maintenance of traffic during construction. This evaluation shall be done within the complete pavement investigation required of the Design-Builder. At a minimum, pavement cores of the existing roadway shall be obtained by the Design-Builder and the structural capacity validated through an appropriate analysis by the Design-Builder's pavement engineer. This shall be done in all cases where any existing roadway or shoulder will be used for maintenance of traffic purposes and is expected to have different traffic patterns than those that existed prior to the notice to proceed for the Project.

The Design-Builder's pavement engineer shall determine if the roadway has adequate structural capacity to support maintenance of traffic and what, if any, construction is required to provide a pavement structure capable of supporting mainline traffic volumes. The results of the pavement investigation along with the maintenance of traffic pavement design and structural improvements shall be provided to the Administration as part of the Design-Builder's design review process prior to moving any traffic on a roadway or shoulder that was not supporting mainline traffic prior to the notice to proceed for the Project.

Existing roadways used for maintenance of traffic, and new pavement constructed for maintenance of traffic that will ultimately be used as permanent shoulders or roadways, shall be restored to a suitable condition and meet the ultimate design requirements at the completion of the work. The Design-Builder shall be responsible for maintaining roadways used for maintenance of traffic.

Design requirements for temporary flexible pavement for Maintenance of Traffic pavements are identified in the SHA Pavement Design Guide. The same minimum and maximum subgrade strength identified in 3.10.06 shall apply for temporary roadways.

**3.10.03.02.05.03 Pavement Structure Drainage and Frost Protection**

The pavement sections shall be of a sufficient depth to protect against pavement heaving due to frost.

The depth of the pavements for frost protection purposes shall be as noted in Section 3.10.06. The frost protection pavement depth includes the surface layer, the granular and bound pavement base layers, and the granular and bound subgrade improvement layers.

The Design-Builder shall design and provide a positive drainage system to adequately drain the entire pavement structure. The pavement drainage system may include longitudinal underdrains, prefabricated edge drains, underdrain outlets, subgrade drains, a free-draining granular layer or combination and variations thereof.

If underdrains are used, space outlets for longitudinal underdrains at intervals as required by the applicable guidelines. If the required spacing for outlets cannot be achieved, the Design-Builder shall submit in writing the location of each spacing issue, their justification for why they are unable to obtain the required spacing and the spacing they can achieve based on the following guidelines:

- For distances exceeding the required spacing but not exceeding 600 feet the Design-Builder shall use 8 inch longitudinal underdrain.
- For distances exceeding 600 feet but not exceeding 900 feet the Design-Builder shall use 10 inch longitudinal underdrain.
- Under no circumstances will outlets be allowed to be spaced greater than 900 feet apart.
- The size of the longitudinal underdrain will be the same for the entire length of longitudinal underdrain between two outlets.
- Underdrain outlets shall be the same size as the longitudinal underdrain it drains.

The Administration will review each location and respond in writing whether or not the Administration agrees that no suitable outlet point exists and approves the outline underdrain spacing detailed for each location. Determination of the suitability of an outlet point and approval of outlet spacing is at the Administration's sole discretion.

All pavement sections shall include, at a minimum, a 4" granular base layer in the pavement section to facilitate pavement drainage, and between the asphalt mix layer and any chemically stabilized base/sub-base/subgrade-stabilization. The use of open-graded granular layers shall require the use of properly designed aggregate or geosynthetic filters. Geotextiles used in subsurface drainage and separation applications shall be designed in conformance with AASHTO M288. The pavement drainage system shall be designed in a manner that will minimize the future maintenance of the system.

#### **3.10.03.02.05.04 Subgrade**

The Top of Subgrade shall be identified by the Design-Builder on the pavement details. Any material placed above the Top of Subgrade shall be considered part of the pavement structure. Any material placed below or other work below Top of Subgrade shall be considered a subgrade improvement.



**3.10.03.02.05.04.01 Design of Subgrade for Pavements**

Borings must extend a minimum of 10 feet below the proposed Top of Subgrade, and the spacing along the roadway alignment shall not exceed 500 feet. The minimum design subgrade resilient modulus ( $M_r$ ) at the Top of Subgrade shall be 4,500 psi. When the native soils are not capable of providing the minimum design strength, a subgrade improvement strategy shall be included in the pavement design to reach the minimum strength requirement at the Top of Subgrade.

The Design-Builder shall specify the design subgrade strength, planned subgrade improvements, and as-needed subgrade improvements in the Interim Pavement Report. The same design subgrade strength value shall be used throughout the entire area of each roadway element. In the case that a subgrade improvement is used throughout a significant portion of a roadway element, it shall be shown in the pavement details.

The Project shall be test rolled in accordance with Section 204.03.01(c) of the Standard Specifications for Construction and Materials. Passing test rolling shall signify that a section of subgrade has reached a stable construction platform and that the minimum subgrade strength of 4500 psi, has been achieved at the Top of Subgrade.

In the case that the Top of Subgrade does not pass test rolling, the Design-Builder shall improve the failed area to a point that it meets or exceeds the minimum required design subgrade modulus specified by the Design-Builder in the Interim Pavement Report. Additional test rolling of the failed area shall be performed after improvement to verify the minimum required design subgrade modulus has been achieved at the Top of Subgrade. FWD testing results and field notes shall be required to confirm the minimum subgrade strength was achieved and shall be included in the FWD Results Report. Falling-Weight-Deflectometer (FWD) testing is only required for design subgrade resilient modulus values greater than 4500 psi.

**3.10.03.02.05.04.02 Acceptable Subgrade Improvement Strategies**

Acceptable subgrade improvement strategies include both mechanical and chemical subgrade improvements and are identified in the Standard Specifications for Construction and Materials. Subgrade improvement techniques not included in the Standard Specifications for Construction and Materials require the following justification documentation for review by the Administration's in the Design-Builder's design review process:

- A) Material design specification;
- B) Material strength and engineering properties;
- C) Construction and placement specification;
- D) Material quality control plan specification;
- E) Long term performance history; and
- F) Material Safety Data Sheets for any recycled material.

Construction of the subgrade improvements using the subject techniques shall not occur until the design, material and construction specifications, and material quality control plan have been reviewed

through the Design-Builder's design quality process and in the Interim Pavement Report. The Design-Builder shall adhere to the approved material and construction specifications.

Subgrade improvement techniques proposed by the Design-Builder shall have a proven history of performance in similar applications. Subgrade improvements shall not utilize materials or construction practices that could endanger the safety of the public or be detrimental to the environment in either the short or long term. Any subgrade improvement technique contained in the SHA Standard Specifications for Construction and Materials is considered acceptable without additional supporting documentation.

### **3.10.03.03 Submittals**

For each Roadway Element that the Design-Builder designs, the Design-Builder is required to submit three reports:

- (1) A Pavement Investigation Plan Report that details the pavement information that will be collected; and
- (2) An Interim Pavement Report that details the information that was collected, and all analysis and designs.
- (3) An FWD Results Report (only if FWD testing is done) that details the FWD testing pattern and results.

Multiple Roadway Elements may be combined for each of these reports.

All submittals shall be subject to review and approval as per TC Section 3.05.18.

#### **3.10.03.03.01 Pavement Investigation Plan Report**

The Design-Builder shall prepare a Pavement Investigation Plan Report for the pavement needs of each Roadway Element. The Pavement Investigation Plan Report shall include the type, details, frequency, and approximate location of testing needed to perform a complete pavement investigation.

The Pavement Investigation Plan Report shall also include a checklist detailing whether each required item was completed. A Report with an incomplete checklist will not be reviewed. If the Design-Builder wishes to exclude any required item from the complete pavement investigation, an explanation of why the testing is not needed must be included.

The review of the Pavement Investigation Plan Report shall be incorporated into the Design-Builder's Design Quality Plan. The review of the report will be completed within the appropriate design stage for each Roadway Element and a copy of the Pavement Investigation Plan Report shall be sent to the Office of Materials Technology's Pavement and Geotechnical Division.

#### **3.10.03.03.02 Interim Pavement Report**

The Design-Builder shall develop and submit an Interim Pavement Report for each Roadway Element of the Project at the Readiness for Construction Review or Interim Review Stage. The Interim

Pavement Report shall come with a full size set of plans of the area covered by the report, a copy of any reports referred to in the pavement report, and contain the Design-Builder's plans for addressing the pavement design sections for the following:

- A) New roadways for mainline, shoulders and ramps;
- B) Pavement rehabilitation treatments;
- C) Widening and reconstruction for existing roadways and other paved areas;
- D) Roadway and pavement base/subbase drainage;
- E) Other pavement related matters on the Project; and
- F) Pavement Material selection.

The Design-Builder shall provide a pavement section for each Roadway Element in the Interim Pavement Report and shall submit it to SHA's Office of Materials Technology for review and comment. The Administration will use AASHTO's DARWin Pavement Design Software to evaluate the pavements designs submitted. A Pavement Engineer for the Design-Builder, who is a registered P.E., shall supervise all work and seal the Interim Pavement Report.

The Design-Builder shall obtain all information necessary to properly complete the Interim Pavement Report. The Interim Pavement Report shall include the design inputs and calculations used to develop the pavement sections.

The results of all soil borings and pavement cores, both the Administration's and the Design-Builder's, shall be shown on the roadway plan sheets. Boring log information shall be shown on the roadway profile sheets. Laboratory and in-situ test data may be shown on separate plan sheets. The recommendations contained in the Interim Pavement Report shall be incorporated into the plans and specifications developed for the Project.

The Interim Pavement Report shall contain pavement design items deemed important by the Design-Builder. The Interim Pavement Report shall contain, but is not limited to the following items:

- 1) Testing results from the Complete Pavement Investigation:
  - a) Summary of records review of as-builts, existing construction and performance records;
  - b) Pavement condition index (PCI) and distress summaries on all existing roadways following D 6433;
  - c) Location and result of pavement and soil borings;
  - d) Location and result of mainline and shoulder pavement cores of existing roadways;
  - e) In-situ test results;
  - f) Laboratory test results of field samples;
  - g) Location and result of non-destructive structural deflection testing;
  - h) Findings and summary of data analysis of any and all field data collection; and
  - i) Estimate of pavement patching needs.
  
- 2) Summary of critical design values and elements from the Complete Pavement Investigation:

- a) Records review analysis of each existing and new pavement section;
  - b) Analysis and pavement design of all roadways;
  - c) All design input requirements for AASHTO and SHA Pavement Design criteria;
  - d) Traffic data, analysis and calculation of the equivalent single axle load (ESAL) for each roadway element;
  - e) Structural capacity values (required, effective and original) for each roadway element;
  - f) Structural pavement layer calculations used to develop pavement sections needed for the required structural capacity; and
  - g) Design subgrade resilient modulus ( $M_r$ ) or modulus of subgrade reaction ( $k$ ).
- 3) Subgrade improvement - treatments and stabilization strategies;
  - 4) FWD testing program guidelines and testing qualifications if effective design subgrade strength values are greater than the minimum values required;
  - 5) Temporary pavement details and design/construction approaches to meeting performance requirements during maintenance of traffic operations;
  - 6) Specific material selections for each pavement layer within the pavement section for each roadway element;
  - 7) Rehabilitation techniques used for existing roadways:
    - a) Selection criteria used in determining of pre-overlay treatments (patching and grinding needs) and the estimated quantity;
    - b) Reasoning for selection of rehabilitation technique with respect to the pavement performance criteria;
    - c) Structural improvement strategy for existing roadway;
    - d) Functional improvement strategy for existing roadway;
    - e) Existing roadway conditions; and
    - f) Existing Design subgrade Resilient Modulus ( $M_r$ ).
  - 8) Specifications for all materials to be used in the pavement section for each roadway element;
  - 9) Pavement drainage design and construction strategies;
  - 10) Use of unique or innovative construction techniques, i.e. automated dowel bar insertion, intelligent compaction, etc;
  - 11) Pavement details; and
  - 12) Full-size set of plans with pavement section typicals and pavement details included.

The Interim Pavement Plan Report shall also include a checklist detailing whether each required item was completed. A Report with an incomplete checklist will not be reviewed. If the Design-Builder

wishes to exclude any required item from the Interim Pavement Report, an explanation of why the item is not needed must be included.

### **3.10.04 Pavement Construction**

Construction of all pavement materials shall be in accordance with the Standard Specifications for Construction and Materials unless modified in this Pavement Performance Specification or in the specifications developed by the Design-Builder.

#### **3.10.04.01 Construction of Pavement Subgrades**

The Design-Builder shall be responsible for construction of a suitable and stable subgrade on which to place the pavement section. The Top of Subgrade shall be test rolled prior to placing the base course in the Pavement Section(s). Any movement in the Top of Subgrade during test rolling shall be an indication of unstable subgrade or the presence of unsuitable material. Unstable or unsuitable areas shall be treated as recommended in the Final Geotechnical Report. After treatment, the area shall again be test rolled. Any area still showing movement shall receive additional corrective treatment.

In the presence of surface water and/or within 3 feet below the proposed subgrade, the Design-Builder shall engineer the subgrade (e.g. Drainage Blanket, Subgrade drain) to handle the water and moisture conditions. In case of pumping of subgrade the Design Builder shall stabilize the subgrade prior to placement of sub base or base material.

FWD testing is required for cases where the design subgrade modulus is greater than 4500 psi, and shall occur after the Design-Builder has properly constructed and compacted the Top of Subgrade. The Design-Builder shall provide testing program guidelines and vendor qualifications for FWD testing in the Interim Pavement Report. The FWD testing program for subgrade resilient modulus shall adhere to the following test parameters and requirements:

- A) ASTM D 4694 shall be followed in the data collection with the FWD.
- B) No data collection shall occur on a frozen subgrade and ambient air temperature shall be greater than 40 degrees F.
- C) The Design-Builder shall use a FWD testing vendor that can demonstrate at least 3 years worth of experience in FWD testing and analysis and submit that information with the Interim Pavement Report;
- D) Load plate radius = 9 inches;
- E) Minimum load applied = 4,000 pounds, maximum load = 9,000 pounds; and
- F) All FWD data shall be collected and stored electronically and submitted as a package with the data analysis to verify subgrade resilient modulus strengths.

FWD set-up, load packages, spacing, and analysis shall be as specified in the following table:

ITEM	REQUIREMENTS	COMMENTS
Sensor Spacing	0", 12", 18", 24", 36", 48", 60"	Additional sensors are acceptable
Load Package	AA1B2	A = Seating Drop of 6,000 lbs. B = Seating Drop of 9,000 lbs. 1 = Recorded Drop of 6,000 lbs. 2 = Recorded Drop of 9,000 lbs.
Test Pattern	One per every 100 yd <sup>2</sup> of prepared subgrade in the mainline and shoulder, minimum of 5 tests.	
Analysis	$M_r = \frac{1.5pa}{\Delta_z}$	p = applied load (psi) a = radius of load plate (in) $\Delta_z$ = measured deflection (in)

The average subgrade strength as tested by the FWD must meet or exceed the design subgrade strength, no more than 20% of the test points may be below the design subgrade strength, and no individual point may be less than 80% of the design subgrade strength. The prepared subgrade shall be improved as appropriate to ensure that the design subgrade strength requirements are met. The limit of improvement may be modified through more frequent and additional FWD testing in the travel lane or shoulder in question.

The Design-Builder shall submit the results of all subgrade improvement testing including Falling Weight Deflectometer test results to the Administration's Pavement and Geotechnical Division within 72 hours of completion of the testing.

**3.10.04.02 Removal of Pavement Markings**

The Administration will allow the Design-Builder to eradicate all existing pavement markings that conflict with the Design-Builder's MOT markings per Section 565. For areas where existing pavement markings have been eradicated, the Design-Builder shall overlay the entire pavement surface, from shoulder edge to shoulder edge, and reinstall permanent pavement markings. If grinding, the depth shall be sufficient to remove the entire thickness of the existing surface layer of the pavement. The Design-Builder shall not install temporary pavement markings other than temporary marking tape on final roadway surfaces.

**3.10.04.03 Repair of Damaged Pavement**

The Design-Builder shall perform pavement repairs of all distressed areas related to the operations of the Project. Distressed areas shall be defined as any medium and high severity distress in existing pavement and any low, medium or high severity level for new construction or reconstruction pavement section. All distress and severity levels shall be as identified in D 6433-Standard Practice for Roads and Parking Lots Pavement Condition Index Surveys. Any damage to the pavement in the Project or adjacent pavements caused by operations of the Design-Builder shall be repaired to the satisfaction of the Administration at the Design-Builder's expense. The depth and materials of all permanent patches shall match the depth and materials of the existing pavement and in accordance with the Book of Standards and the SHA Pavement Design Guide.

In addition, the Design-Builder shall perform patching and other necessary repairs to maintain traffic during all construction operations at no additional expense to the Administration.

### **3.10.05 Performance Criteria**

The parameters that will be used to evaluate performance of all constructed pavements are:

- A) Structural capacity;
- B) Skid resistance;
- C) Visual Appearance; and
- D) Ride quality.

These parameters will be evaluated by the Design-Builder in coordination with the Administration, during construction and at Final Administration Acceptance. If corrective action needs to be taken, the Design-Builder shall coordinate all such activities to minimize disruption to the traffic at no additional cost to Administration.

#### **3.10.05.01 Structural Capacity**

The structural capacity (thickness and strength) of 100% of all pavement sections shall be evaluated during the design and construction phase through the Design-Builder's Quality Plan. The parameters that will be evaluated include thickness, strength, and quality of materials. The thickness, strength, quality, and proper placement of materials shall be evaluated to ensure compliance with the Design-Builder's Design Quality Control Plan. Final Acceptance will require meeting or exceeding the design criteria as well as meeting proper construction requirements. The Design-Builder shall provide documented field evidence and/or data that confirms the design thickness for each pavement layer, and tack/bond between each layer was achieved after final construction. If the structural capacity is determined to be deficient by the Design-Builder or the Administration, the Design-Builder shall take corrective action at no expense to the Administration.

#### **3.10.05.02 Skid Resistance**

The Design-Builder shall construct a pavement surface that shall meet or exceed an average friction number of 45 for each travel lane to provide adequate skid resistance for each roadway element. The friction number of the roadway shall be collected and determined in accordance with "Standard Test Method for Skid Resistance of Paved Surfaces Using a Full-Scale Tire" (E 274) and "Specification for Standard Rib Tire for Pavement Skid-Resistance Tests" (E 501). The Design-Builder shall be responsible for the friction number data collection. The Design-Builder may elect to request the Administration to collect friction data. If the Design-Builder disputes the friction number collected by the Administration, the Design-Builder must collect the data through other means in accordance with this specification for justification of friction number dispute.

A friction number data test point shall be collected every two-tenths of a lane-mile for each travel lane, at a minimum testing frequency. The average of all test points collected for each roadway element shall meet or exceed a friction number of 45 with no single data point falling below 35. Roadway elements with pavements exhibiting values less than an average friction number of 45 or a

single data point less than 35 shall require corrective action from the Design-Builder to provide average friction number values that exceeds 45 and is projected to provide that value for at least 5 years into the future. Data collection 5 years into the future shall not be required. The Design-Builder shall provide justification and evidence that the corrective action will provide the friction number of 45 for 5 years into the future. A flexible pavement constructed with a surface layer meeting the requirements of this specification with an approved high polish value aggregate source shall be considered as satisfying the skid resistance performance criteria.

**3.10.05.03 Visual Appearance**

The Design-Builder shall provide a pavement for each roadway element that is visually appealing and free of distress. The pavement surface shall have a consistent color and texture. Milling is not permitted as a final surface. The Design-Builder shall minimize the number of construction joints. The construction joints that do exist shall be visibly straight and performing as intended. The Design-Builder shall be required to provide a pavement surface that is free of any severity distress. All distress and severity levels shall be as identified in D 6433-Standard Practice for Roads and Parking Lots Pavement Condition Index Surveys. A visual survey shall be done on a representative sample of the pavement per D 6433. The Design-Builder shall take corrective action to ensure the visual appearance is in accordance with this specification.

**3.10.05.04 Ride Quality**

Ride quality shall be evaluated in all travel lanes for each roadway element based on the SP 535 Pavement Surface Profile specification provided in the contract documents.



**3.10.06 Project-Specific Data and Criteria**

**3.10.06.01 General**

This section includes geotechnical and pavement data, and criteria for design. This section shall control any conflicts between TC 3.10.03 and this section.

**3.10.06.02 Scope of Work**

The scope of work will be determined by the Design-Builder.

**3.10.06.03 Roadway Elements**

Roadway Elements are not identified by the Administration for this contract. However, the Design-Builder shall identify all Roadway Elements. Each Element shall be explicitly defined (e.g. what is a permanent shoulder, what is a part-time use shoulder lane, what is a ramp, what is an auxiliary lane, etc.), and may be delineated by changes in the required pavement section due to changes in traffic loading or other design features that impact the pavement design.

**3.10.06.04 Pavement Sections**

Pavement sections are not provided for this contract. All pavements must be designed per TC 3.10.

**3.10.06.05 Traffic Data**

The Design-Builder shall provide the following traffic data inputs for approval by the Travel Forecasting and Analysis Division for the pavement design of each Roadway Element identified in 3.10.06.03:

- Average Daily Traffic
- Percent Trucks
- Growth Rate
- Directional Distribution
- Lane Distribution

Approved traffic data along with the below traffic information shall be used to determine the Equivalent Single Axle Loads (ESALs) for each element.

<b>Criteria</b>	<b>Value</b>
Percent Trucks – Inside Shoulder	0% (No trucks allowed on inside shoulder)
Truck Factor – Inside Shoulder	0.008 (Cars only)
Truck Factor – Travel lanes and Outside Shoulder – West of I-83	1.14
Truck Factor – Travel lanes and Outside Shoulder – East of I-83	0.95

Note: This traffic data shall only be used for pavement design purposes and shall not be used for any other traffic needs in the Project.

**3.10.06.06 Pavement Design Criteria**

The Design-Builder shall use the following requirements as the general pavement design criteria for each pavement design Element identified in 3.10.06.03:

<b>Pavement Type</b>	<b>Flexible</b>	<b>Rigid</b>	<b>Composite</b>
New Construction Design Life	25 years	25 years	NA
Rehabilitation / Hard Shoulder Running Design Life	15 years	15 years	15 years
Initial Serviceability	4.2	4.5	4.2
Terminal Serviceability	3.0	3.0	3.0
Reliability – New Construction	90%	90%	90%
Reliability – Rehabilitation / Hard Running Shoulder	50%	50%	50%
Overall Standard Deviation	0.49	0.39	0.49
Load Transfer Coefficient	N/A	3.2	N/A
PCC Modulus of Rupture	N/A	685 psi	N/A
PCC Elastic Modulus	N/A	4,371,000 psi	N/A
Overall Drainage Coefficient	1.0	1.0	1.0
Minimum Modulus of Subgrade Reaction (static) *	N/A	230 psi/in	230 psi/in
Minimum Resilient Modulus of Subgrade *	4,500 psi	N/A	N/A
Maximum Modulus of Subgrade Reaction (static) *	N/A	550 psi/in	550 psi/in
Maximum Resilient Modulus of Subgrade *	10,500 psi	N/A	N/A

\* The Design-Builder has the option of designing with a higher design subgrade modulus than the minimum requirement and less than the maximum requirement, providing field verification is submitted by the Design-Builder as per Sections 3.10.03.02.05.04.01, 3.10.03.02.05.04.02 and 3.10.04.01 of the Pavement Performance Specification and is approved by the Office of Materials

Technology.

**3.10.06.07 Minimum Pavement Thickness for Frost Depth**

1 All new and reconstructed pavement sections shall be of a sufficient depth to protect against pavement heaving due to frost. The thickness of the pavements for frost protection purposes shall be a minimum of 14 inches. The frost protection pavement depth includes the asphalt mix surface or Portland cement concrete layer, the granular and bound pavement base layers, and the granular and bound subgrade improvement layers. The minimum thickness requirement may be waived if preventive methods identified in 7.04.03 of the Pavement & Geotechnical Design Guide are used.

**3.10.06.08 Pavement Rehabilitation Design Criteria**

Asphalt mixes to be used as a surface on Interstate Roads and their associated ramps shall be gap-graded.

**3.10.06.09 Preliminary Investigation Data**

The following preliminary investigation was performed:

**3.10.06.09.01 Ground Penetrometer Radar (GPR)**

A GPR data survey was performed at the below locations to estimate the asphalt thickness at a 25-foot interval. The asphalt thicknesses and the shoulder locations were incorporated in a kmz file and are part of the additional information available in ProjectWise.

- Inner shoulder – Inner loop
- Outside shoulder – Inner loop
- Inner shoulder- Outer loop
- Outside shoulder – Outer loop

**3.10.06.09.02 Pavement Cores**

Twenty (20) pavement cores were drilled on the shoulder for calibration of the GPR data. The Summary pavement core log is part of the additional information available in ProjectWise.

**3.10.06.09.03 Falling Weight Deflectometer (FWD)**

FWD data were collected in the below areas. Raw FWD files are part of the additional information available in ProjectWise.

- Inner shoulder – Inner loop
- Outside shoulder – Inner loop
- Inner shoulder- Outer loop
- Outside shoulder – Outer loop

**TC 3.11 Structural Design Performance Specification****3.11.01 General**

Design and construct all structures in accordance with requirements of this specification and the structure description in this Special Provision, including performance requirements, standards and references, design and construction criteria, maintenance during construction, and required submittals. The minimum design life for all permanent structures shall be 75 years.

All structural engineering functions shall be directed, supervised, reviewed, signed, and sealed by a Maryland Registered Professional Engineer with a minimum of 10 years of experience in structural engineering.

The requirements in this specification apply to the design and construction of all temporary and permanent structures, including but not limited to bridges, box culverts, pipe culverts, retaining walls, noise barriers, and drainage structures.

**3.11.02 Guidelines and References**

Guidelines and References for the design of the structures within this Contract are listed in TC 3.08. Copies of the Office of Structures Guidelines and Procedures Memorandums (GPMs) required for this Contract can be found on the Administration website. The design and construction of all temporary and permanent structures, including but not limited to bridges, box culverts, pipe culverts, retaining walls, noise barriers, and drainage structures shall conform to the requirements set forth in these documents.

In addition to the specific engineering design and maintenance criteria that have been established by each railroad and transit agency, state and federal laws govern and regulate various aspects of railroad engineering. Additionally, the railroad industry contributes to and maintains a set of recommended engineering practices and plans for standardized track and signal components under the auspices of the American Railway Engineering and Maintenance of Way Association (AREMA) which, in the absence of more stringent criteria set forth by a specific railroad, are the industry standard to be followed. Applicable standards and references are listed in TC 3.08.

Any portion of the project adjacent to MTA right-of-way associated with Light Rail Transit shall be coordinated with MTA. Contact MTA at the beginning of the project to coordinate construction restriction.

**3.11.03 Structural Hydrology and Hydraulics Requirements**

The Design-Builder shall study, analyze, design, obtain permits and approvals for structures over waterways and perform any in stream construction in accordance with requirements of this specification, including performance requirements, standards and references, design and construction criteria, maintenance during construction, and required submittals.

**3.11.03.01 Scour Design Requirements**

- A. Scour analysis shall be performed using the latest available MDOT SHA ABSCOUR program and the guidance in Chapter 11 of the Office of Structures Hydrologic and Hydraulic Design Manual.
- B. Scour analysis shall be based upon the 100-year flood (design flood). If the 100-yr flood overtops the road the Design-Builder will also analyze the incipient overtopping storm and choose the one which produces greater scour depths. Otherwise, the foundations of bottomless structures shall be designed for the design flood and checked for lateral stability under the 500-year flood as per Chapter 11 of the Office of Structures Hydrologic and Hydraulic Design Manual.
- C. Channel lateral migration distances and vertical degradation amounts as determined through the Stream Morphology study reports to be developed by the Design-Builder shall be used in conjunction with computed scour depths to determine total scour depths.
- D. Scour analysis shall be performed for all bottomless structures over waterways.
- E. Scour analysis shall not take into account scour countermeasures for the purposes of calculating scour depths.
- F. Scour countermeasures shall be designed to protect substructure elements. Piers and abutments shall be structurally designed based on the estimated scour depths for the 100-year flood and checked for lateral stability under the 500-year flood.
- G. All scour analyses shall be documented in accordance with the Office of Structures Hydrologic and Hydraulic Design Manual and shall be submitted to the Office of Structures structure hydrology and hydraulics division for review and approval.

**3.11.03.02 MDE Hydraulics**



Major drainage structures shall be located and designed in accordance with the Office of Structures Hydrologic and Hydraulic Design Manual and MDE regulations (COMAR 26.17.04 “Construction on Nontidal Waters and Floodplains”). If the Design-Builder proposes a new structure or modification of a structure in a regulated resource or cause impact to a regulated resource, the Design-Builder is alerted to the fact that MDE and USACE may require fish, aquatic organism and other animal passage to be included. Any coordination with MDE and USACE shall go through MDOT SHA. The Design-Builder shall be responsible for any requirements established by MDE and USACE for the Design-Builder’s Improvements. Any time and efforts for approval and as a result of work to meet the requirements of MDE and USACE, including any mitigation measures, shall not result in additional costs to the Administration nor be the basis of a claim or time extensions against the Administration

**3.11.03.03 Stream Morphology**

Lateral migration distances and vertical degradation amount shall be used in conjunction with the scour analysis for foundation design.

**3.11.03.04 FEMA Hydraulics and CLOMR Requirements**

FEMA Floodplain Map Change Requirements: If the Design-Builder's proposed design will impact the FEMA-regulated 1-percent annual chance floodplain limits and water surface elevations, the Design-Builder shall be responsible for obtaining a FEMA Floodplain Conditional Letter of Map Revision (CLOMR). Design-Builder shall receive approval on the CLOMR from Baltimore County and then FEMA. The Design-Builder shall be responsible for obtaining the Letter of Map Revision (LOMR). The Design-Builder shall coordinate with MDOT SHA throughout the duration of submitting and securing and meeting all subsequent requirements of the required FEMA acceptance. The Design-Builder shall provide MDOT SHA with copies of the CLOMR and LOMR submissions, approval and all related documents.

**3.11.03.05 In-Stream Structure Design**



If the Design-Builder propose a new In-Stream structure or modification of an In-Stream structure in a regulated resource or cause impact to a regulated resource, the Design-Builder is alerted to the fact that MDE and USACE may require the design of the in-stream structures to stabilize the channel bed or bank within the character of the proposed design strategy.

Materials for any Design-Build proposed structures must be designed to resist the range of forces and velocities in the channel in proximity to the structure(s) at discharges up to the 100 year storm event. Design computations must be provided to the Administration indicating the resistance and/or design life of any stone, wood, or other materials integral to the structural stability of all in-stream structures, prior to final approval of the design plans. A design narrative and the computations described above must be included in the Stream Stability Assessment and Design Report. Details and specifications depicting the materials, methods, and means of construction must be provided to the Administration in each plan submittal.

**3.11.03.06 Deliverables**

A. Design Report.

The Design-Builder must provide plans and a Design Report. At a minimum, the design report must include all the elements described in TC 3.11.03.03.11. The Design-Builder is responsible for rectifying any deficiencies perceived by the regulatory agencies prior to issuance of the required permit.

Design plans and specifications must include details to describe the structure in layout, materials, methods and means. The specifications must be in the format of the MDOT SHA Specification Guide dated 5/23/2013.

B. Requirements for Design-Builder Hydrologic and Hydraulic Analysis Reports. Design-Builder will perform all hydraulics studies needed to secure MDE permit and approvals for the proposed work. At a minimum, the studies shall include the following items:

1. A geomorphic study of the reach through the project limits as discussed above. The geomorphic study must be performed by an engineer with a Maryland Professional Engineering License and at least 10 years of experience with geomorphology assessments.
2. Hydraulic Analysis Study and Report for the existing and proposed conditions, as well as the surveys and mapping needed to complete the hydraulic studies.
3. Hydrologic Analysis Report for the existing and ultimate development land use conditions.

The Hydrologic and/or Hydraulics Analysis Reports shall contain the completed text, exhibits, summary tables, computer input and output data, and other technical information. The reports will include a digital full copy of the report as well as the appropriate computer models used for the analyses. The format and content of report shall be prepared in conformance with the instructions in the Office of Structures Hydrologic and Hydraulic Design Manual. The Design-Builder shall include the impacts the proposed project would have on the hydraulic characteristics such as water surface elevations, flow velocities, Froude numbers and shear stress in the channel in the report.

All Design-Builder study reports shall be self-contained documents to the extent practicable. When necessary, reference may be made to outside sources of information used by the Design-Builder in their preparation of data or exhibits for the reports. All references shall be clearly stated, listed and described as related to the Hydraulics Analysis Report. All the pages within the report shall be numbered, dated and shall be placed in an 8 ½-inch by 11-inch, three-hole binder.

Upon completion of the Hydrologic and/or Hydraulics Analysis Reports, the Design-Builder shall submit the report to MDOT SHA's Bridge Hydraulics Division for review and concurrence prior to submittal to MDE. After MDOT SHA approval, the Design-Builder shall submit the Hydraulics Analysis Report to MDE for review and approval and copy MDOT SHA. Upon approval from MDE, the Design-Builder shall provide two copies of the final, approved report, files on CD/DVD, and the notification of the MDE approval to the Office of Structures Bridge Hydraulics Division.

### **3.11.03.07 Structure Hydrology and Hydraulics Construction Requirements**

In-stream construction shall adhere to the requirements in the Nontidal Wetlands & Waterways Permit and Section 404 Individual Permit.

### **3.11.04 General Structure Design Requirements**

Design calculations shall be performed in Customary U.S. units. Only Customary U.S. units shall appear on the plans.

#### **3.11.04.01 Design Methodology**

The following references are for AASHTO Load and Resistance Factor Design (LRFD) Bridge Design Specifications.

A. Concrete.

All reinforced concrete members shall be designed in conformance with AASHTO LRFD specifications, including all applicable provisions for service, fatigue, strength and extreme event limit states.

B. Prestressed Concrete.

All prestressed concrete members shall be designed in conformance with AASHTO LRFD specifications, including all applicable provisions for service, fatigue, strength and extreme event limit states.

C. Structural Steel

All structural steel members shall be designed in conformance with AASHTO LRFD specifications, including all applicable provisions for service, fatigue, strength and extreme event limit states.

D. Composite Members.

Composite members shall be designed to include effects resulting from differential creep and shrinkage of the concrete deck.

E. Load Ratings.

All vehicular bridges, culverts, and pipes shall be rated using the load factor and resistance factor rating (LRF) method of analysis using the latest edition of the AASHTO "Manual for Bridge Evaluation" and performed in accordance with PPM D-97-47(4). The load ratings shall be recorded on the Load Rating Standard Summary Sheet and shall be submitted to the Office of Structures. The HL-93 inventory rating factor for all new structure construction shall be greater than 1.

#### **3.11.04.02 Loads and Forces**

All loads and forces applied to structures shall be in accordance with AASHTO Load and Resistance Factor Design (LRFD) Bridge Design Specifications except as modified below.

A. Dead Loads (DL)



1. Unit weights of materials shall conform to AASHTO specifications which includes the weight of embedded reinforcement.
  2. All bridges shall be designed to accommodate a loading of 25 psf for a future 2 inch wearing surface. A loading of 15 psf for forms which remain in place shall be included in the design.
- B. Highway Loads (LL)
1. Live loading, designated HL-93 shall be in accordance with AASHTO.
  2. Retaining walls including wing walls and headwalls shall be designed to accommodate the horizontal surcharge and traffic impact loads caused by live load per AASHTO criteria. Along median retaining walls, live load surcharge shall be applied to only the high side.
- C. Thermal Forces
1. Moderate Temperature Climate Changes shall be used per AASHTO criteria.
  2. Normal Temperature shall be 60 degrees Fahrenheit.
- D. Seismic Forces.
1. Structures are located within seismic zone 1.
- E. Miscellaneous Lateral Forces.
- Wind loads, longitudinal traction forces, stream flow forces, etc. shall be in accordance with AASHTO LRFD Specifications.
- F. Construction Loads.
- Where the Design-Builder, during construction, anticipates passing truck traffic in excess of the design load over structures designed and constructed under this Project, the structure shall be designed with the higher truck load. The Inventory and Operating Rating Factors shall be greater than 1.0 for the higher truck load. The Design-Builder shall receive written concurrence from the Administration's Office of Structures before developing a design using a live load in excess of that specified above.

### **3.11.04.03 Materials**

A. Foundations

1. Piling

- a. Steel H piles shall conform to conform to A 36, Grade 36 or A 709, Grade 50 Steel.
- b. Steel pipe piles and steel mini/pin piles shall conform to A252, Grade 3 steel (Fy = 45,000 psi.).

- c. Concrete for steel pipe piles shall conform to Mix No. 3 with a slump range of 4-6 inches in accordance with Section 902.10 of the Administration's Standard Specifications for Construction and Materials.
  - d. Reinforcement for steel pipe piles shall conform to Section 908.01 of the Administration's Standard Specifications for Construction and Materials.
2. Drilled shaft materials shall conform to Section 412 of the Administration's Standard Specifications for Construction and Materials.
- B. Structural Steel.
1. Structural Steel shall conform to A 709, Grade 50 or 50W and 909.01. All structural steel, weathering or non-weathering, shall be fully painted, 100 percent, as indicated in the special provisions.
  2. Fracture critical member structures are prohibited.
  3. All bridges utilizing steel beams or girders shall be designed without the use of cover plates.
  4. The use of longitudinal and transverse stiffeners is prohibited except for required bearing stiffeners.
  5. Minimum sizes for steel members and welds shall conform to the Administration's Guidelines and Procedures Memorandum D-18-52(4).
  6. Electro-slag welding is prohibited in main structural tension members.
  7. All bolts shall conform to A 325.
  8. All bolted connections shall be designed as Class A slip critical connections.
  9. Steel sheet piling shall conform to A328.
- C. Concrete.
1. Mix No. 6 (4500 psi – Design for 4000 psi) normal weight concrete shall be used at the following locations:
    - a. Bridge Deck Slabs
    - b. Entire portion of abutment back walls and expansion joint cross beams.
    - c. Top Slab of Culverts with a minimum depth of fill 18 inches or less.
    - d. Precast portions of box culverts.
    - e. Precast headwalls for pipe culverts.
    - f. Parapet Portion of Wing Walls, Retaining Wall Parapets and Copings, and Culvert Headwalls.

- g. Copings for MSE retaining walls.
  - h. Precast Noise Barrier elements.
  - i. All concrete for bridge deck slabs and parapets shall have synthetic fibers added to the concrete per section 902.06.06. All concrete for abutment backwalls, parapet at abutment wing walls, and entire superstructures shall have synthetic fibers added to the concrete per section 902.15.
2. Mix No. 3 (3500 psi – Design for 3000 psi) normal weight concrete shall be used at the following locations:
    - a. All footings and bridge substructure units except Abutment Backwalls.
    - b. Retaining Walls.
    - c. Top Slab of Culverts with a minimum depth of fill greater than 18 inches and all cast-in-place box culvert walls, bottom slabs, cutoff walls, headwalls, and wing walls.
  3. Subfoundation concrete shall be normal weight Mix No. 4 (Minimum 3500 psi) concrete.
  4. The use of prestressed concrete substructures is prohibited.
  5. All precast elements shall be fabricated with the use of self-consolidating concrete.
  6. Mix No. 8 (Minimum 4000 psi) normal weight concrete shall be used for the overlay placed on bridges constructed with precast slab elements. The mix no. 8 overlay concrete shall have synthetic fibers added to the concrete per section 902.06.06.
  7. The use of lightweight concrete for structures is prohibited.
- D. Reinforcement Steel
1. Reinforcement steel bars shall conform to 908.01.
  2. Welded Wire Fabric (WWF) reinforcing shall conform to 908.05.
  3. Epoxy coated reinforcement steel bars shall conform to 917.02 and shall be used at the following locations:
    - a. Deck Slabs
    - b. Deck overlay for precast concrete slab bridges
    - c. Barriers and Parapets
    - d. Bearing Seat Pads
    - e. All Concrete Superstructure/Roadway Elements
    - f. Non-prestressing steel contained in concrete beams

- g. Abutment Back Walls
  - h. Abutment Bearing Seat Areas
  - i. Parapet Portion of Wing Walls including Retaining Walls and Culvert Headwalls.
  - j. Portions of Retaining Walls and Noise Barriers located within 10 ft of the outside edge of shoulder measured vertically and/or horizontally.
  - k. Top mat of the top slab, including truss bars and any reinforcement extending into the top of the top slab, for box culverts with less than 18” of cover.
  - l. Top portions for precast pipe headwalls.
4. Unless noted otherwise minimum clear cover to reinforcement steel shall be as follows:

<b>Location</b>	<b>Clear Cover</b>
Top of Bridge Deck Slabs	2-1/2 in.
Bottom of Bridge Deck Slabs	1 in.
Top of Box Culvert Slabs Built to Grade	2-1/2 in.
Box Culvert Slab Not Built to Grade	2 in.
Toe Wall – Top, Bottom and Sides	3 in.
Culvert Bottom Slab – Bottom	3 in.
Footings – Bottom and Sides	3 in.
Precast Concrete Elements	2 in.
Bottom of precast slabs, beams, girders	3 in.
All Other Locations – Main Reinforcement	2 in.
All Other Locations – Stirrups	2 in.

- 5. Welding of reinforcement steel is prohibited.
- 6. Box culverts shall be designed to allow the reinforcing steel in the top mat to be laid out parallel to the headwalls or perpendicular with the culvert sidewalls when using a headwall edge beam. A fanned reinforcing layout will also be permitted provided the minimum clearance between all reinforcing is 3”.
- 7. Mechanical rebar couplers may be used.
- 8. Substructure units shall be designed so that the largest reinforcement steel bar utilized will be No. 11 bars.

**E. Pipe Culverts**

1. All new pipe culverts shall be constructed with the use of gasketed reinforced concrete pipe.
2. Existing culverts requiring replacement shall utilize gasketed reinforced concrete pipe regardless of the material used for the existing pipe.
3. Existing pipes requiring extension shall be extended with the use of a material that matches the original construction. The exception is corrugated steel or metal pipe. In this case, the pipe shall be replaced with a RCP that matches the existing diameter. The interface between the pipe/culvert extension and the existing pipe/culvert shall be watertight. Closure pour with the use of a water stop is preferred if possible. Other methods to ensure the joint is watertight may be submitted for approval.
4. Any new pipe extension that will interface with a pipe with grout repairs along the invert shall be properly detailed to ensure a smooth transition from new to old or old to new. Details shall be submitted for approval.
5. The use of corrugated steel or metal pipes, including structural plate pipe, is strictly prohibited.

**3.11.04.04 Foundations and Construction**

The Design-Build Team shall prepare a Foundation Plan and Report for each new or replacement structure, including box culverts, retaining walls, pipe culverts, and bridges, in conformance with the Administration's Guidelines and Procedures Memorandum D-79-17(4) and the following requirements.

**3.11.04.04.01 Foundation Boring Requirements**

The Design-Build Team shall obtain borings in accordance with the Administration's Standards for Subsurface Exploration. All borings shall extend at least 10 ft below the proposed pile tip elevations. The location of borings shall be selected by the Design-Build Team in conformance with the Administration's Guidelines and Procedures Memorandum D-79-17(4). For bridges, at least two borings are required for each substructure unit. Foundation borings, rock cores, laboratory testing, etc. shall be in conformance with appropriate Administration, AASHTO and ASTM policies and specifications.

**3.11.04.04.02 Foundation Design Requirements**

Structures foundations shall be designed in accordance with AASHTO Load and Resistance Factor Design (LRFD) Bridge Design Specifications and as required below.

**A. Spread Footings.**

The bottom of a spread footing, including leveling pads for a proprietary

retaining wall, shall be placed so that the top of the footing is a minimum of 1 ft below the proposed ground line and the bottom of the footing is a minimum of 3 ft below the proposed ground line. If the footing is to be placed on rock as determined by the Engineer, it shall be keyed into the sound rock at least 1 ft. The Plans developed by the Design-Build Team shall specify the maximum allowable bearing pressure for each substructure element and its footing.

Setting spread footings or leveling pads for proprietary retaining walls in embankment or fill material is prohibited. Any spread footing, including leveling pads for a proprietary retaining wall, shall be set into existing in-situ soil or sound rock.

The Design-Build Team shall meet all requirements of Section 10 of the AASHTO Specifications with regards to the design of spread footings, allowable foundation bearing pressures, and settlements.

The allowable bearing capacity for spread footings shall be established by the Design-Builder based on additional site investigation, AASHTO Specifications and FHWA Geotechnical Engineering Circular No. 5 – Evaluation of Soil and Rock Properties. The proposed bearing capacity will be reviewed by the Administration as part of the foundation evaluation.

The Design-Builder shall have the exposed subgrade of any spread foundation inspected during construction by their geotechnical engineer with a written recommendation of their findings forwarded to the Office of Structures.

#### B. Driven Piles.

Steel H-piles, steel pipe piles, or steel mini/pin piles are acceptable pile types for use on this project. No other driven pile type, including concrete piles, will be considered. Bottom of footings for bridge abutments or wing walls may be placed in approach embankments provided they sit on pile-supported foundations with the pile tip elevation set in competent in-situ soil or sound rock. Pile tips shall be applied to driven piles where warranted. For bridges crossing roadways, the pile tip shall extend below the elevation of the roadway that is being crossed.

Only one type of pile shall be used on each individual substructure unit. However, different substructure units of the same structure may have different foundation types.

Any driven pile that reaches refusal with less than 20 feet of pile length embedment in original competent in-situ soils will be unacceptable and shall be extracted and holes shall be augured a minimum of 10 feet into competent rock or 5 feet into sound rock. The piles shall be embedded into the augured hole and the void area around the piles shall be filled with Mix No. 4 concrete.

The proposed pile spacing for design shall conform to the following:

1. Spacing in the front row of a pile group shall not exceed 8 ft.

2. Spacing for all other rows shall not exceed twice the spacing of the front row and/or a maximum spacing of 10 feet.
3. The Design-Build Team shall use battered piles to resist all horizontal loads
4. Pile patterns shall be designed so that no piles are in tension or uplift.

As-built pile foundation data shall be documented in the final As-Built plans.

- C. Augered or Drilled Piles, including steel mini/pin piles, reinforced cast in place drilled shafts (caissons), and steel H-piles placed in augered holes with voids filled with concrete, are acceptable for use on this project. No other augered or drilled pile type, including helical piles, will be considered. Any augered or drilled pile foundation that encounters rock shall have its final tip elevation a minimum of 10 ft into competent rock or 5 ft into sound rock. Steel mini/pin piles shall have a 5' deep grout bulb below the final tip elevation. Structural capacity of auger cast piles with steel H-pile cores shall be determined solely on the capacity provided by the steel H-pile core without any contribution of the surrounding cast in place concrete. The augered or drilled pile spacing shall conform to the same criteria as driven piles, excluding mini/pin piles. Pile patterns shall be designed so that no piles are in tension or uplift. Design strength shall be maintained for the full length of the pile.

**3.11.04.04.03 Subsurface Condition Requirements**

The following chart represents the minimum subsurface requirements that must be present for the various structure and foundation types. This information does not supersede any other foundation design criteria. For retaining walls supporting noise walls, this chart does not apply.

Structure /Foundation Type	Spread Footing	Deep Foundation (Piles)
Subsurface Conditions	N > 30 for 10 feet of sampling*	N > 50 blows per 1 foot for tests over 10 feet of sampling* or REC >50

N = Blow counts representing penetration resistance as defined in AASHTO T-206

\* - In accordance with SHA's Standard Specifications for Subsurface Exploration

**3.11.04.04.04 Rock Definition**

The definition of competent rock shall be material with a minimum Rock Quality Designation (RQD) of 80% and a minimum Rock Core Recovery (REC) of 80%. The Engineer shall determine, by observations of the exposed in-situ materials and the operation of the excavation equipment, if the competent rock has been encountered for spread footings and the bottom of caisson holes. For mini/pin piles, competent rock will be determined by the Engineer based on observations of the operation of the drilling equipment and the cuttings retrieved.

**3.11.04.05 Aesthetic Criteria**

Specific aesthetic details are intended for the various structures on this project as described in this specification. The following aesthetics shall be applied to bridges, retaining walls, and noise barriers. Sample Panels shall be submitted for each of the following finishes in accordance with Section 456 – Architectural Treatment.

**3.11.04.05.01 Formliner for Bridge Parapets and Concrete Barriers**

The inside and outside faces of bridge parapets and concrete barriers shall be a tree bark/fractured granite pattern in accordance with Section 456.01.

**3.11.04.05.02 Finish for Noise Barriers**

The highway side of all noise barrier panels shall match the adjacent noise barrier aesthetics in finish and stain color. The Design-Build team shall submit the aesthetics for review and approval with the TS&L submission. All concrete stain colors shall meet Federal Standard 595. In lieu of an adjacent barrier, finish shall be in accordance with Section 456.

The residential side of all noise barrier panels shall match the adjacent noise barrier aesthetics in finish and stain color. The Design-Build team shall submit the aesthetics for review and approval with the TS&L submission. All concrete stain colors shall meet Federal Standard 595. In lieu of an adjacent barrier, finish shall be in accordance with Section 456.

Formliner joint seams shall not be visible in the noise barrier system and applies to both full height and stacked panel designs. Patterns for formliners shall be oriented level and plumb and shall not follow the profile of the noise barrier. Post type and design shall be compatible with the panel design in terms of texture, color, and scale. Incidental items such as access doors, etc. shall be incorporated in a manner consistent with the aesthetics aspects of the noise barrier system.

**3.11.04.05.03 MSE Retaining Wall Panels**

The exposed faces of concrete retaining walls and bridge substructures shall match adjacent structure aesthetics in finish and stain color. The Design-Build team shall submit the aesthetics for review and approval with the TS&L submission. All concrete stain colors shall meet Federal Standard 595. In lieu of an adjacent structure, finish shall be in accordance with Section 456. The pattern and color shall match adjacent MSE Walls in the area

**3.11.04.05.04 Formliner for Retaining Walls and Bridge Substructure**

The exposed faces of concrete retaining walls and bridge substructures shall match adjacent structure aesthetics in finish and stain color. The Design-Build team shall submit the aesthetics for review and approval with the TS&L submission. All concrete stain colors shall meet Federal Standard 595. In lieu of an adjacent



structure, finish shall be in accordance with Section 456.

**3.11.04.05.05 Use of Concrete Copings**

Horizontal and vertical copings for the concrete retaining walls, MSE Walls, and bridge parapets shall be closely coordinated. A 2 foot vertical coping shall be provided at all MSE Wall slip joints the spacing of the vertical coping shall be consistent throughout the corridor. A similar 2 foot wide vertical coping shall be provided along all concrete retaining walls with the same spacing provided for the MSE wall vertical coping. The vertical coping spacing shall be coordinated with the noise barrier posts spacing so that all vertical coping for retaining walls supporting noise barriers line up with a noise barrier post.

The horizontal coping along the top of MSE Walls adjacent to bridges shall be oriented such that the parapet formliner on the bridge follows a linear pattern with the formliner on the retaining wall parapets. The bottom coping on the bridge parapet shall follow the same thickness along the length of the MSE walls. If a wider coping is required along the MSE Wall, the coping shall be stepped such that the top portion of the stepped coping is the same thickness as the bottom coping of the parapet.

**3.11.05 Structure Design and Construction Requirements**

**3.11.05.01 New Bridges**

If the Design-Build Team determines a bridge requires replacement or a new bridge is proposed, the following requirements shall apply.

**3.11.05.01.01 Geometric Design Criteria for Bridges**

The Design-Build Team shall be responsible for determination of the structure size, clearances, geometry, etc. to meet or exceed the design criteria.

- A. The minimum vertical under clearance for all new bridges over highways and roads shall be 16'-9".
- B. Whenever possible bridges shall be located on tangent alignments. If this is not possible, the layout of bridges on non-tangent alignments shall be in conformance with the Administration's Guidelines and Procedures Memoranda D-85-25(G).
- C. Every effort shall be made to provide a roadway profile grade across bridges so that the bridge surface drains without the need for scuppers. The minimum grade allowed on any structure shall be 0.5 percent. Any flow spread shall be limited to the shoulder area during the 10 year storm event.
- D. Locating the low point (sump) of the vertical profile within the limits of the bridge or end wing walls is prohibited.

- E. In order to address maintenance of traffic for future bridge deck replacements, all substructure units shall be designed to support full live load with portions of the superstructure completely removed. For purposes of design assume the bridge deck will be replaced one-half at a time.

The Design-Build Team shall also consider maintenance of traffic during future deck replacements when establishing the superstructure typical section. A minimum of five (5) girders shall be used for the construction of any structure. The use of a 2 girder section for the initial stage of construction is prohibited.

- F. The maximum super elevation rate allowed on any structure built to grade shall be 6 percent.

### **3.11.05.01.02 Structural Details for Bridges**

Structural Details developed by the Administration and located on the Administration shall be utilized for bearings, bridge decks, deck joints, F shape barrier, and any other details whenever possible. Any proposed deviation from the established Structural Details shall be approved in writing by the Administration.

#### **A. Abutments**

1. The use of MSE walls as abutment front walls or wing walls is prohibited for the bridges in this Contract.
2. Integral or semi-integral abutments may not be utilized.
3. Only cast-in-place concrete abutments and piers may be utilized for this project.
4. The maximum slope provided in front of bridge abutments shall not be steeper than two horizontal to one vertical (2:1).

#### **B. Superstructure**

1. For bridges supported by individual beams or girders, the maximum beam or girder spacing between center lines of the beams or girders shall be no more than 10 ft.
2. A line girder analysis shall be used for the design of straight superstructure members. Other methods to analysis/design curved girders shall be approved by MDOT SHA.
3. All girders within a single bridge structure shall utilize a single type of girder.
4. Girder haunches shall not reduce the minimum vertical clearance over any median shoulders that are used for peak period lanes. The minimum vertical clearance is required over the entire shoulder width.
5. The location and design of field splices shall be in conformance with the Administration's Guidelines and Procedures Memorandum D-18-52(4)

6. Partial Depth cross frames are prohibited.
7. Prestressed concrete superstructure members with voids are prohibited. No prestressed concrete superstructures shall be used over roadways.

**C. Decks**

1. For bridges supported by stringers, all bridge deck slabs shall match the Office of Structures Structural Details. Alternate designs of bridge decks are prohibited.
2. Steel deck forms which remain in place shall be used for all steel girder bridges.
3. The ratio of deck overhang length to adjacent deck span shall not exceed 36%.
4. A deck pouring sequence shall be prepared in accordance with the Administration's Guidelines and Procedures Memorandum P-76-11(4) and be provided to the Office of Structures for approval in writing as part of the Structural Submissions.
5. The development of Finished Roadway Elevation Plan Sheets shall be in conformance with the Administration's Guidelines and Procedures Memorandum P-75-8 (4).

**D. Parapets**

1. The bridges shall have a straight back 42" 'F' shape parapet along outside of bridge and 42" Median TL-5 Bridge Railing for median barrier to conform to the Office of Structures Details. If needed, parapets shall be made wide enough to accommodate bridge mounted noise barrier.
2. All parapets on the bridges shall have two 3 in. diameter PVC conduits cast into the barrier in conformance with the Administration's Structural Details.
3. Precast concrete traffic barriers are prohibited.
4. Slip-Forming of Parapets shall be permitted but only when structures are constructed without live load. Slip-forming of parapets will be prohibited on structures constructed under staged construction with active live load.
5. No new or existing structures or appurtenances mounted on top of parapet shall overhang the top face on the traffic side.

**E. Deck Joints**

1. Intermediate joints are prohibited.
2. All bridge deck expansion joints, at fixed and expansion bearing locations, shall match the Office of Structures Structural Details contained in the contract documents. Modular joints are prohibited.

F. Bearings

1. Fixed and expansion bearings for straight steel girder bridges shall be in conformance with Office of Structures Structural Details. Steel Reinforced elastomeric bearings are prohibited on steel girder bridges.
2. Steel Reinforced elastomeric bearings shall be used in conjunction with any concrete slab structures.
3. Pot Bearings or disc type bearings are prohibited and will not be allowed for any reason within this contract.

G. Utilities

1. Conduits for future utilities shall be placed in bridge back walls with pipe extending 5' beyond the end of the back wall, or to the end of the moment slabs on wing walls; whichever is greater.
2. When utilities are supported on a bridge, the support requirements shall be coordinated with the utility owner and accommodated by the structural framing.
3. Utilities shall be supported between girders on a bridge. No portion of the utility or support system shall extend below the bottom flange of the girders. Utilities shall not be mounted to the fascia of a structure or supported from a concrete deck slab.

H. Slope Protection

1. Slope protection shall be required at all embankment slopes at abutments.
2. Slope protection shall be developed in accordance with the Administration's Structural Details.

I. Bridge Mounted Noise Barriers

1. No new bridge mounted noise barriers will be allowed to be constructed or rebuilt as part of this RFP. A separate support structure shall be required if a noise barrier is required at any roadway or stream crossing.
2. Noise barriers currently mounted on top of bridges may be maintained on top of the bridge parapet, provided that the bridge parapet is not required to be reconstructed or modified.

**3.11.05.02 Modifications to Existing Structures**

If a structure is modified to accommodate additional lanes, median barrier or parapets are replaced, or other structural changes are proposed, the Design-Builder shall provide an updated load rating for the structure. Load ratings shall be in accordance with TC 3.11.04.01.E.

### **3.11.05.03 New Box Culverts and Pipe Culverts**

#### **3.11.05.03.01 General**

Structural Details developed by the Administration and located on the Administration website shall be utilized whenever possible. Any proposed deviation from the established Structural Details shall be approved in writing by the Administration.

All pipe culverts and precast concrete box culverts shall be constructed to a distance sufficient enough to allow for the placement of the roadside grading and w-beam traffic barriers. All proposed headwalls/wing walls taller than 4'-0" shall have Type III Chain Link Fence placed on top of them.

#### **3.11.05.03.02 Foundations**

- A. All culverts, head walls, and wing walls shall be founded on spread footings or pile foundations as determined by the foundation boring program and associated foundation design.
- B. Refer to TC 3.11.04.04.01 for specific foundation requirements.
- C. Anticipated scour depth and scour protection information shall be developed by the Design-Builder and incorporated into the foundation design, when applicable.
- D. Structures shall be designed and detailed for all forces that result from maximum calculated vertical, horizontal and rotational movement of foundation elements. The limiting values in AASHTO 4.4.7.2.5 shall not be exceeded.

#### **3.11.05.03.03 Hydraulics**

Multi-cell box culverts and pipe culverts shall be constructed in stages so at least one cell is available for stream flow at all times. If only one cell or pipe exists, Design-Builder shall accommodate stream flow with other methods as approved by MDE. The Design-Builder operations shall not result in flooding beyond the limits of right-of-way or 2 year flood plain.

#### **3.11.05.03.04 Support of Excavation**

Temporary support of excavation may be required in order to maintain the roadway embankment and to stay within the State right-of-way during the construction of the new pipe culverts, pipe culvert extensions, box culverts, and retaining walls.

#### **3.11.05.04 Retaining Walls**

If the Design-Build Team determines retaining walls are required, the following requirements shall apply.

**3.11.05.04.01 Geometric Design Criteria for Retaining Walls**

The Design-Build Team shall layout retaining walls in accordance with the following geometric design criteria:

- A. Retaining walls on curved horizontal alignments may be constructed on chords, unless otherwise stated, provided the angle of deflection between segments does not exceed 5 degrees. Median retaining walls shall be curved to match roadway curvature.
- B. The horizontal offset of the wall from the baseline shall not change abruptly. All changes in offset shall be accomplished using curves or chorded construction as described above.
- C. The top of retaining walls shall not be stepped or contain sharp breaks in slope to accomplish a change in elevation. The top shall be level or shall vary using a smooth linear or curved transition.
- D. The completed retaining wall, and all associated structural elements, shall be located entirely within the Administration's Right-of-Way. Construction easements shall only be used to facilitate construction efforts and will need to be acquired by the Design-Builder at their own risk and expense.
- E. The ground line behind the retaining wall shall be placed a minimum of 9" below the top of the wall, unless a barrier is required on top of the wall.

**3.11.05.04.02 Structural Details for Retaining Walls**

Structural Details developed by the Administration and located on the Administration website shall be utilized whenever possible. Any proposed deviation from the established Structural Details shall be approved in writing by the Administration.

The following structural details shall be used where appropriate:

- A. For retaining walls supporting roadways and adjacent to the shoulder, an F-Shape Barrier shall be placed on top of the proposed retaining wall. The height of the proposed barrier shall be 42" in accordance with the roadway design requirements.
- B. For retaining walls adjacent to and supporting sidewalks, a 2'-8" vertical face barrier with a one-strand rail, resulting in a combined barrier height of 3'-6", shall be utilized. For retaining walls adjacent to and supporting hiker/biker facilities, a 2'-8" vertical face barrier with a two-strand rail, resulting in a combined barrier height of 4'-6", shall be utilized. All railing elements shall meet the horizontal clear spacing requirements outlined in section 13.8 of AASHTO. These spacing requirements may not be exceeded.
- C. For barriers placed on top of MSE walls, a moment slab shall be utilized to resist the horizontal loads applied to the barrier. The moment slab and barrier

shall be cast-in-place.

- D. For retaining walls supporting private property or other facilities that are accessible to pedestrians, Type III fencing 3'-0" in height shall be provided on top of the wall. If an ornamental fence is required per the structure's aesthetic specifications, the fencing details shall be developed in accordance with those requirements.
- E. The overall horizontal deflection at the top of top-down secondary retaining walls shall be limited to  $H/100$  or 2 inches, whichever is less at the head (top) of the wall. The overall horizontal deflection at the top of any primary retaining walls shall be limited to 1 inch at the head (top) of the wall. The effects of wall movements on adjacent facilities shall be considered in the development of the wall design. Retaining wall deflections shall not detract from the serviceability, usefulness, or aesthetics of the walls or any structures or facilities supported by the wall.
- F. All retaining walls shall contain the appropriate details for drainage. The drainage system for cast-in-place cantilever walls shall be in accordance with Standard No. RW-301.
- G. For retaining walls supporting noise barriers, the following shall be applied:
  - 1. The retaining wall shall be designed to resist all loads imposed by the noise wall.
  - 2. The geometry of the wall shall be sized to allow for proper anchorage of the noise barrier posts. Anchor bolts with a base plate or embedded posts can be considered.
- G. For MSE walls, slip joints are required at expansion joints, and every attempt shall be made to provide equal spacing of the slip joints throughout the corridor. Expansion and contraction joint spacing shall not exceed the distances specified in the Structural Details.
- H. For cast in place retaining walls, vertical concrete coping shall be provided to mimic the concrete slip joints used for MSE Walls throughout the corridor. The same spacing used for the MSE slip joints shall be applied to the vertical concrete coping. For retaining walls supporting noise barriers, the vertical copings shall fall in line with noise barrier post locations. For coping aesthetic requirements, refer to 3.11.05.
- I. The Design-Builder shall determine if noise absorptive treatments are required on the retaining walls in order to satisfy the noise abatement requirements of this project. If absorptive treatments are required, the DB Team shall meet all aesthetic requirements outlined in Section 3.11.04.05 – Structure Aesthetics.

**3.11.05.04.03 Design Alternates for Retaining Walls**

The design for permanent retaining walls shall follow one of the following alternates listed below, unless otherwise stated in the Special Provisions.

Only one alternate shall be used per wall location Retaining Wall Plans shall be developed in accordance with the Administration's Guidelines and Procedures Memorandum P-94-38(4).

**A. Cast-in-Place Cantilever Retaining Walls.**

The Design-Build Team shall design and detail proposed concrete cantilever retaining walls in accordance with Structural Detail Nos. RW-101 through RW-403.

**B. Proprietary Retaining Walls.**

The Design-Build Team shall design and detail proposed proprietary retaining walls in accordance with the manufacturer's approved details. Use of the manufacturer's approved details does not relieve the Design-Builder of complying with the remainder of the plan, detail, material and structural performance requirements outlined in this specification and the RFP. The list of proprietary retaining wall systems that have been approved by the Administration are located on the Administration website. The manufacturer's details shall be revised/modified as necessary to comply with the requirements outlined herein.

1. Mechanically Stabilized Earth (MSE) retaining walls that are to be placed adjacent to streams, floodplains, SWM ponds, or other water features shall be placed so that no stream flows up to the 100 yr. flood elevation or standing water comes in contact with the face of the wall. A solid concrete barrier may be designed to protect the base of the wall and shall contain the appropriate scour countermeasures.
2. The leveling pads for proprietary retaining walls shall be cast-in-place concrete. They are considered spread footings and shall follow the design requirements for spread footings.
3. The reinforced zone backfill for Mechanically Stabilized Earth (MSE) walls shall be comprised of No. 57 stone. A phi angle of 34 degrees shall be used for No. 57 stone in the design calculations.

**C. Top-Down Retaining Walls.**

The Design-Build Team shall design and detail proposed top-down retaining walls in accordance with AASHTO and the following:

1. All loads shall be resisted by the soldier piles, lagging, or other elements in direct contact with the retained soil.
2. Only concrete lagging shall be used for permanent retaining walls. The use



of any type of timber lagging will be strictly prohibited.

3. A concrete facing shall be provided that will not be considered structural in nature. The aesthetic finish for the concrete facing shall be as outlined in the contract documents.
4. Portions of permanent steel elements, which are exposed after excavation, shall be coated in accordance with Section 465.

### **3.11.05.05 Noise Barriers**

#### **5.05.05.01 Description**

All design elements associated with noise barriers for this project shall be the responsibility of the Design-Builder. For the Noise Abatement Performance Specification, refer to TC 3.18.

#### **3.11.05.05.02 Design**

Design of noise barrier elements shall be in accordance with AASHTO Standard Bridge Design Specifications. Foundations shall be designed in accordance with this performance specification.

#### **3.11.05.05.03 Noise Barrier Types**

- A. Noise barriers shall be designed and detailed utilizing a pre-approved proprietary noise barrier system.
- B. A list of pre-approved noise barrier system manufacturers is provided on the Administration website.

#### **3.11.05.05.04 Geometric Design Criteria**

- A. The horizontal alignment shall be smooth and shall roughly follow the Project alignment within the Project right-of way.
- B. Consistent post spacing shall be used across the entire noise barrier.
- C. The vertical profile of the top of noise barrier shall be equal to or above the acoustic profile.
- D. The minimum height for a proposed noise barrier shall be 7 ft. above the finished ground line.
- E. The top surface of individual noise barrier panels shall be level. Exceptions will be made for the panels at the beginning and end of the proposed wall.
- F. Vertical steps between the adjacent top panels shall be a minimum of 2 in. and a maximum of 12 in.
- G. At the top of barrier elevation transitions, the elevation difference between the tops of panels shall be established so that the increment is constant for the entire transition. A small step at every panel shall be used in lieu of a larger step at every other panel. Where transitions are so flat that providing a step at every

panel cannot be accommodated, the transition shall be accomplished by stepping up or down a constant increment (such as 6 inches) after a constant number of panels (minimum of 5 panels). The pattern shall repeat for several series.

- H. The top of wall at the bottom of a sump curve in the acoustic profile shall be raised to provide a long level section at the top of the wall.
- I. A minimum distance of four (4) feet shall be provided from the face of a noise barrier and the hinge point of a cut or fill slope steeper than 2.5 (H):1 (V). The area between the barrier and the hinge point shall be sloped at a maximum of 4% for positive drainage.

### **3.11.06 Structure Plan Development**

The Design-Build Team shall prepare structure plans as part of the Contract using the latest SHA MicroStation CADD Standards and Plan Development Checklists. Specific details are shown on the conceptual plans provided on Projectwise. Each structure plan sheet shall be prepared on the Office of Structure's standard border and title block sheet.

Plan Development Checklists included in the contract documents are developed for various types of structures (Concrete Girder Bridges, Retaining Walls, etc.) and indicate the minimum amount of information that is required on the Structure Contract Plans. If a checklist is not provided for the type of structure that is proposed by the Design-Build Team, the existing checklists shall be used as a general guide to provide similar information.

The development of views on all Structure Contract Drawings shall be in conformance with the Administration's Office of Structure's Guidelines and Procedures Memorandum P-75-7(4).

### **3.11.07 Submittals for Structures**

All structures included in this Contract shall follow an independent review process. This process will be coordinated with the review and acceptance of the other articles (roadway, drainage, etc.) as appropriate.

The structure submission schedule shall be presented in the Design-Build Team's original project schedule and updated as the project progresses. Submissions for the proposed structures' Type, Size and Location (TS&L), combined Type, Size and Location/Foundation review, Foundation Review, and/or Structural Review shall be made, for each individual structure, one at a time. The submittals, for each individual structure project wide, shall be made at least 7 (seven) days apart. Review packages shall not be combined (i.e. 3 TS&L's in the same package). This schedule shall be presented in the Design-Build Team's original submission schedule.

#### **3.11.07.01 Type, Size, and Location Submission**

The first submission required for each structure in this Contract shall be the Type, Size and Location (TS&L) Plans. The materials developed for this submission shall

represent approximately 30 percent complete construction documents. It is recommended that the roadway alignment and profile be finalized and accepted prior to this submission. It is also recommended that any other pertinent information such as grading plans or drainage features that impact the proposed structures shall also be accepted prior to submitting the structure plans for review. Comments for TS&L submissions will be provided within 21 calendar days of receipt of the submission.

Once the TS&L plan package is received by the Office of Structures, and found to be complete, a TS&L plan review meeting will be conducted in the Office of Structures. The purpose of the meeting is to discuss any concerns the Administration may have regarding the TS&L submittal, as well as allowing the Design Build Team the opportunity to ask questions they may have regarding the final development of the design and plans for each individual structure. At a minimum the Design Build Team will be required to have their Design Build Project Manager, the Design Manager, and the structural designer present at the meeting. The Administration will have representation from the Project Manager from the Office of Highway Development, and his Division Chief, the Director Office of Structures, the Deputy Director Office of Structures – Engineering, the Office of Structures Project Manager, and his Division Chief, and the MDOT SHA OOS designated reviewer. The meeting is mandatory for each structure and will typically be limited to one hour.

After the meeting, the Design-Builder shall prepare meeting minutes, which will include a list of compiled comments to be addressed prior to the resubmission of the TS&L plans, and distribute them to the attendees for review and comment.

### **3.11.07.02 Foundation Report**

The Foundation Report and Plan submission shall be made in conformance with the Maryland Department of Transportation Guidelines and Procedures Memorandum D-79-17 (4), the Structure Descriptions, and other requirements specified in the Special Provision. The submission of the foundation report can be made concurrently with the TS&L submission; however, it shall be noted that the foundation design may be impacted by comments received on the TS&L Plans. If the TS&L submission is provided separately, the Foundation Reports shall not be submitted until comments on the TS&L have been provided back to Design-Build Team and the Design-Build Team's responses are accepted by the Administration. Comments will be provided back to the Design-Build Team within 21 calendar days of receipt of the submission if the Foundation Report is submitted independently. If the Foundation Report is submitted concurrently with the TS&L submission, comments will be provided within 40 calendar days of the receipt of the submission.

### **3.11.07.03 Structural Detail Submissions**

Following acceptance of the TS&L Plans and Foundation Report, the Design-Build Team shall submit detailed plans for various structural elements. Structural details for an individual structure may be submitted as a number of sub-plan set packages or as a

complete set. The Design-Build Team shall submit a structure submission schedule that outlines the anticipated structural detail submissions. The Design-Build Team shall coordinate the submission of the detailed design plans with the submission of the Type, Size and Location (TS&L) or combined Type, Size and Location/Foundation review, such that only one individual submission is being made at a time project wide, with a minimum of at least 7 (seven) days, between individual submissions. Review packages shall not be combined (i.e. a TS&L for one bridge, and a detailed design plan for another bridge, in the same package).

The Design-Build Team shall have adequately developed the load contributing elements prior to finalizing the design of any structural details that are impacted by these loads. If load conditions change during the design, previously submitted elements shall be resubmitted for acceptance. Comments for each structural detail submission will be provided back to the Design-Build Team within 21 calendar days of receipt of the submission.

At this stage of the design, the Office of Structures offers the Design Build Team and their structural designers, the opportunity to participate in a structural review meeting to discuss any concerns or questions they may have in the development of the plans for final approval. While the meeting is not mandatory, the Office of Structures has found this to be beneficial for Design Build Teams on past projects. It is a time when information can be exchanged in an informal manner, and questions can be answered.

#### **3.11.07.04 Revisions to Structure Plans**

Any modifications or revisions to the structural drawings after acceptance has been received shall be submitted in writing to the Administration and accepted prior to proceeding with any change to the accepted and conforming structural drawings. If the request for modifications or revisions is accepted, revised structural drawings shall be submitted to the Administration.

#### **3.11.07.05 Working Drawing Review Process**

All working drawings relating to the structures shall be reviewed in accordance with TC 4.01.

#### **3.11.07.06 Final Plans and Computations**

The Design-Build Team shall submit a complete set of structure plans once all structural details have been accepted. A full set of plans (details, standards etc.) shall be developed for each of the structures. A structure key plan sheet shall be developed to show the location of multiple structures. The complete set shall consist of one set of .pdf and .tiff files provided electronically. The General Plan & Elevation sheet for each of the structures shall be sealed by the Design-Build Team structural designer thus denoting it as the final construction documents.

The Design-Build Team shall submit a complete set of structure computations once all structural details have been accepted for each structure. All computations shall be

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provided electronically as a .pdf document subdivided into relevant design sections with the initials of the designer and reviewer. A coversheet shall be included that is signed and sealed by the Design-Build Team structural designer, who is a Professional Engineer registered in the State of Maryland with experience in bridge design, responsible for performing or oversight of the pertinent design work.

The Design-Build Team shall submit As-Built Drawings of structure plans in accordance with TC 3.05.



The Design-Build Team shall submit completed Structural Inventory and Appraisal (SIA) and Element Level Data information forms for each structure for use by MDOT SHA in entering the structure data into their structural inventory system.

**TC 3.12 TRAFFIC PERFORMANCE SPECIFICATION**

**3.12.01 General**

The Design-Builder shall be responsible for the design and construction of the Project traffic control devices (TCD), including ground mounted signing and sign structures (overhead and cantilever); pavement markings; roadway and sign lighting; roundabouts; traffic signals; signal systemization; and ITS devices, and coordination of TCD design and construction with all other disciplines involved with the project. Refer to TC 3.21 Intelligent Transportation System Performance Specification for more details regarding ITS devices and coordination requirements. The Design-Builder shall be responsible for completion of traffic analysis and submission of Design Requests.

For any traffic control device or methodology not adhering to the Administration's guidelines, the Design-Builder shall submit the proposed device or methodology to the Administration for review and approval as an Alternative Technical Concept (ATC) during the proposal phase. If during the progression of the Design-Builder's project, post award, it is determined that a traffic control device or methodology not adhering to the Administration's guidelines is needed, the Design-Builder shall submit the proposed device or methodology to the Administration for review. The submittal shall include a written letter requesting to utilize the device or methodology, information supporting its use and any other engineering support and/or documentation as required. The device or methodology shall not be used unless the Design-Builder receives written approval from the Administration in the form of a letter. Approval is at the sole discretion of the Administration.

**1 3.12.01.01 Office of Traffic and Safety Signature Process**

Unless noted elsewhere in this requirement all submittals for MDOT SHA review shall be per the requirements of TC 3.05.18 until the Administration determines, in its sole discretion that the plans are suitable to enter the Office of Traffic and Safety (OOTS) review for Director Signature process. All signing, marking, signalization, and lighting, and ITS Infrastructure and Equipment Placement plan must be signed by the Director of the OOTS and go through this review process to receive that signature. The Administration will notify the Design-Builder in writing that they may make a submittal into the review for Director Signature process. This submittal will then be reviewed by the Chief of the Traffic Engineering Design Division (TEDD). Any comments from this review will be returned to the Design-Builder to address and resubmit for further review. Once all comments from the Chief of TEDD have been resolved, the Chief will initial the plans and submit them to the Director for review. Any comments from the Director will be returned to the Design-Builder to address and resubmit. Once all comments have been resolved, the Director will sign the plans and they will be returned to the Design-Builder for title sheet submission per TC 3.05.18.01. Each submittal or resubmittal in the review for Director Signature process will be reviewed and a response returned within 21 calendar days, beginning the day after acknowledgement of receipt of the submittal. Additionally when the Chief of TEDD initials the plans and submits them to the Director for review, this shall be a resubmittal and a response returned within 21 calendar days, beginning the day after MDOT SHA notifies the Design-Builder that they have been initialed.

**3.12.02 Standards and References**

Traffic analysis and TCD design and construction shall be in accordance with this Traffic Performance Specification and the relevant requirements of the Guidelines and References in TC 3.08.

**3.12.03 Coordination with Other Contracts**

The Design-Builder shall coordinate the design and construction of all TCDs for the Project with those required for other MDOT SHA, County, and local jurisdiction Projects.

**3.12.04 Traffic Operational Analysis**

**3.12.04.01 Operational Assessment of Design Alternative(s)**

Through design progression traffic operational analyses may be required to support the design of the project. The analysis methods described below may be required in the preparation of reports, studies, and analyses as required for design review and comment or concurrence. If after award a change is proposed to the general geometric layout and/or traffic operations included in the Design-Builder's proposal, the Design-Builder shall submit the proposed changes to the Administration for review and approval. The submission shall include analysis of the proposed configuration using the Project Design Year Build Volumes and analysis techniques as described in TC 2 and in this specification. The traffic analysis submitted to the Administration will be used as part of the evaluation of the Design-Builder's revised proposal.

**3.12.04.02 Preparation and Submittal of Design Request Form**

The Design-Builder shall prepare the Administration's Office of Traffic and Safety's Traffic Control Device Request Design Request Form in accordance with the Design Request Form Instructions and Guidelines. The Design-Builder shall coordinate preparation and submittal of all Design Request Forms with the appropriate MDOT SHA District Traffic Office. All Design Request Forms will be submitted to the Administration (with accompanying traffic operational analysis/documentation and signal warrant analysis) for consultation, written comment, and approval prior to the Design-Builder proceeding with the design, installation, or modification to any traffic control device. The Design-Builder shall not proceed with design, installation, or modification of any traffic control devices until the submitted Design Request Form has been approved by the Administration.

**3.12.04.03 Approved Analysis Techniques and Software**

The Design-Builder shall be responsible for all traffic analysis required to complete the design and construction for this project. The Design-Builder shall also complete any traffic safety and operational analysis needed to complete/supplement/modify the Categorical Exclusion, Interstate Access Point Approval, Maintenance of Traffic Alternative Analysis, or other required documentation for agency approval.

All traffic analysis completed for this project shall include both the AM and PM peak periods, at a minimum. These peak periods consist of multiple hours, using models that include a seeding hour and four recording hours during both the AM and PM periods.

**3.12.04.03.01 Highway Capacity Manual and Software – Latest Version**

All freeway mainlines, ramp junctions (merge and diverge locations), and weaving sections shall be analyzed using the Highway Capacity Manual and/or Software (latest version). The Design-Builder shall provide a summary of results on a line diagram of the proposed roadway configurations, including both level of service and volume-to-capacity (V/C) ratios as appropriate. The Design-Builder shall also submit all calculation files electronically to support the summary of results.

**3.12.04.03.02 Synchro/SimTraffic – Latest Version**

For corridors with multiple intersections or for individual signalized intersections, the Design-Builder shall use Synchro/SimTraffic to evaluate corridor and intersection operations. The Design-Builder's timing plans shall consider corridor-wide cycle lengths and appropriate offsets. The Design-Builder shall also submit all calculation files electronically to support the summary of results.

**3.12.04.03.03 VISSIM – Latest Version**

For freeway and arterial operations, the Design-Builder shall use VISSIM to analyze operations. This shall be in addition to the Highway Capacity Manual and/or Software and Synchro/SimTraffic requirements. VISSIM results will be considered by the Administration in conjunction with Highway Capacity Manual and/or Software and Synchro/SimTraffic analysis when assessing design alternatives proposed by the Design-Builder.

The Design-Builder shall use the calibrated existing and future-year VISSIM models provided by MDOT SHA as a basis for operational analysis of their project. VISSIM models for analysis of their proposed project shall be developed in accordance with the latest version of MDOT SHA's VISSIM Modeling Guidance. The Design-Builder shall not modify calibration parameters (e.g., vehicle inputs, vehicle routes, driving behavior, link behavior type, lane change distance, vehicle inputs, vehicle routes, speed distributions and decisions, etc.), unless explicitly documented and justified. VISSIM models developed for evaluation of MOT may require adjustments to driving behaviors. These shall be noted and explained in the TMP. It will be MDOT SHA's determination if the modifications are acceptable.

Results may include, but are not limited to, travel times, speeds, person/vehicle throughput, density, delay, and queues. All VISSIM model files shall be provided to support the summary of results. All data collection and evaluation tables shall be completed for the Design-Builder's project and compared to results provided in the RFP.

**3.12.04.03.04 SIDRA – Latest Version**



Operational analyses for roundabouts shall be completed using the latest version of SIDRA. Roundabouts shall also be coded and analyzed in VISSIM in order to capture and visualize the effects on the overall road network. The volumes should also be checked against the capacity thresholds outlined in FHWA NCHRP 672, Roundabouts: An Informational Guide, 2<sup>nd</sup> Edition, 2010. An analysis that results in a degree of saturation of 0.85 or more on any movement shall be submitted to the Administration for review and approval.

#### **3.12.04.03.05 Queuing Analysis**

To determine the appropriate length of turns lanes, auxiliary lanes, merge, diverge, and weaving segments, and/or other operational components where queuing may be a consideration, including any proposed ramp metering, the Design-Builder shall calculate the queue length. For turn lane length, calculations shall be completed for both the through lane/s and the turn lane/s for the proposed design and each MOT phase of operation.

The Design-Builder shall demonstrate that ramp queues will not extend from the ramp terminus to the mainline and that side road queues will not extend to adjacent intersections wherever possible. The queuing analysis shall be supplemented with simulation analysis for all cases. The Design-Builder shall also provide calculations demonstrating that the sight distance will be adequate for vehicles exiting and entering the mainline at highway speeds to see the back of the queue and decelerate to a stop condition.

#### **3.12.04.03.06 Signal Warrant Analysis**

The Design-Builder shall be responsible for performing an evaluation to determine if signalization is appropriate, based on the latest version of the Maryland MUTCD. Study findings shall be submitted to the Administration for review and approval in a report that outlines the warrants evaluated, with consideration given to traffic volumes, safety, operations, delay, and available gaps in traffic resulting from adjacent signalized intersection(s). Recommendations shall also be included in the report and the report shall be attached to the Administration's Office of Traffic and Safety's Traffic Control Device Request Design Request Form.

#### **3.12.04.03.07 Safety Analysis**

The Design-Builder shall perform safety analysis to identify impacts associated with their project. Safety analysis shall be performed using the latest version of the Highway Safety Manual, CMF Clearinghouse, and/or other research available from reliable sources. Emphasis should be placed on using crash modification factors of the highest quality and confidence available, with consideration to the local characteristics of the roadway and types of improvements. This analysis should include an evaluation of the frequency, severity, and duration of incidents.

### **3.12.05 Signing**

#### **3.12.05.01 Signing Functional Operation Requirements**

Permanent signing for this Project shall conform to requirements of the RFP including TC 3.08 Guidelines and References. It is the intent of this Project to provide fully-compliant signing that meets all applicable standards. The Design-Builder shall design and construct all necessary signing required per this RFP to meet the traffic operations as part of their proposal. This may entail the design and construction of proposed signing, and/or modifications to existing signing. Modifications to existing signing may require removal and/or replacement of existing signing. Existing signing may remain throughout the project limits provided it does not require modification to meet the proposed traffic operations or is not physically impacted by construction.

Overhead and/or cantilever sign structures are anticipated to be needed for this project. It is assumed overhead sign structures/gantries may have to support static signs and ITS devices on the same structures. The Design-Builder shall prepare designs consistent with the Maryland MUTCD and applicable national guidance and best practices. Refer to TC 3.21 Intelligent Transportation System Performance Specification for more details regarding ITS devices and coordination requirements.

Static-Dynamic Inside Hard Shoulder Running designed for a SU-30 design vehicle shall require truck restriction signing throughout the limits of operation to prohibit trucks larger than SU-30 from using the shoulder. Signs shall be based on the R4-5 series signs contained in the Maryland MUTCD and the Maryland Standard Sign Book. The Design-Builder shall prepare as part of their signing design a comprehensive truck restriction signing system with beginning and ending signs for review and comment or concurrence. This may require modifications to existing truck restriction signing.

If the Design-Builder proposes use of a non-standard sign, the Design-Builder shall prepare the Administration's Office of Traffic and Safety's Non-Standard Regulatory & Warning Sign Approval Form in accordance with the form's instructions. The Design-Builder shall provide support documentation, as required, and coordinate preparation and submittal of all Non-Standard Regulatory & Warning Sign Approval Forms with the appropriate MDOT SHA District Traffic Office.

### **3.12.05.02 Design and Construction Requirements**

#### **3.12.05.02.01 Signing Plan Sheets**

The Design-Builder shall prepare a signing "post-it note" roll plan to be submitted to the Administration for review and comment or concurrence prior to preparing the signing plan cut sheets. The post-it note plan shall show the proposed message, size, Maryland MUTCD or MUTCD sign designation (if applicable), and location of all guide, supplemental, route marker assemblies, regulatory, and warning signing. These plans shall also show the location and messages of all existing signs to be retained. The plans shall also include the location and type of delineation devices (including pavement markings and SRPM's). These plans shall be coordinated with the signal, lighting, and ITS designs and depict all existing and proposed TCDs within the project limits, and/or affected by the project.

The Design-Builder shall prepare signing plans at a scale of 1"=50' or equal to the roadway plans. Plans shall show the proposed message, size, Maryland MUTCD or MUTCD sign designation (if applicable), and location of all guide, supplemental, route marker assemblies, regulatory, and warning signing. These plans shall also show the location, messages, and sizes of all existing signs to be retained, removed, and relocated. The plans shall also include the location and type of delineation devices (including pavement markings and SRPM's). The owner of each sign/structure shall be clearly noted on the plan sheets, if it differs from MDOT SHA.

All proposed guide, supplemental, and non-standard signs shall be detailed on an SN-3 (Sign Fabrication) detail sheet. The plan set shall include MDOT SHA's latest SN-1 sheet (General Notes and Proposals). The Design-Builder shall be responsible for contacting MDOT SHA to obtain the latest SN-1 sheet. The SN-4 (Ground Mount Sign Support Details) sheet shall be used for all ground mounted guide or supplemental sign supports. All ground mounted sign supports (steel and wood) shall be detailed on this sheet. MDOT SHA may waive the need to list the standard signs on wood supports on the SN-4 sheets. The tables on this sheet shall include the Sign Number, Plan Sheet number where the sign is located, the sign size, the post size to be used, if the supports are breakaway or non-breakaway, the support lengths, the lateral clearance code and offset, and the support spacing from left edge of sign. As necessary, the SN-8 (Overhead Structures) and the SN-9 (Cantilever Structures) sheets shall also be included in the plan set. The SN-11 (Signing and Marking Quantities) sheet shall be included which summarizes in table format the quantities and materials being used for this Project. Every sign location shall have a separate line. Supports for standard sheet aluminum signs shall be detailed on SN-11 sheets in full.

#### **3.12.05.02.02 Sign Location Design and Construction Requirements**

The Design-Builder shall install all overhead and ground mounted signs within 25-feet of the location shown on the signing plan. An 800-foot spacing shall be maintained between overhead signs and traffic signals. For all guide signs, supplemental guide signs, and any overhead or cantilever structures, including ITS device structures with messages, shall be installed such that 800 foot spacing is maintained, unless approved by the Administration. It is the Administration's intent to have the signs spaced at 800 foot intervals so that future signing can be accommodated and the 800 foot spacing is maintained.

Overhead and cantilever sign structures installed upstream of bridges crossing over the traveled roadway shall be constructed with at least 300 feet between the sign structure and the bridge, unless precluded by the Maryland MUTCD or Administration standards. Overhead and cantilever sign structures installed downstream of bridges crossing over the traveled roadway shall be constructed at least 800 feet from the bridge. All overhead and cantilever sign structure installed under this Project shall be located at a minimum of 50 feet from any roadway lighting.

To the extent possible, the Design-Builder shall provide minimum 500 foot spacing between ground-mounted signs. The Design-Builder shall coordinate the proposed sign locations with all proposed landscaping, utility, hydraulic, lighting, and all other roadside features to

assure proper clearances, lighting levels, and adequate sight distance.

The Design-Builder shall also provide for the replacement or removal of any signing outside the limits of the Project that is no longer appropriate or pertinent as a result of changes associated with this Project. The signing shall be removed or replaced regardless of whether it falls within or outside the limits of construction along the mainline and cross-street approach roadways.

### **3.12.05.02.03 Sign Design and Construction Requirements**

The Design-Builder shall design, fabricate, and install all guide, supplemental, route marker assemblies, regulatory, warning, and transit-related signing required for this Project, including signing on approaches outside the Project limits. The Design-Builder shall identify and install sign structure identification numbers for all overhead and cantilever sign structures. Structure numbers will be provided by the Administration upon request from the Design-Builder. The Design-Builder shall request structure numbers for all sign structures from the Administration's Traffic Engineering Design Division Structures Team following approval of the post-it note plan, or upon the decision to install a sign structure if the decision is made after post-it note review.

The messages, fonts, font size, arrows, shields, colors, borders, and type of support for the overhead and ground mounted signs shall be designed and constructed according to the Maryland MUTCD. The FHWA Standard Highway Gothic Alphabet shall be used for all sign legends. Legends for guide signs and non-standard sign shall be submitted to the Administration for review and approval. For signs along and on I-695 fonts for guide signs shall follow Maryland MUTCD Freeway Table 2E-4 and Table 2E-5. All other roadways: design per Maryland MUTCD guidelines for the design criteria set forth in TC 3.08 Guidelines and Requirements.

**Note:** The MUTCD meanings of the terms, "Expressway" (MUTCD Definition #71) and "Freeway" (MUTCD Definition #77) are different according to Maryland law (see Section TR 8-101 of The Maryland Vehicle Law). In Maryland, an "Expressway" is defined as a divided highway with full access control and other features. Those provisions of the Manual and its referenced documents that relate to a freeway should be applied to a Maryland expressway. Those provisions in this Manual and its referenced documents that relate to an expressway should be applied to a divided highway in Maryland that has only partial control of access.

All proprietary logos (e.g. Police, etc.) will be provided and installed by the Administration onto signs and/or supports furnished and installed by the Design-Builder. The Design-Builder shall submit a letter to the Administration requesting the logos and the required size.

All signs greater than 4' x 10' shall be manufactured using extruded aluminum sign material. All new signs for this Project shall be constructed with non-reflective (black copy with retroreflective background) or retroreflective (all other colors) sheeting background and copy. All signs mounted on overhead or cantilever structures shall use ASTM D4956 Type

XI legend on ASTM D4956 Type XI background.

Please note that on January 25, 2016, the Federal Highway Administration (FHWA) issued a notice in the federal register officially terminating Interim Approval IA-5 for Clearview font which was issued in 2004; all new signs shall use the FHWA approved Highway Gothic alphabet.

The Design-Builder may reuse or relocate existing signs within the Project limits, provided that the sign meets all applicable standards (including placement, application, size, color, reflectivity, condition, etc.). Existing signs that have been damaged in any way shall be removed and replaced, as necessary. The Design-Builder shall be prepared to submit photographs of any signs to remain or be relocated within the Project Limits at the request of the Administration to verify that the sign is suitable for reuse. Removed signs and supports become the property of the Design-Builder.

#### **3.12.05.02.04 Sign Support Design and Construction Requirements**

For each overhead or cantilever structure location, the Design-Builder shall draw the sign panel(s) and the sign structure on the corresponding completed cross-section. The proper vertical and horizontal clearances, sign sizes and sign structure offsets, number of lanes, and lane widths shall be labeled on the cross- sections. The Design-Builder shall maintain 20'-9" to the bottom of Design Sign, or actual sign if the actual sign is taller than the Design Sign, from the high point on the roadway for overhead and cantilever sign structures, regardless of the presence of sign lighting. The Design-Builder shall check the cross-sections and profiles at all overhead sign locations and make adjustments as necessary to provide adequate sight distances and ground clearances to the bottom of the luminaire supports, where necessary.

Structure verification sheets shall be submitted for any modifications to an existing sign structure. Modifications may include sign replacements (including sign replacements with net increase or no net increase to sign area on structures) and installation of ITS devices as defined in TC 3.21 Intelligent Transportation Systems Performance Specification. The Design-Builder may elect to document that the proposed loading on an existing sign structure does not exceed the original design load for the structure; or that the proposed loading on the existing sign structure exceeds the original design load for the structure in which case the Design-Builder shall submit a structural analysis of the existing sign structure and foundation which satisfies the Administration that the existing sign structure can accommodate the proposed loading in accordance with TC 3.08 Guidelines and References. All modifications to existing sign structures will be reviewed by the Administration for approval prior to construction commencing. The Administration may require modifications and/or replacement of any sign structure regardless of whether the change involves an increase in loading or not.

Any alternate to MDOT SHA standard sign structure design shall be submitted to the Administration for review and approval. The Combined Stress Ratio (CSR) for any structural support members shall be limited to 0.90. Alternate sign structure designs for



Overhead structures shall be designed for a maximum design sign area equal to the overall roadway width multiplied by the height of the tallest design sign size panel including exit panel(s); Cantilever sign structures shall be designed for a maximum design sign area equal to the design sign size width multiplied by the sign height multiplied by a factor of 1.25. The wind speed to be used in design shall be 100 mph. The structure design life shall be a 10 year recurrence interval for ground mounted signs using breakaway steel supports.

For signs using breakaway steel supports, the Design-Builder shall utilize the design assistance software provided by the manufacturer of the breakaway system and follow the ground mounted steel post breakaway system selection process provided by the Administration. Post sizes W8x21 and larger shall have 7 foot minimum clearance between adjacent posts. The minimum clear distance shall be measured from inside flange edge to inside flange edge. All wide flange steel I-beam sign supports shall utilize ASTM A709 Grade 36 steel. All square steel posts shall utilize ASTM A500 Grade B structural tubing.

Sheet aluminum signs on State-maintained roadways shall be mounted on wood supports. Sheet aluminum signs on all other roadways may be mounted on either wood supports or 2” square tubular steel posts. Signs over 40 square feet shall be installed on steel posts. Additionally, if the signs are installed at a location where steel posts are required, then extruded aluminum sign material shall be used. All exit gore signs shall be placed on two steel supports. All steel I-beam mounted signs shall be installed on two steel supports, unless otherwise approved by MDOT SHA.

No signs or sign structures will be allowed on bridge overpass structures. No signs shall be banded to utility poles, street lighting poles, and overhead or cantilever sign structure uprights without Administration approval.

Signs shall be placed outside the clear zone wherever possible. Traffic barriers shall be provided for protecting all non-breakaway supports within the clear zone and for new structures within as well as outside the limits of work.

The Design-Builder will be responsible for locating and marking all underground and overhead utilities prior to any signing work beginning.

#### **3.12.05.02.05 Sign Layout and Overhead Sign Requirements**

Signing layout and sequencing shall be per the most recent Maryland MUTCD. The Administration adheres to all “shall” and “should” conditions in the Maryland MUTCD. Only “may” conditions are subject to discussion for non-adherence.

The Design-Builder shall seek guidance from the Administration regarding the configuration of any proposed lane reductions (e.g. merge left, merge right, alternate merge). If an alternate merge application is to be used, the Design-Builder shall follow the Maryland MUTCD and the Administration’s “Form Single Lane Application Guidelines November 2016.”

Permanent guide signing for this Project on I-695 and its ramps shall have the following functional requirements:

- Exit directional guide signing along I-695 for interchange ramps shall be installed on overhead or cantilever sign structures;
- Exit direction and exit gore signs shall be provided for all interchange ramps along I-695;
- Exit numbers and exit panels shall be provided for all interchange ramps along I-695;
- For overhead or cantilever mounted signs, the controlling text and shield size from Table 2E-2 and Table 2E-4 shall be the greater of the Type of Interchange and Overhead column;

### **3.12.06 Pavement Markings**

#### **3.12.06.01 Design and Construction Requirements**

##### **3.12.06.01.01 Plan Sheets**

The final design marking plans shall be indicated on the signing plan with the same scale as the signing plan. The plans are to show color, size, location, and material type for markings within the limits of work. The lanes shall be dimensioned based on the typical sections for the Project. Dimensions shall be included for each change in the roadway typical. Dimensions shall be included for placement of arrows, “ONLY” or other text messages, bicycle markings, stop lines, and length of longitudinal turn lane lines. The plan shall also clearly define locations where pavement markings change color, width, or material. Existing pavement markings that are to remain shall be shown on the plans and locations where proposed pavement markings tie-in to existing pavement markings shall be denoted on the plans.

##### **3.12.06.01.02 Pavement Marking Design and Construction Requirements**

The Design-Build Team shall be responsible for the design and construction of all pavement markings. At a minimum, final pavement marking lane lines, including parallel, acceleration/deceleration lanes for ramps, intersection auxiliary lanes, and Snowplowable Raised Pavement Markers (SRPM), the Pavement Marking Materials shall adhere to the guidelines and references in TC 3.08, including the Pavement Marking Material Selection Policy and Guidelines updated 7-27-2017, or current version if a newer document has been issued. SRPM shall be used per MDOT SHA Memorandum Dated 8-1-2017 and Pavement Marking Material Selection Policy and Guidelines updated 7-27-2017. Metal holders (castings) will not be permitted for use on hot mix asphalt pavements (HMA) for this project. Recessed SRPM with Plastic Holders shall be used on all hot mix asphalt pavement on this project in accordance with Shelf Typical 557.01. When using SRPM on new HMA or Portland Cement Concrete (PCC) roadways with a posted speed limit of 50 MPH or greater, use Recessed Snowplowable Raised Pavement Markers with Dual Plastic Holders and Dual Lenses in a groove where alignments allows.

I-695 shall be treated as a Freeway for the design of pavement markings. All pavement markings on HMA on I-695 shall be Inlaid Pavement Marking Tape.

Durable Markings include thermoplastics, preformed thermoplastics (wet tape), or epoxy. All durable markings shall demonstrate wet retro reflective properties when tested in accordance with ASTM #E 2177-01 (Test Method for Measuring the Coefficient of Retroreflected Luminance (RL) of Pavement Markings in a Standard Condition of Wetness). Whenever paint is listed as an application, the 50/50 blend of large and standard glass beads is required.

For pavement markings along ramps, the Design-Builder shall utilize the highest category markings of the intersecting roadways.

All transverse pavement markings (i.e. yield symbols (shark's teeth), crosswalks, stop lines), as well as all arrows, symbols, and letters shall be permanent preformed thermoplastic.

Crosswalks shall be provided at all signalized intersections as specified in an approved Design Request. The Design-Builder shall make use of Enhanced Visibility crosswalks as per the Administration's memo titled "Enhanced Visibility Crosswalk Pavement Markings" dated March 5, 2019, or current version if a newer document has been issued.

All permanent pavement markings installed on the Project shall be listed on the Administration's List of Qualified Permanent Pavement Markings, unless submitted and approved through the Administration's Maryland Product Evaluation List (MPEL) program.

The use of flex posts or channelizing devices at Maryland T or J Turn intersections shall not be considered an acceptable alternative for physical channelization using curbs or barriers.

### **3.12.07 Traffic Signals**

#### **3.12.07.01 Traffic Signal Functional Operation Requirements**

Temporary traffic signals, permanent traffic signals, ramp metering signals, and existing traffic signal modifications shall be designed as per the requirements outlined in the Design Request Forms as coordinated by the Design-Builder with the appropriate District Traffic Office. All temporary and permanent traffic signals for this Project shall conform to requirements of the RFP including TC 3.08 Guidelines and References.

Any proposed temporary and permanent modifications to existing traffic signals (e.g. signal timing, phasing, turn restrictions, etc.) proposed by the Design-Builder shall be submitted to the Administration for review. If approved, the Design-Builder is required to prepare and submit a Design Request Form per "3.12.04.02 Preparation and Submittal of Design Request Form."

All temporary and permanent traffic signals proposed by the Design-Builder shall be coordinated with the appropriate District Traffic Office and meet their functional requirements. An approved Design Request from the Administration is required for any new traffic signals,



traffic signal reconstructions, ramp metering signals, and traffic signal modifications.

In addition, ramp metering signals shall be consistent with the Administration's installation of ramp metering signals along the I-270 corridor, and shall comply with the Administration's ramp metering signal guideline documents as noted in TC 2.07.03.

### **3.12.07.02 Design and Construction Requirements**

#### **3.12.07.02.01 Traffic Signal and Interconnect Plan Sheets**

The Design-Builder shall prepare traffic signal and interconnect plans to address any new traffic signals, temporary traffic signals, ramp metering signals, or modifications to existing traffic signals that are required.

#### **3.12.07.02.02 Traffic Signal Design and Construction Requirements**

Design and construction of all permanent traffic signal shall use mast arm signal poles. The use of diagonal single mast arms is not permitted. Any proposed alternatives to mast arm requirements shall be submitted by the Design-Builder to the Administration for review and approval. Design and construction of temporary traffic signals may use strain poles or wood poles (if the estimated duration of signal operation is less than one year) with span wires.

Light-Emitting Diode (LED) lighting shall be provided on signal poles in accordance with the Administration's current Lighting Guidelines, and shall be coordinated with adjacent existing and/or proposed roadway and/or sign lighting. Electrical cables for intersection lighting shall not pass through the signal cabinet, shall be equipped with a photocell and shall be wired to the metered service pedestal for the signal.

The Design-Builder shall prepare and submit Accessible Pedestrian Signal (APS) worksheets to the Administration for review and approval of APS messages. Countdown Pedestrian Signal (CPS) heads shall be used for signalized pedestrian crossings.

All conduits crossing roadways shall be installed perpendicular to the roadway being crossed, unless there are constructability or utility conflicts, in which case the Administration must approve of the proposed conduit route. With the exception of conduit being used for non-invasive probes, all conduit crossing underneath a roadway shall be 4 inch Schedule 80 rigid PVC conduit. Conduit used for the installation of non-invasive probes shall be 3 inch Schedule 80 rigid PVC conduit. Three (3) inch Schedule 80 rigid PVC may be used between handholes and pedestal poles with transformer bases. Two (2) inch Schedule 80 rigid PVC may be used between handholes and pedestal poles with breakaway couplings. Two (2) inch Schedule 80 rigid PVC conduit may only be used for power feeds where acceptable by the power company. The Design-Builder shall confirm and use the conduit size required by the power company providing power on this project. HDPE Polyethylene Conduit with a wall thickness equal to Schedule 80 may be used in lieu of PVC at the discretion and approval of the Engineer, generally for bored conduits. Splicing of HDPE conduit to PVC conduit is prohibited. HDPE, when used, shall be installed from

handhole/manhole to handhole/manhole in one continuous section.

Traffic signals shall be designed and constructed in accordance with the following:

- 1 A) Using base mounted (NEMA size S) Maryland State Econolite Traffic Signal Cabinets wired in accordance with Administration specifications for all permanent traffic signals. Pole mounted (NEMA size 5) cabinets may be permitted for use at temporary traffic signals only. All signal cabinets, controllers, and rack mounted modules will be supplied by the Administration for all signals except for those utilized for Ramp Metering. All signal cabinets, controllers, rack mounted modules and other components as needed for Ramp Metering shall be supplied by the Design-Builder as part of the Total Lump Sum Price. See TC 3.21 for additional Ramp Metering Requirements. The Design-Builder shall be responsible for delivering the assembled cabinet from the Administration's Traffic Signal Shop to the site and installing. The Administration will provide final connection of all cables within the cabinet for all signals except for those utilized for Ramp Metering;
- B) Using Light-Emitting Diode (LED) traffic signal heads and countdown pedestrian signal heads;
- C) Using schedule 80 rigid PVC conduit for underground installations, and,
- D) NEMA Size S cabinet uninterruptable power supply (UPS) battery backup shall be installed at traffic signals which meet any of the following requirements:
- Railroad Pre-emption
  - Airport obstruction lights
  - Located at military bases
  - Multiple intersection controllers
  - 2 or more intersections operated from a single controller
  - Point-control (police, crossing guard) intersections
  - FITA, mid-block with Hazard Identification Beacon (HIB), intersection with school HIB
  - Unusual geometry
  - Two or more right or left turn bays in same direction
  - Interactive warning beacons (Prepare to Stop When Flashing, etc.)
  - System master controller
  - Cell Modem Location in Hardwire Interconnect Systems
  - Interstate, State or US route ramp signals, including ramp metering signals and advance HIB flashers
- E) Provide high speed data communications to traffic signal cabinets which are installed or modified under this project. Using cellular communication and Ethernet switches for communication between traffic signals and the MDOT SHA Advanced Transportation Management System (ATMS) in accordance with ATMS Implementation and Design Guidance for Traffic Signals memorandum dated 12-20-2016 or latest revisions is acceptable to meet this requirement.
- F) Ramp metering signals shall meet the consistency and guideline documents noted above and shall be comprised of the following:
- Provide two signal indications for both single and two lane ramp layouts. Single lane ramp layouts shall have 12' separation between ramp metering signal heads,

with the left signal head mounted 6' from the left edgeline. Two lane ramp layouts shall have 15' separation between ramp metering signal heads, with the left signal head mounted 2' from the left edgeline.

- An advance hazard identification beacon (HIB) connected to the ramp metering signal controller for coordinated operations. The HIB shall be comprised of two 12" circular LED signal heads mounted above a diamond "RAMP METERED WHEN FLASHING" W3-8 sign (min. 36"x36" size) with a supplemental rectangular "PREPARE TO STOP" plaque (min. 36"x18" size).
- Ground mounted signs shall be installed at the stop line to consist of "STOP HERE ON RED arrow" R10-6aR/L signs (min. 24"x30" size).
- An overhead mounted "ONE VEHICLE PER GREEN" R10-28 sign (min. 24"x30" size) shall be installed in between the ramp metering signals.

The Design-Builder shall ensure all traffic signal heads for existing, temporary, and permanent conditions can be seen by all approaching traffic at the required sight distance at all times during and after construction. The Design-Builder shall prepare and submit to the Administration for review and comment sightline profiles for all overhead signs, bridges, and hazard identification beacons that are on traffic signal approaches, including calculations that the sight distance will be adequate for vehicles approaching signalized intersections to see the back of the queue and decelerate to a stop condition for all approaches to traffic signals under existing, temporary, and permanent conditions. If sight lines do not meet the Maryland MUTCD requirements, the Design-Builder shall provide a recommendation for meeting the requirements to the Administration for approval, such as red signal ahead warning signs or flashing beacon signs. UPS battery backup must be provided for interactive HIBs.

### **3.12.07.02.03 Interconnect Design and Construction Requirements**

The Design-Builder shall obtain all existing interconnect information and all existing interconnected signals shall remain connected under the final design. All existing traffic signal interconnect shall be maintained throughout construction, which may require relocation or temporary interconnect. Along any run of existing interconnect there shall be no net increase in splice points. The Design-Builder shall utilize twelve-pair communication cable (twisted pair or fiber, as required) for all proposed interconnect. All impacted or damaged interconnect cables shall be replaced in-kind.

The Design-Builder shall be solely responsible for all work and costs associated with maintaining communication cable for all signals throughout construction. The Design-Builder shall be responsible for coordinating the relocation of any existing interconnect cable attached to utility poles. All interconnect shall be relocated prior to roadway construction in order to assure that interconnect can be maintained throughout construction. The Design-Builder shall be responsible for relocation of any existing interconnect (twisted pair or fiber optic cables) impacted by construction. The Design-Builder shall coordinate with MDOT SHA/County to facilitate the relocation of existing interconnect and fiber optic cables and equipment. All proposed splices shall occur in signal cabinets. If a section of interconnect run is not long enough to be relocated, the entire section of cable shall be

replaced. The Design-Builder shall be responsible for obtaining all permits required for placing interconnect on utility poles and shall be responsible for all associated costs.

In locations where the Design-Builder completes work within an interconnected system which is not already converted to the Advanced Transportation Management System (ATMS) using high speed data communications, the Design-Builder is responsible for converting all locations within the interconnect system to ATMS using high speed data communications. This is typically accomplished by installing a cellular modem at a single location within the interconnect system and installing Ethernet switches in all other cabinets within the system.

#### **3.12.07.02.04 Utility Design and Construction Requirements**

The Design-Builder shall be responsible for locating and marking all underground and overhead utilities prior to any work. The Design-Builder shall be responsible for all work, materials, and costs associated with obtaining power (including coordination with the utility company). Electric costs for maintaining power throughout construction for all traffic signals and other electrical work required for this Project shall be the responsibility of the Administration. The Design-Builder shall be responsible for completing all electrical service application materials necessary for obtaining and/or removing service from the appropriate power company. All materials shall be submitted to the power company through the Administration.

The Design-Builder shall use 200A Metered Service Pedestals at all traffic signal locations, unless otherwise noted by the Administration. The Design-Builder shall install conduit between the metered service pedestal and the nearest handhole (bypassing the signal cabinet) for intersection lighting. The Administration will be responsible for all on-going electric costs of proposed signal equipment after the signals have been accepted for Maintenance by the Administration. Metered Service Pedestals shall only be used to service traffic signal equipment and related intersection lighting, unless otherwise noted by the Administration. The current party responsible for any existing metered service that needs to be upgraded or replaced will continue to be responsible for all on-going electric costs after the Project is complete. For each location requested, it is the Design-Builder's responsibility to complete all paperwork, coordinate with the utility company, and schedule all utility connections so as to not adversely affect the project schedule.

The Design-Builder shall schedule meetings with the Administration to verify traffic control device work as follows:

- A) At the completion of all cabling and wiring and prior to electrical utility service connection; and
- B) Prior to traffic control device activation.

### **3.12.08 Lighting**

#### **3.12.08.01 Design and Construction Requirements**

Lighting shall be provided in accordance with the Administration's Lighting Guidelines, most recent version, and all other relevant standards as provided in TC 3.08 Guidelines and References. The Design-Builder shall design and construct all necessary lighting required per this RFP to meet the traffic operations as part of their proposal. This may entail the design and construction of proposed lighting, and/or modifications to existing lighting. Modifications to existing lighting may require removal and/or replacement of existing lighting. Existing lighting may remain throughout the project limits provided it does not require modification to meet the proposed traffic operations or is not physically impacted by construction.

The lighting requirements for this project are as follows:

- Photometric calculations must be performed using the lighting fixture which will be installed in the field, any deviation must be approved by the Administration;
- At a minimum partial interchange lighting shall be provided at all interchanges affected by the Design-Builder's proposed project within the project limits in accordance with Administration's Lighting Guidelines;
- The Design-Builder shall evaluate the lighting needs associated with their proposed improvements to the roadways throughout proposed project limits including the introduction of new ramp merges, ramp operations modifications, shoulder use, etc. All proposed lighting shall follow the Administration's Lighting Guidelines or national guidance and best practices in the absence of specific guidance in the TC 3.08 Guidelines and Requirements.
- All roundabouts in the project limits shall be lit per the Administration's Lighting Guidelines;
- Partial intersection lighting shall be provided at all traffic signals; and
- As-Built lighting inventory data shall be supplied to MDOT SHA in accordance with the Special Provisions.

#### **3.12.08.01.01 Lighting Plan Sheets**

The Design-Builder shall complete a lighting analysis for all areas where new or modified lighting is proposed to be submitted to the Administration for review and comment prior to preparing the lighting plans. The submission shall include photometric calculations (illuminance and veiling luminance as appropriate) supporting the light locations and voltage drop calculations for all circuits.

The Design-Builder shall prepare and present lighting plans with a scale appropriate for the Project, generally 1"=50' or the established roadway plan scale when appropriate. Plans shall include existing and proposed geometry, existing and proposed utilities, right-of-way, landscape features, applicable drainage features, ditch lines, applicable structural facilities, and other information required for coordination of utilities. Plans shall show location of new lighting, type and mounting height of poles, type and wattage of luminaires, length of luminaire arms, removal and relocation of existing lighting, conduit, circuit routings, cable types and installation method, manholes/junction boxes, splice locations with appropriate connector kits, ground rod locations, signs to be lit, electrical service locations, and other details pertinent to the construction.



The lighting plans shall include standard Administration identifiers for light poles and manholes as well as standard designations for cable sizes. The plans shall include a panel schedule (including pole and base mounted lighting cabinets and metered service pedestals) showing the circuit breaker loads and equipment connected to each circuit breaker. The plan shall include a schedule of light poles, a sign lighting schedule, and a schedule of enclosures (manholes/vaults/junction boxes.) Voltage drop calculations shall be provided concurrently with the lighting plan sheets.

For each lighting submittal, the Design-Builder shall submit all available lighting sheets (updated and previously submitted) as one complete package. The submission shall include photometric calculations (illuminance and veiling luminance as appropriate) supporting the light locations and voltage drop calculations for all circuits.

The Design-Builder shall combine intersection lighting with the traffic signal plans whenever possible.

### **3.12.08.01.02 Lighting Design and Construction Requirements**

Prior to any construction activities, an inventory of the existing lighting system shall be conducted to document which luminaires, including signs and roadway, are operating. For existing lighting, the maximum outage time for luminaires shall be 24 hours unless otherwise approved by the Administration. All proposed luminaires within the Project limits shall be working upon completion of the Project. All existing (to remain) luminaires within the Project limits that were working at the time of conducting the existing lighting inventory shall be working upon completion of the Project and are to be maintained throughout the duration of the construction.

All roadway lighting installed under this Project shall be located a minimum of 50 feet from any overhead or cantilever structure.

All lighting cabinets shall be designed and constructed with at least 20 amps spare capacity for the Administration's future use.

All proposed lighting equipment shall be located such that it can be readily maintained by personnel of the maintaining agency. Where possible, the Design-Builder shall locate signal and lighting cabinets in the same quadrant of the intersection/interchange. Lighting placed on traffic signal equipment shall be serviced from a metered service pedestal. Each luminaire mounted on a signal structure shall be equipped with a photocell. Power supply for signal structure mounted lighting and the traffic signal may be installed in the same conduit system.

The voltage drop for each branch circuit shall not exceed five percent for new circuits or existing circuits, assuming a cable temperature of 40 degrees Celsius. A minimum of two branch circuits shall be used for each continuous succession of lighting structures. All lighting circuits shall have balanced lighting loads. The voltage drop for each feeder circuit

shall not exceed the maximum recommended by the National Electric Code (NEC).

Lighting circuits shall be direct-buried duct cable unless under roadway surfaces, in structures, or in locations where protection from surface loading is needed. Two conductor duct cables shall be used for all roadway lighting circuits. Four conductor duct cable is permitted for sign lighting circuits. Only the conductors that serve the lighting structures shall enter the foundation of the lighting structures. All other conductors shall remain unspliced and bypass the foundation. The Design-Builder shall furnish and install single conductor Type USE cables in Schedule 80 rigid PVC conduit under all roadway surfaces. Single conductor cables shall be used any place cables are to be installed in conduit. For cable runs in bridges and/or parapets, cables sizes equal to or less than #6 AWG shall be used.

The Design-Builder shall provide electrical manholes (or vaults) and connector kits to splice the conductors. The Design-Builder shall provide no more than 30 connector kits in each manhole and no more than 50 connector kits in each electrical vault. No in-ground splices of electrical cables shall be permitted for any reason. The use of 'splitbolt' type connectors for splicing conductors shall not be permitted. The Design-Builder shall use waterproof electrical splice kits (sealed with silicone gel) or approved equal for splicing conductors in non- breakaway applications such as manholes and other similar underground locations.

No foundations or electrical handholes/handboxes/manholes shall be placed in drainage ditches. Electrical manholes shall be constructed of concrete. Manholes constructed of composite materials will not be permitted for use on the Project. The stone surrounding these structures shall not be considered a suitable outfall. Underdrain shall be connected to a suitable outlet such as a drainage pipe or structure. If a drainage structure is not available, the Design-Builder shall submit alternative designs to the Administration for review and approval. The Design-Builder shall abandon existing conductors between poles that are to be removed. Power supply for lighting (other than that mounted on signal structures) shall be installed in separate conduit (including cabinets, handboxes, handholes, and manholes/vaults) and on independently metered circuits for respective jurisdictional owners.

All underground lighting conduits shall be constructed of Schedule 80 rigid PVC conduit. All exposed conduit shall be constructed of galvanized rigid steel. PVC coated rigid galvanized steel conduit shall be used from the nearest manholes/handhole below grade to a minimum of 2' above grade. Conduit fill ratios shall not exceed 25% of conduit area. HDPE Polyethylene Conduit with a wall thickness equal to Schedule 80 may be used in lieu of PVC at the discretion and approval of the Engineer, generally for bored conduits. Splicing of HDPE conduit to PVC conduit is prohibited. HDPE, when used, shall be installed from handhole/manhole to handhole/manhole in one continuous section.

All light poles that are not protected by traffic barrier and are in the clear zone as defined in the AASHTO Roadside Design Guide shall be installed on a breakaway transformer base complying with the Maryland Book of Standards. Light poles shall not be installed in front of traffic barrier.

The lighting system shall utilize cabinets, conduits, and handboxes/manholes/vaults/junction boxes separate from the traffic signal or ITS equipment. Common metered service pedestals may be used.

The Design-Builder shall place luminaries approximately one foot over the pavement marking edge line. To avoid foundation conflicts, the luminaire location may be located between 1' inside to 2' outside of the pavement marking edge line. Where such adjustments are made, the Design-Builder shall ensure that all other design requirements are being met.

Illuminance and veiling luminance calculations shall include uniformity ratios (average-to-min and max-to-min), point-by-point computations, and a summary of the minimum and average maintained lighting levels and the critical veiling luminance ratios. The Design-Builder shall apply a light loss factor of 0.64 when computing photometrics. For lamp types not listed in Section 950.12.02, the Design-Builder shall use the values provided by the manufacturer. The light loss factor and lamp lumens shall be provided with the illuminance and veiling luminance calculations. For LED luminaires, the Design-Builder shall use fixtures listed on the MDOT SHA Qualified Producers and Products Lists (QPL). All LED fixture choices shall be approved by the Office of Traffic and Safety. Point-by-point computations shall be provided for all proposed interchange, roundabout, intersection and roadway lighting. Photometric calculations shall be performed with the fixture which is intended for installation on the project.

At a minimum, intersection lighting calculation grids shall include the area of the intersection bound by the stop lines (or the location where a stop line would be located on an uncontrolled approach). Calculation grids for channelized right turns or channelized left turns at at-grade intersection shall be placed in accordance with Figure III-A.2 and Figure III-A.3 from the Administration's Lighting Guidelines unless waived by the Engineer through the design process. The recommended and optional light poles shown in Figure III-A.1 of the Administration's Lighting Guidelines shall be considered required unless waived by the Engineer through the design process. Calculation grids for roundabout intersections shall extend to the nose of the separation median islands. In locations where 600 feet or less is provided between any two light poles, the 600 feet or less shall be lit and included within a lighting calculation grid. All gaps of lighting 600 feet or less shall be lit. Calculation grids for secondary ramp merges or diverges shall be placed in accordance with Figure III-A.2 and Figure III-A.3 from the Administration's Lighting Guidelines.

The Design-Builder shall design, fabricate, and install all roadway lighting shown on the lighting plan within 5 feet of the location shown on the lighting plan.

### **3.12.08.01.03 Existing Lighting Design and Construction Requirements**

All impacted existing roadway lighting shall be replaced by the Design-Builder unless otherwise directed by the Administration. Lighting shall incorporate the same luminaire and pole type as on the rest of the roadway in order to maintain consistency.

The Design-Builder shall design and construct the lighting system consistent with



operational and engineering requirements of the utility company and owning/maintaining agencies. For locations where luminaires are attached to a utility pole, the Design-Builder (as a part of the utility relocation effort) shall contact the owner of the lighting to coordinate relocation of the light fixture. The Design-Builder is responsible for coordinating agreements between the owner and the utility company.

The Design-Builder shall remove existing light poles that are no longer required due to construction of the Project. The equipment shall be the property of the Design-Builder upon removal. The Design-Builder shall notify the owner of the lighting being removed at least two weeks in advance of scheduled equipment removal.

Any existing lighting structure that is impacted by construction of this Project shall be disconnected, reconnected, and made fully operational by the Design-Builder as part of this Project. All abandoned cables shall be made safe.

#### **3.12.08.01.04 Sign Lighting Design and Construction Requirements**

Overhead sign lighting shall only be installed under the following criteria:

- A) All overhead or cantilever mounted signs with unencumbered sight distance of less than 1,000 feet. Unencumbered sight distance exists if all portions of every overhead sign panel on that structure is visible to motorists in all approaching lanes.
- B) Additional lighting may be considered and requested as part of the Design Request based on Engineering Judgement to address site specific conditions.
- C) All overhead or cantilever mounted signs which have sign sheeting which does not meet or exceed ASTM D4956 Type XI shall be lit.

Sight distance as noted above should be considered when selecting locations for new structures. All signs on a structure with any one sign that requires lighting shall be lit.

Lighting for all new sign structures shall follow the above criteria. Individually mounted sign lighting fixtures with luminaires is the preferred method of illumination of signs; sign lighting maintenance systems should only be used at the discretion of the Administration's Office of Traffic Safety (OOTS). All existing sign lighting will be upgraded to LED lighting; all new lighting shall be LED. Where existing signs are replaced with new signs fabricated from ASTM D4956 Type XI sheeting, the need for sign lighting will be determined according to the above criteria. If any overhead sign does not require lighting it shall use ASTM D4956 Type XI sheeting which shall be specified on the sign detail sheets.

Lighting for new sign structures shall consist of individually mounted sign lighting fixtures. Signs shall be only lit from beneath the signs. Acceptable lighting shall consist of a long-life system, meeting the following requirements:

- A) Using Light Emitting Diode (LED) luminaires approved by the Administration;
- B) Having a functional life time of at least 100,000 hours, including lamp and ballast;
- C) Having < 50% failure of any component at 60,000 hours, including lamps; and

D) Having a lamp lumen depreciation not worse than 70% at 60,000 hours.

All sign lighting shall be on dedicated circuits. For each sign structure a minimum of two circuits shall be used. The sign lighting design shall be shown on the roadway lighting plans. The design of luminaires for sign illumination using long-life lighting systems shall be in accordance with Administration's Office of Traffic and Safety's standard lighting charts contained within the Traffic Engineering Design Division's Traffic Control Devices Design Manual, available on the Administration website.

All sign lighting systems shall be designed to provide an average of 20 to 40 foot candles with 6:1 max to min uniformity. Photometric calculations shall be on a 1 foot grid over the entire surface of the sign. All existing sign lighting within Project limits that is impacted by construction activities shall be maintained throughout construction.

#### **3.12.08.01.05 Leased Lighting Design and Construction Requirements**

For locations where luminaires are attached to a utility pole, the Design-Builder (as part of the utility relocation effort) shall contact the appropriate agency to coordinate relocation of the light fixture or installation of new light fixtures provided photometric analysis supports the changes. In cases where the photometric analysis supports the change, the Design-Builder shall also develop lighting plans for submission to the Administration for review and approval. The Administration will be responsible for coordinating agreements with the utility company.

#### **3.12.08.01.06 Temporary Lighting Design and Construction Requirements**

All existing roadways which have roadway lighting shall remain illuminated at IES minimum levels for the duration of the Project unless approved otherwise by the Administration.

The Design-Builder shall maintain all existing lighting within the Limits of Work throughout construction. Where temporary lighting is needed to maintain the existing lighting levels in the Project area, the Design-Builder shall install and maintain temporary lighting (cobra heads attached to wood poles). Temporary overhead electrical service is acceptable for non-breakaway poles. The Design-Builder shall remove temporary lighting when no longer needed. The Design-Builder shall be responsible for the power costs of any and all temporary lighting that may be required and it is the Design-Builder's responsibility to schedule all utility connections.

#### **3.12.08.01.07 Electrical Service for Lighting Design and Construction Requirements**

The Design-Builder shall be responsible for locating and marking all underground and overhead utilities prior to any lighting work beginning. The Design-Builder shall be solely responsible for all work, and materials, and costs associated with obtaining power (including coordination with the power company). Electric costs for maintaining power throughout

construction for all lighting facilities and other electrical work required for this Project shall be the responsibility of the Administration. The Design-Builder shall be responsible for completing all electrical service application materials necessary for obtaining service from the appropriate power companies. All materials shall be submitted to the power company through the Administration. The Design-Builder shall contact all utility companies to fulfill requirements to determine the location of all existing and proposed utilities, obtain power company requirements for service and obtain power company approval for service location(s). For each location requested, it is the Design-Builder's responsibility to complete all paperwork, coordinate with the utility company, and schedule all utility connections so to not adversely affect the Project schedule.

Lighting systems owned by different jurisdictions shall have separate power sources derived from the utility company. Exceptions shall require written approval and agreement of all jurisdictions involved and will require separate circuits for each jurisdiction's electrical elements fed from the electrical service equipment.

**3.12.08.01.08 Light Pollution**

For all proposed roadway lighting, the maximum allowable vertical and horizontal illuminance at residential property lines shall not exceed 0.05 foot-candles (fc). Photometric analyses for light trespass at residential property lines is required and the analysis shall utilize a light loss factor of 1.00. House side shielding shall be provided on all roadway lighting, as necessary based on photometric calculations or as requested by the Engineer.

**3.12.09 Bicycles**

All signing and marking design and construction of bicycle facilities shall be in accordance with the Maryland MUTCD, the most recent revision of the Administration's "Bicycle Policy and Design Guidelines," and the other relevant requirements of the Guidelines and References in TC 3.08. If the Design-Builder proposes use of a non-standard sign, the Design-Builder shall prepare the Administration's Office of Traffic and Safety's Non-Standard Regulatory & Warning Sign Approval Form. The Design-Builder shall work with the Administration's Office of Traffic and Safety – Traffic Engineering Design Division and appropriate District Traffic Office to provide bicycle control that is acceptable to both offices.

**TC 3.13 LANDSCAPE AND REFORESTATION DESIGN AND  
CONSTRUCTION PERFORMANCE SPECIFICATIONS**

**3.13.01 General**

The Design Build Team (DBT) shall design and install landscape plantings associated with the project in accordance with this specification. It is the responsibility of the DBT to coordinate proposed landscaping with proposed improvements and with existing elements to remain, including but not limited to; traffic control devices, utilities, vegetation, adjacent land uses, site distances, and recovery clear zones.

The DBT shall include a Professional Landscape Architect (PLA), licensed to practice in the State of Maryland, with at least 10 years of experience related to highway corridor landscape design and construction. The PLA will address the functional and aesthetic needs of the project, in collaboration with all other disciplines for the Project. This includes the preparation and implementation of design responses to project requirements. The PLA shall understand MDOT SHA's context sensitive solutions process as outlined in the MDOT SHA's Landscape Design Guide (LDG); be knowledgeable of native vegetation of the Piedmont Region of Maryland; be experienced in the requirements of the Maryland Reforestation Law; be experienced in Maryland Department of the Environment (MDE) and MDOT SHA requirements for stormwater management and associated plantings; and be knowledgeable about the LDG, Landscape Management Guide (LMG), and Landscape Chapter of the MDOT SHA Highway Construction Cost Estimating Manual. The Administration reserves the right to request a resume to verify qualifications.

**3.13.02 Guidelines and References**

Design and construction of landscape and reforestation plantings shall be in accordance with this Landscape and Reforestation Design Performance Specification and the relevant requirements of the Guidelines and References in TC 3.08.

**3.13.03 Preservation and Protection of Woodlands**

The DBT shall design and construct the project to minimize the removal of healthy, native or non-invasive non-native trees and avoid or minimize impacts to existing tree stands, and specimen and significant trees in good to fair condition by using tree protection measures in accordance with this Landscape and Reforestation Design and Construction Performance Specification and the relevant requirements of the Guidelines and References in TC 3.08. The DBT shall design and implement sound tree protection measures in accordance with the 2019 SSCM, Section 120 - Tree Preservation Area, and with ANSI A300.

- A. Impacts to individual trees, woods, and forest areas located within the project limit of disturbance include, but are not limited to: tree branch pruning, tree felling, and root pruning. Work performed shall be in accordance with the

MD Reforestation Law and/or Roadside Tree Law, as applicable, and with Section 120 - Tree Preservation Area. The DBT shall clearly indicate tree removals and tree protection measures on the erosion and sediment control plans. Impacts to individual specimen and significant trees located within the project limit of disturbance shall include, but are not limited to: tree branch pruning, tree felling, canopy pruning, trunk protection, root protection and root pruning

B. The DBT shall maintain compliance with the USDA Federal and State requirements and quarantines for regulated materials or organisms, including, but not limited to, the following:

1. Regulated materials for the Federal Emerald Ash Borer (EAB) Quarantine include:
  - a. Any life stage of the Emerald Ash Borer
  - b. Hardwood firewood
  - c. Any piece of *Fraxinus* spp. (Ash), including cut or fallen, living or dead.
  - d. Any uncomposted Ash chips or uncomposted Ash bark, larger than 1 inch in any two dimensions.
2. Regulated materials for the Quarantine of Thousand Cankers Disease of Walnut, Maryland Department of Agriculture Plant Protection Order #19-01 are as follows:
  - a. Any life stage of the walnut twig beetle, *Pityophthorus juglandis*
  - b. The fungal pathogen, *Geosmithia morbida*
  - c. Firewood of any non-coniferous species
  - d. All plants and plant parts of the genus *Juglans* including but not limited to nursery stock, budwood, scionwood, green lumber, firewood, and other material living, dead, cut, fallen including stumps, roots, branches, mulch, and composted and uncomposted chips.
  - e. Any other article or means of conveyance when it is determined by an inspector to present a risk of spread of Thousand Cankers Disease.
3. If the Spotted Lanternfly Quarantine MDA Plant Protection Order #19-02 expands into the project area prior to or during the project, compliance will be required.

C. The DBT shall prioritize the preservation and protection of specimen and significant trees to the extent feasible.

1. Specimen trees are defined as trees with a Diameter at Breast Height (DBH) of 30 inches or greater, or at least 75% of the DBH of the MD State Champion of the species, whichever DBH measurement is smaller.

2. Significant trees are defined as trees a DBH of 24 inches to less than 30 inches or at least 50% of the DBH of the MD State Champion of the species.
  3. DBH is measured at 4.5 ft. up from the ground line on the uphill side of the tree.
- D. The DBT shall employ the services of a qualified professional who is a Maryland Registered Forester, Professional Landscape Architect (PLA), ISA-certified Arborist, or a Maryland Licensed Tree Expert (LTE) to perform the following activities:
1. Conduct an on-site inspection to document the location and assess the condition of specimen and/or significant trees within the limit of disturbance.
  2. Conduct an on-site inspection to document the location and assess the condition of specimen and/or significant trees located outside the limits of disturbance but with Critical Root Zones (CRZ) located within the limits of disturbance.
  3. Calculate and graphically indicate the CRZ of specimen and/or significant trees where the trunk is located up to 30 feet outside the limit of disturbance. The CRZ radius equals 1 foot per 1 inch of DBH for trees less than 30 inches DBH; and a radius of 1.5 feet per inch DBH for trees 30 inches DBH or greater.
  4. Evaluate general health, species composition, and characteristics of forest stands and specimen trees to determine priorities for preservation.
  5. Prepare a Tree Impact Avoidance and Minimization Report as described under TC 3.13.23.02 Landscape Submittals and consistent with the 2019 SSCM Section 120 - Tree Preservation. Submit the Report to the Office of Environmental Design, Landscape Programs Division (OED-LPD) for review and approval. Approval must be received prior to installation of erosion and sediment controls.
  6. Coordinate tree protection measures with erosion and sediment control measures.
  7. Conduct Level 2 tree risk assessments (per ANSI A300 Part 9) prior to and during construction for significant and specimen trees located within the limits of disturbance which may be preserved during construction or located within 50 ft of the limits of disturbance and make recommendations for tree protection measures or risk mitigation by tree branch pruning or tree removal.



8. Monitor and provide direction to the DBT during construction regarding risk reduction measures such as pruning or removal trees located in close proximity to work areas, travel lanes, roadway shoulders, pedestrian ways, highway structures, and adjacent structures.
  9. Prepare the application and supporting documentation as necessary to obtain the Roadside Tree Permit or Reforestation Site Review Approval from Maryland Department of Natural Resources - Forest Service (DNR-FS) for cumulative impacts to trees and forest areas within the project limits.
- E. A Maryland Licensed Tree Expert (LTE) shall provide direct oversight of tree work during construction as required by the MD Roadside Tree Law, other applicable MD State Laws, and/or as described in 2019 SSCM, Sections 712 through 716.
1. The LTE shall conduct constructability review of tree protection measures on erosion and sediment control plans, and coordinate adjustments to protection measures where necessary.
  2. The LTE shall maintain project compliance with the Federal and State quarantines on the Fraxinus (Ash) species, Black Walnut, and other regulated materials. Provide a plan for disposal of Ash trees, Black Walnut, and other regulated materials impacted by the project, subject to the approval of MDA.
  3. The LTE shall ensure tree protection measures are correctly installed and maintained during construction and monitor the condition of significant and specimen trees for signs of stress and decline during construction.

**3.13.04 Department of Natural Resources - Forest Service Coordination**

The DBT is to obtain the necessary permits and/or approvals under the Maryland Reforestation Law (Reforestation Law), and/or Maryland Roadside Tree Law (Tree Law) from MD Department of Natural Resources Forest Service (DNR-FS) for impacts to trees and forest areas within the proposed cumulative limits of disturbance for the Project. Field work to inventory tree and forest resources as well as preparation of plans indicating forest and tree impacts, preservation areas, and tree protection measures are the responsibility of the Design Build Landscape Architect, or other approved professionals as per TC 3.13.03.



- A. Tree removal or other work impacting the critical root zones of State or County Champion Trees will be prohibited without approval by DNR-FS and the concurrence of the MDOT SHA. Champion Trees removed without DNR-FS and MDOT SHA's approval will be replaced with trees 2 in. caliper minimum in size, at a 1:1 ratio: one caliper inch for every one caliper inch of damaged or removed tree.
- B. The DBT shall be responsible for replacing specimen or champion trees of fair to good condition outside the limit of disturbance (LOD) that are damaged or

removed by construction operations without prior approval by the MDOT SHA. The replacement plantings will be trees 2 in. caliper minimum in size, at a 1:1 ratio: one caliper inch for every one caliper inch of damaged or removed tree.

- C. The Design-Build Team is to perform the necessary field inventory and prepare the application, forest and tree impact plans, and mitigation planting plans for review by DNR-FS in accordance with the applicable regulations.
  - 1. If cumulative forest impacts will be an acre or more, a Reforestation Site Review approval will be required from DNR-FS.
  - 2. If cumulative forest impacts are less than an acre, a Roadside Tree Permit will be required for tree and forest impacts located within MDOT SHA or municipal highway rights-of-way.
  - 3. The DBT shall include impacts to TMDL reforestation as forest impacts under the MD Reforestation Law or tree impacts under the MD Roadside Tree Law, depending on which law is applicable.
- D. The Design-Build Team shall submit the application packages to the MDOT SHA's Office of Environmental Design, Landscape Programs Division (OED-LPD) for review and concurrence prior to submittal to DNR-FS. The DBT shall provide all documentation required by DNR-FS for reviews and approvals.
- E. The Design Build Team shall attend site review meetings with DNR-FS if requested by DNR-FS or the MDOT SHA.
- F. If work will impact trees beyond the permitted limits, the DBT shall develop and submit revised Forest Impact Plans for required modifications to the approved Roadside Tree Permit or Reforestation Site Review. Submit documents to OED-LPD for review prior to submittal to DNR-FS. Compliance with additional DNR-FS requirements or conditions associated with approval modifications shall be the responsibility of the DBT.
- G. Documentation of impacts to TMDL reforestation areas and proposed onsite mitigation areas shall be provided to the MDOT SHA as supplemental information to the Roadside Tree Permit or Reforestation Site Review application package.
- H. Mitigation and/or penalties for forest impacts in excess of an approved Reforestation Site Review or Roadside Tree Permit shall be the responsibility of the DBT, and may include payment of fines, a site search for offsite mitigation, obtaining right of way, agency reviews and approvals, reforestation



design, site preparation, reforestation plantings, invasive species management, and extended tree establishment.

**3.13.05 Forest and Tree Impacts Mitigation**

The DBT shall maximize on-site individual tree and/or reforestation mitigation for impacts to trees and/or forest areas per MD Roadside Tree Law, and/or MD Reforestation Law, as applicable. On-site replacement of impacted TMDL Tree plantings shall be prioritized over other reforestation mitigation required under the applicable MD Tree Laws.

- A. Mitigation for all forest impacts shall be the responsibility of the DBT, and may include a site search for offsite mitigation, additional agency reviews and approvals, reforestation design, offsite forest banking, invasive species management, right-of-way acquisition, construction, and extended maintenance agreements.
- B. The order of preference for the location of reforestation and mitigation tree plantings is as follows:
  - 1. Cleared MDOT SHA land within the project limits adjacent to existing, preserved forest areas and not in locations reserved for future roadway widening or other improvements.
  - 2. Cleared MDOT SHA land within the project limits adjacent to existing, preserved wetlands, waters of the U.S., wetland buffers, or riparian buffers, and not in locations reserved for future roadway widening or other improvements.
  - 3. Cleared MDOT SHA land within the project limits that is not reserved for future roadway widening or other improvements and provides a screening benefit for adjacent sensitive land uses.
  - 4. Cleared MDOT SHA land within the project limits that is not reserved for future roadway widening or other improvements.
  - 5. Offsite, cleared MDOT SHA land within the watershed limits adjacent to existing, preserved forest areas and not in locations reserved for future roadway widening or other improvements.
  - 6. Offsite, cleared MDOT SHA land within the watershed limits adjacent to existing, preserved wetlands, waters of the U.S., wetland buffers, or riparian buffers, and not in locations reserved for future roadway widening or other improvements.
  - 7. Offsite, cleared MDOT SHA land within the watershed limits that is not reserved for future roadway widening or other improvements.

8. Offsite, cleared MDOT SHA land within the county limits adjacent to existing, preserved forest areas, wetlands, waters of the U.S., wetland buffers, or riparian buffers, and not in locations reserved for future roadway widening or other improvements. Offsite, cleared MDOT SHA land within the county limits that is not reserved for future roadway widening or other improvements. Offsite areas on MDOT SHA land, other State Lands, or private lands under a protective easement, in coordination with, and pending the approval of, MDOT SHA and DNR-FS.

**3.13.06 General Landscape Design and Construction Requirements**

The DBT shall design, construct, and establish landscape, reforestation, and mitigation plantings within the project limits. The Design-Build Team shall coordinate the Reforestation and Landscape Plans with other elements of work to be performed under the Contract including, but not limited to: grading, stormwater management facilities and ancillary structures, drainage swales, storm drain, utilities, paved areas, maintenance access ways, traffic control devices, and lighting.

- A. If the DBT or MDOT SHA identifies a conflict between the Landscape Plans and other plan sheets or as-built conditions during design or in construction, the DBT shall be responsible for modifying the plans and/or correcting conflicts in construction.
- B. The DBT shall indicate tree removals, tree preservation, tree protection, and impact minimization measures on erosion and sediment control plans. The DBT shall ensure tree protection measures are coordinated with the sequence of construction.
- C. Furnish seed and seed mixes according to the 2019 SSCM and in accordance with applicable State and Federal Law. The DBT may submit requests to modify MDOT SHA seed mixes or develop custom seed mixes. Submitted requests in writing to the MDOT SHA. Approval of modifications shall be at the sole discretion of the MDOT SHA.
- D. Plant selections shall be appropriate for the environmental conditions of the planting site, including microclimate, air and water-borne salt, drainage, soil type, chemistry and pH. Recommended plant species, minimum sizes and plant per ANSI standards, and spacing or density requirements are listed in 7.05 for each of the Landscape Zones. The DBT may reference the MDOT SHA Preferred Plant List (PPL) for additional acceptable species suited to the project site. Submit written requests for substitution of other species, selections, and cultivars to the MDOT SHA. Approval of modifications shall be at the sole discretion of the Administration MDOT SHA.
- E. The DBT may recommend and install wildlife damage prevention devices to protect the proposed landscaping. Installation and maintenance of wildlife damage prevention devices will be the responsibility of the DBT.

- F. The DBT shall be responsible for the replacement of landscaping that is damaged by wildlife through Final Acceptance.
- G. The DBT shall be responsible for invasive species and high-risk tree management within vegetated areas of the ROW as per TC 3.13.21.

**3.13.07 Landscape, Tree Mitigation, and Reforestation Plans**

The Design-Build Landscape Architect shall prepare a set of Landscape Plans for Landscaping and Reforestation, based on the Forest Impacts Plan and Request for Proposal. Refer to TC 3.13. 7.05 Landscape Submittals for detailed instructions for each submittal.

- A. Landscape and Reforestation Plans will include the following information:
  - 1. Environmental/surface features, extending at least 100 ft. beyond the Proposed Right-of-Way or Temporary Construction Easements, whichever distance is greater. Include ownership and parcel numbers for each adjacent parcel.
  - 2. Critical Root Zones (CRZ) for significant and specimen trees to remain. For this contract, the CRZ radius equals 1 foot per 1 inch of DBH for trees less than 30 inches DBH; and a radius of 1.5 feet per 1 inch of DBH for trees 30 inches DBH or greater.
  - 3. TMDL tree planting reforestation locations.
  - 4. Tree preservation measures and details including, but not limited to, fencing, signage, tree planking, root protection, fertilizing, root aeration, tree branch pruning, root pruning, and sequencing of construction indicating any additional requirements for tree preservation not identified in the Erosion and Sediment Control Plans. Sequence of construction shall be coordinated with Erosion and Sediment Control Plans.
  - 5. Existing roadway and incidental structures, including, but not limited to: retaining walls, noise barriers, overhead signs, and utilities.
  - 6. Combined limit of disturbance (LOD) for all erosion and sediment control phases.
  - 7. Proposed improvements, including but not limited to traffic control devices and signs, highway and incidental structures, traffic barriers, drainage features, storm drains, SWM facilities, highway lighting and cabinets, utilities.
  - 8. Areas of subsoil and topsoil placement, including type (salvaged or furnished) and depth. This information may be indicated with notes if necessary.

9. Soil Enhancement Areas. Areas where the existing pavement is demolished are designated as Soil Enhancement Areas, where the base and subbase are to be excavated and loosened, and any debris is to be removed. These areas are to be delineated on the roadway plans within the appropriate phase of work.
10. Areas of soil stabilization matting (SSM) placement, including type of SSM as per Section 709. SSM locations may be indicated through notes and typical details where graphically indicating locations on the plans is infeasible due to the presence of other hatches/patterns.
11. Type of permanent vegetation, including but not limited to: Bioswale Meadow Establishment, Turfgrass Establishment, Meadow Establishment, Shrub Seeding, and Turfgrass Sod Establishment.
12. Density and quantity of tree, shrub, perennial, and live stake plantings, including plant symbology and labels where required by zone. Plantings, quantities and species are to be called out for each contiguous area of planting in each separate zone. When multiple sizes of the same species are planted in the same planting area, plant size is also to be called out. Contiguous areas extending across multiple plan sheets may be called out on a single sheet.
13. Limits of constructing planting beds.
14. A master schedule of materials, indicating total plant quantities for each type and size of plant material using proper nomenclature for plant species, size, form, and root specifications as per ANSI standards. Include individual schedules of plant material types, quantities, sizes, and spacing on each sheet of the Landscape Plan.
15. Site location(s) for on-site reforestation areas and vicinity map for off-site reforestation areas (if required).
16. Additional information as required by the LDG, MDOT SHA, DNR-FS, MDE, or other regulatory agencies.

**3.13.08 Subsoil and Topsoil**

The DBT shall determine salvageable quantities of subsoil and topsoil available within the LOD, amend as necessary to meet 2019 SSCM, Section 701, and provide additional quantities of Furnished Subsoil and Topsoil as necessary for soil stabilization, mitigation, and all landscape plantings. The DBT shall provide the appropriate soil profile, including subsoil and topsoil, for the proposed vegetative treatment and landscaping in accordance with the LDG and as specified below.

- A. The DBT shall provide topsoil and subsoil, in accordance with 2019 SSCM, Section 701 and the Estimating Manual, Section 701, and as follows:
1. In all areas to be vegetated or landscaped, 12-inch minimum depth of existing or placed subsoil is required in addition to topsoil requirements. This requirement may be reduced or waived on slopes 2:1 or steeper, in areas of shallow rock, or for engineered reinforced slope systems at the discretion of MDOT SHA.
  2. In locations where landscape trees and shrubs in planting pits or planting beds are to be installed, 24-inch minimum depth of existing or placed subsoil is required in addition to topsoil requirements.
  3. For Turfgrass Establishment and Turfgrass Sod Establishment areas, install topsoil 4-inch minimum depth. This requirement may be reduced on slopes 2:1 or steeper at the discretion of MDOT SHA, provided the soil profile is suitable for successful establishment of permanent vegetation.
  4. Where vegetation is proposed on slopes 2:1 or steeper that are constructed primarily of stone rather than subsoil, install topsoil 4-inch minimum depth.
  5. In landscape planting bed locations and in curbed medians that are to receive Turfgrass Establishment, Turfgrass Sod Establishment, or landscape planting, install topsoil 6-inch minimum depth.
  6. For stormwater management facilities, Bioretention Soil Mix meets the requirements for subsoil and topsoil placement.
- B. Soil Enhancement Areas. Areas where the existing roadway is removed and not replaced. Excavate and loosen the base and subbase and remove construction debris. Indicate Soil Enhancement Areas on the roadway plans, within the appropriate phase of work
- C. The DBT shall submit samples of salvaged and furnished subsoil to a MDOT SHA-approved lab to be tested in accordance with 2019 SSCM, Section 920.01.01. Testing results are to be kept on file by the DBT.
- D. The DBT shall be responsible for removing unsuitable subgrade, loosening highly compacted subgrade, and furnishing additional subsoil and topsoil as necessary for successful plant establishment.
- E. The DBT shall test and document compaction to be between 100 - 150 PSI (150 PSI maximum) when tested with a Cone Penetrometer, or permeability of 1 inch per hour for a minimum of 2 locations on each site within areas converted from paving to planting area.

- F. The DBT shall prepare a Nutrient Management plan in accordance with the MD Nutrient Management Program when required by Maryland Law, prior to applying regulated fertilizers or other soil amendments. The DBT may elect to amend existing subsoil or topsoil through screening and addition of amendments to meet the requirements in the 2019 SSCM, Section 920. Submit the Nutrient Management Plan to the MDOT SHA for concurrence.
- G. The DBT shall ensure that soil which is to be planted, seeded, or sodded is properly prepared and/or amended in accordance with the approved Nutrient Management Plan and 2019 SSCM, Section 701.03.01(f).

**3.13.09 Utility and Safety Setbacks.**

The DBT shall avoid conflicts between proposed landscaping and existing/proposed/relocated utilities and maintain safety setbacks for vehicle recovery clear zones and sight distance per AASHTO and LDG. The Design-Build Landscape Architect shall be responsible for resolving conflicts identified by the DBT, the MDOT SHA, or utility owners during design and construction.

- A. Offset trees and shrubs from underground and overhead utilities, power cabinets, electrical transformers, lighting, and traffic control devices in accordance with the LDG and the District Utility Engineer. Additional setbacks may be required at the discretion of the utility owner or the District Utility Engineer.
- B. Prior to planting, adjust tree and shrub layout where necessary to maintain offsets from new or relocated utilities. Trees and shrubs installed without necessary utility offsets will be relocated at no cost to the MDOT SHA.
- C. The mulch edge of planting pits for individual trees and shrubs and the edge of mulched landscape beds shall be a minimum of 7 feet from the centerline of swales and ditches. Larger setbacks may be required for lined and/or rip-rapped swales or swales with higher volume or flow velocity.
- D. Offset trees from the edge of travel lanes according to the roadway section and design speed. Refer to the LDG.
- E. Design planting layouts to offset trees from bridges and other structures as required for maintenance and inspection access. Offset large trees 30 feet minimum from bridge parapets and abutments. Offset trees from overhead sign structures to maintain sign visibility at mature plant size without tree branch pruning.
- F. Additional setbacks may be required for safety clear zones/recovery areas, to maintain sight distance, and/or for maintenance needs. Refer to AASHTO for



interchange and intersection sight distance requirements not included in the LDG.

- G. The DBT shall take into consideration existing roadway alignments to remain, proposed roadway alignments, existing pedestrian crossings to remain, proposed pedestrian crossings, existing roadside grades to remain, proposed roadside grades, existing structures to remain, and proposed structures to remain when determining landscape planting offsets for sight distance. Where sight distance lines are restricted due to existing highway condition to remain or proposed highway construction and appurtenances, plantings are not to decrease sight distance.

**3.13.10 Low Maintenance Landscape Design.**

Design roadside plantings, including but not limited to landscaping and screening, reforestation, revegetation, and stormwater management facility landscaping, following an approach that balances safety, environmental stewardship, maintenance requirements, and aesthetic appeal. The DBT shall develop designs that minimize landscape maintenance requirements in accordance with the LDG, and as follows:

- A. Arrange individual tree plantings, landscape beds, and plant masses to accommodate mowing and other maintenance operations in locations within or abutting areas of regularly mowed turfgrass and as requested by MDOT SHA.
- B. Use Turfgrass Establishment or Turfgrass Sod Establishment in locations requiring regular mowing and in areas where vegetation height must be controlled to maintain sight distance. Sight distance areas include merge areas and roadside shoulder areas, where required in SWM facilities, and elsewhere as specified in the LDG and Contract Documents.
- C. In locations where regular mowing is unnecessary for maintenance or safety considerations, (i.e. on areas of future roadway expansion, slopes steeper than 4:1 or in reforestation, revegetation, or other naturalized areas), DBT to specify Meadow Establishment, Shrub Seeding, or other native seeding approved by OED-LPD in lieu of Turfgrass Establishment or Turfgrass Sod Establishment.
- D. Landscape plantings associated with SWM facilities and outfalls will not receive regular maintenance and are to be designed to naturalize. Use appropriate trees, shrubs, and tough perennials suited for challenging growing conditions and able to outcompete invasive and undesirable vegetation.
- E. Where existing landscape plantings, including ornamental tree plantings and shrub and perennial plantings are impacted by contract work, provide suitable low-maintenance replacements.

**3.13.11 Planting Zones**

Design and install landscape and mitigation plantings that are appropriate to site conditions and constraints. The Design-Build Team shall be responsible for ensuring that the requirements of these Specifications and LDG for planting densities, plant species, species mix, and spacing apply to all plantings within the LOD.

Use native species and cultivars of natives unless otherwise approved by OED-LPD. Design diverse random groupings of odd numbers of plants to achieve a naturalized appearance. Plant shrubs in masses of 15 or more. Arrange trees in odd-numbered single-species groups of at least 3 trees. Create a planting palette for each planting zone using a minimum of three different genera of each type of plant required, unless a higher requirement is specified. Provide continuity and a smooth transition from one planting zone to the next, appropriate to the site context; maximize multi-season aesthetic interest and minimize the need for intensive maintenance.

Use massings of large evergreen/semi-evergreen shrubs to augment screen plantings in locations where utility conflicts or other site constraints preclude installation of evergreen trees.

Approximately 50 percent of the shrubs are to be massed at planting area edges to minimize mower damage to trees. The remaining shrubs are to be used in locations where they will provide screening benefit.

Understory trees and shrubs may be planted beneath the canopy of shade trees to meet density requirements.

Submit requests for adjustments to tree species, plant types, and required spacing during design as necessary to address sight conditions or planting constraints to OED-LPD for approval.

Understory trees and shrubs may be utilized in the area of shade tree minimum on center spacing to achieve density requirements of each planting zone to the extent of emphasizing maximum surface area coverage.

Provide screen plantings composed of staggered rows or masses of deciduous shade trees, deciduous understory trees, evergreen trees, and large shrubs.

Submit a Preliminary Landscape Plan indicating the planting opportunities for each planting zone prior to commencing with detail design. The following Planting Zones are proposed within the limits of this Contract.



**3.13.12 Zone 1 Turfgrass**

**Primary Aesthetic Intent:** Zone 1 shall provide Turfgrass Establishment (2019 SSCM 705) or Turfgrass Sod Establishment (2019 SSCM 708) in areas conforming to the LDG. Zone 1 includes all locations within the project limits where regular mowing is required, including disturbed turf areas on private properties, curbed medians, grass swales, behind guard rails, and ditches.

Turfgrass Establishment or Turfgrass Sod Establishment shall be used to establish turfgrass. Soil Stabilization matting is to be used with Turfgrass Establishment as recommended in the Estimating Manual. Use of Turfgrass Sod Establishment is recommended in locations where rapid stabilization is desired, including but not limited to areas of concentrated flow, areas adjacent to pedestrian walkways, and adjacent to areas of well-maintained turf on commercial or residential properties. Sod shall be used between the curb and sidewalk, curbed median strips of 6' to 16', islands of greater than 250SF.

**3.13.13 Zone 2 Meadow**

**Primary Aesthetic Intent:** Zone 2 shall be utilized where regular mowing is not required to maintain sight distance and in locations immediately adjacent to privately-maintained turf in residential or commercial areas. This zone shall be located within the center of open section medians where turfgrass is utilized at the shoulder and from the outermost limits of the Turfgrass Zone to setback distances for woody plant materials.







- A. As appropriate for site grading, topography, and drainage, or if necessary, for site distance constraints, the appropriate type of Meadow Establishment (2019 SSCM 707) shall be specified or a customized native seed mix approved by OED-LPD may be used.
- B. Type D soil stabilization shall be specified with Meadow Establishment on slopes steeper than 4:1 and in locations where straw mulch is insufficient for preventing erosion and retaining soil for establishment of permanent vegetation.

**3.13.14 Zone 3 Screen Planting**

**Primary Aesthetic Intent:** Zone 3 shall provide this screening and buffering planting zone in areas of the roadway adjacent to residences, commercial and institutional uses which will have insufficient buffer from roadway lanes following construction of roadway improvements. For high speed roadways, with a posted speed limit greater than 45 mph, insufficient buffer is defined as areas without noise barriers where the distance between the closest edge of the nearest travel lane is 200 ft. or less from a residential, commercial, or institutional structure, except where at least 100 ft of existing landscape buffer consisting of dense trees and shrubs is present and is to remain.

For lower speed roadways, with a posted speed limit of 45 mph or less, insufficient buffer is defined as areas without noise barriers where the distance between the closest edge of the nearest travel lane is 100 ft. or less from a residential, commercial, or institutional structure, except where at least 50 ft of existing landscape buffer consisting of dense trees and shrubs is present and is to remain.

Screen Plantings are to meet the following requirements:

-  A. Consist of a mix of evergreen and deciduous trees and large shrubs, arranged to provide a year-round visual screen.
-  B. Augment existing landscape plantings or forest areas to remain or augment the visual screening benefit of proposed reforestation areas.
-  C. This planting zone shall be under-planted with Meadow Establishment, except that individual planting pits shall be mulched with shredded hardwood bark (SHB) and shrub massings shall be installed in planting beds mulched with SHB for weed control during establishment.
-  D. Columnar trees, small trees, and large shrubs shall be substituted for large and medium shade and evergreen tree species when overhead utilities and other site constraints preclude the use of large and medium tree species.
-  E. Plant selections shall be appropriate for the environmental field conditions of the planting site, especially heat from highway pavement and structures and road salt spray and runoff.
-  F. For Narrow Screen Planting Areas, consisting of plantable areas 50 ft. in width or narrower measured perpendicularly to the travel lane, the DBT shall:
  - 1. Provide a screen planting composed primarily of evergreen trees, augmented with evergreen and semi-evergreen shrubs, and laid out as follows:
    - a. Arrange trees in odd-numbered single-species groups.
    - b. Space pyramidal or broad-spreading, needled evergreens a maximum of 18 ft. on center when installed in multiple staggered rows and space at a maximum spacing of 12 ft. on center when only a single row is feasible.
    - c. Space columnar, needled evergreens and broadleaf evergreens a maximum of 12 ft. on center when installed in multiple staggered rows and space a maximum of 8 ft. on center when only a single row of planting is feasible.

- d. Use massings of large evergreen/semi-evergreen shrubs in place of tree plantings in locations where utility conflicts or other site constraints preclude installation of evergreen trees.
2. Increase the number of tree species in the screen planting based on contiguous planting area length as follows:
  - a. Plant 1 or more species for screen plantings under 120 linear feet (LF).
  - b. Plant a minimum of 3 species for screen plantings between 120 LF and 240 LF.
  - c. Plant a minimum of 5 species for screen plantings 240 LF or longer.
3. Non-native evergreen and semi-evergreen species such as Ilex Nellie R. Stevens, Picea abies, Picea omorika, Thuja 'Green Giant', Thuja 'Steeplechase,' Viburnum x Pragense, and Viburnum rhytidophylloides 'Allegheny' may be utilized in Narrow Screen Planting Areas.
4. Graphically indicate the locations of individual trees, shrub massings, or individual shrubs on the landscape plans and the label the plant quantities and species.




G. For Wide Screen Planting Areas, consisting of plantable areas between 50 to 100 feet in width when measured perpendicularly from the travel lane, the DBT shall:

1. Graphically indicate wide screen planting areas on the landscape plans using a single graphic to indicate the limits of each wide screen planting area. Provide planting layout details in plan view showing single-species masses of 3 or more trees or 15 or more shrubs, using plant symbols to differentiate plant types.
2. Label each contiguous wide screen planting area with plant species and quantities.
3. Provide screen plantings composed of staggered rows or masses of deciduous shade trees, deciduous understory trees, evergreen trees, and large shrubs as follows:
  - a. Mass a minimum of 50 percent of the shrubs at planting area edges adjacent to turf or meadow to minimize mower damage.
  - b. Locate the remaining shrubs as necessary to augment screening or establish edge plantings.
4. Use native species and native cultivars unless otherwise approved by OED-LPD.

5. Wide Screen Planting areas may be credited toward the Project's reforestation requirements where they meet or exceed the requirements for Zone 4 Reforestation.
6. Provide plantings at the following minimum densities:

Trees:	200 trees per acre
Overstory Shade Trees:	20% 2 in. cal. B&B or CG, as noted 15% 1.25 in. cal. B&B/#15 CG min.
Understory Ornamental Trees:	15% 1.25 in. cal. B&B/#10 CG min. or 5 ft. ht. B&B/#10 CG min.
Evergreen Trees:	35% 5 ft. ht. B&B or CG, as noted 15% 3 ft. ht. B&B/#5 CG min.
Shrubs:	200 shrubs per acre
Larger Shrubs:	60% 3 ft. ht. B&B/#5 CG min.
Smaller Shrubs:	40% 30 in. ht. #3 CG min.

 H. Recommended plant species, minimum acceptable sizes, and maximum spacing are listed below. Submit written requests for adjustments to tree species, plant types, and required spacing during design as necessary to address site conditions or planting constraints to OED-LPD for approval.

**PLANT MATERIAL:**

<u>Botanical Name (Common Name)</u>	<u>Maximum Spacing</u>	<u>Comments</u>
<b>Shade Tree Species (Overstory)</b>		
<i>Acer rubrum</i> cultivars (Red Maple)	30' OC	
<i>Betula lenta</i> (Sweet Birch)	30' OC	
<i>Betula nigra</i> (River Birch)	30' OC	
<i>Note: For Betula nigra, use 8 ft. ht. B&amp;B/#15 CG multistem stock in lieu of 2 in. cal. and 5 ft. ht. B&amp;B/#7 CG multistem stock in lieu of 1.25 in. cal.</i>		
<i>Celtis occidentalis</i> (Hackberry)	30' OC	
<i>Liquidambar styraciflua</i> (Sweetgum)	30' OC	
<i>Nyssa sylvatica</i> (Black Gum)	30' OC	B&B/CG
<i>Platanus occidentalis</i> (Sycamore)	30' OC	
<i>Quercus alba</i> (White Oak)	30' OC	
<i>Quercus bicolor</i> (Swamp White Oak)	30' OC	
<i>Quercus coccinea</i> (Scarlet Oak)	30' OC	B&B/CG
<i>Quercus palustris</i> (Pin Oak)	30' OC	
<i>Quercus phellos</i> (Willow Oak)	30' OC	B&B/CG
<i>Quercus rubra</i> (Red Oak)	30' OC	B&B/CG
<i>Quercus velutina</i> (Black Oak)	30' OC	

**Ornamental Tree Species (Understory)**

<i>Amelanchier canadensis</i> (Canadian Serviceberry)	15' OC	Multistem
<i>Amelanchier laevis</i> (Downy Serviceberry)	15' OC	
<i>Cercis canadensis</i> (Eastern Redbud)	15' OC	
<i>Crataegus viridis</i> 'Winter King' (Winter King Hawthorn)	15' OC	
<i>Crataegus crusgalli inermis</i> (Thornless Cockspur Hawthorn)	15' OC	
<i>Chionanthus virginicus</i> (White Fringetree)	15' OC	Multistem
<i>Crataegus phaenopyrum</i> (Washington Hawthorn)	15' OC	
<i>Hamamelis virginicus</i> (Witchhazel)	10' OC	Multistem
<i>Magnolia virginiana</i> (Sweetbay Magnolia)	15' OC	Multistem

**Evergreen Tree Species (Overstory)**

<i>Ilex opaca</i> (American Holly) (approved cultivars)	12' OC	
<i>Juniperus virginiana</i> (Eastern Red Cedar)	8' OC	#20 CG min
 <i>Magnolia grandiflora</i> 'Edith Bogue' (Edith Bogue Southern Magnolia)	12' OC	
 <i>Magnolia grandiflora</i> 'Brackens Brown Beauty' (Brackens Brown Beauty Southern Magnolia)	12' OC	
<i>Picea abies</i> (Norway Spruce)	12' OC	
<i>Picea omorika</i> (Serbian Spruce)	12' OC	
<i>Pinus rigida</i> (Pitch Pine)	12' OC	
<i>Pinus taeda</i> (Loblolly Pine)	12' OC	
<i>Pinus strobus</i> (Eastern White Pine)	12' OC	
<i>Pinus virginiana</i> (Virginia Pine)	12' OC	
<i>Thuja occidentalis</i> (American Arborvitae) (approved cultivars)	8' OC	#20 CG min.

**Shrub Species**

<i>Calycanthus floridus</i> (Eastern Sweetshrub)	4' OC
<i>Clethra alnifolia</i> (Summersweet)	4' OC
<i>Cornus sericea</i> (Redosier Dogwood)	5' OC
<i>Ilex glabra</i> (Inkberry)	4' OC
<i>Ilex verticillata</i> 'Sparkleberry' (Winterberry) (Provide 10% male plants of OED approved compatible varieties)	4' OC
<i>Ilex verticillata</i> 'Winter Gold' (Winterberry) (Provide 10% male plants of OED approved compatible varieties)	4' OC

<i>Ilex verticillata</i> ‘Winter Red’ (Winterberry)	4’ OC	
(Provide 10% male plants of OED approved compatible varieties)		
<i>Myrica pensylvanica</i> (Northern Bayberry)	5’ OC	
<i>Rhus aromatica</i> (Fragrant Sumac)	5’ OC	
<i>Rhus glabra</i> (Smooth Sumac)	5’ OC	
<i>Viburnum acerifolium</i> (Mapleleaf Viburnum)	5’ OC	
<i>Viburnum dentatum</i> (Southern Arrowwood)	5’ OC	
<i>Viburnum lentago</i> (Nannyberry)	5’ OC	
<i>Viburnum nudum</i> (Witherod Viburnum)	4’ OC	
<i>Viburnum prunifolium</i> (Blackhaw Viburnum)	5’ OC	#7 CG min.
<i>Viburnum x pragense</i> (Prague Viburnum)	5’ OC	#7 CG min.
<i>V. x rhytidophylloides</i> ‘Allegheny’ (Allegheny Viburnum)	5’ OC	#7 CG min.

Note: Maximum spacing is between plants of the same species where not otherwise indicated in the requirements for Zone 3. B&B indicates Balled and Burlapped. Cal. indicates Caliper inches. OC indicates On-center Spacing. CG indicates Container-grown.

**3.13.15 Zone 4 Reforestation Plantings**

**Primary Aesthetic Interest:** Zone 4 shall be utilized to establish mature forests using plant species associations indicative of the Piedmont Region. The Design-Build Team shall maximize reforestation wherever possible to meet minimum area requirements where establishment of forest is not precluded by site constraints such as proposed improvements or utility offsets.

**Reforestation Plantings** shall be designed and constructed according to the following:

- A. Plantings shall consist of random, naturalized arrangements to mimic the ecologic niches of the local area. Plantings shall be comprised of native trees and shrubs, underplanted with Meadow Establishment. A mix of native evergreen and deciduous tree species and shrubs of the Piedmont region of Central Maryland shall be specified as appropriate to site conditions. Use of cultivars of native species may be approved at the discretion of OED-LPD. Unacceptable species will be rejected by MDOT SHA.
- B. In highly visible areas, such as roadside edges or cut or fill slopes facing the highway, exit ramps, or secondary roads, the DBT shall use larger groupings of single species of trees and shrubs rather than random plantings of minimum groupings of trees and shrubs to increase aesthetic interest. Masses of trees selected for seasonal aesthetic interest with flowers, fruit, foliage color, bark texture or color are recommended in highly visible areas.
- C. In areas adjacent to residential or other uses that would benefit from screening the emphasis shall be on the use of evergreen plants.



**1** D. Turfgrass Establishment of Turfgrass Sod Establishment shall not be used within Reforestation or Revegetation Planting areas without approval of OED-LPD. The appropriate type of Meadow Establishment (2019 SSCM 707) shall be specified or a customized native seed mix approved by OED-LPD may be used. Where soil stabilization matting is used with meadow seeding, it shall be Type D or E, in accordance with the *MDOT SHA Landscape Estimating Manual*.

E. Reforestation plantings shall be provided at a mitigation ratio of 1:1: one acre of reforestation plantings is required for one acre of impacts. Reforestation areas species diversity and planting density shall be as follows:

Reforestation stock shall be a mix of at least 11 species of deciduous and evergreens trees and shrubs, with no more than 30% from the same taxonomic family. Individual reforestation areas smaller than 1.0 acre in size may be a mix of at least 7 species, with no more than 30% from the same taxonomic family.

<b>1</b> Trees:	200 trees per acre
Overstory Shade Trees	30% 2 in. Cal., B&B or CG, as noted
Evergreen Trees	30% 5' Ht., B&B/#15 CG or as noted
Understory Ornamental Trees	10% 5 ft. ht., B&B 30% 1.5 in. Cal., B&B <i>or</i> 5 ft. ht. multistem B&B/#10 CG
Shrubs:	150 shrubs per acre
Large Shrubs:	60% 3 ft. ht. B&B/#5 CG min.
Small Shrubs:	40% 30 in. ht. #3 CG min.

**PLANT MATERIAL:**

<b>Botanical Name (Common Name)</b>	<b>Maximum Spacing</b>	<b>Comments</b>
<b>Shade Tree Species (Overstory)</b>		
<i>Acer rubrum</i> (Red Maple)	20' OC	
<i>Betula nigra</i> (River Birch)	20' OC	Multistem
<i>Note: For Betula nigra, use 8 ft. ht. B&amp;B/#15 CG multistem stock in lieu of 2 in. cal. and 5 ft. ht. B&amp;B/#7 CG multistem stock in lieu of 1.25 in. cal.</i>		
<i>Liquidambar styraciflua</i> (Sweetgum)	20' OC	
<i>Liriodendron tulipifera</i> (Tulip Tree)	20' OC	
<i>Nyssa sylvatica</i> (Blackgum)	20' OC	#25 CG
<i>Platanus occidentalis</i> (Sycamore)	20' OC	
<i>Prunus serotina</i> (Black Cherry)	20' OC	
<i>Quercus alba</i> (White Oak)	20' OC	

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<i>Quercus bicolor</i> (Swamp White Oak)	20' OC	
<i>Quercus coccinea</i> (Scarlet Oak)	20' OC	#25 CG
<i>Quercus phellos</i> (Willow Oak)	20' OC	#25 CG
<i>Quercus rubra</i> (Red Oak)	20' OC	#25 CG
<i>Quercus velutina</i> (Black Oak)	20' OC	
<i>Ulmus americana</i> 'Jefferson' (American Elm)	20' OC	
<i>Ulmus americana</i> 'Princeton' (American Elm)	20' OC	
<i>Ulmus americana</i> 'Valley Forge' (American Elm)	20' OC	

**Ornamental Tree Species (Understory)**

<i>Amelanchier arborea</i> (Downy Serviceberry)	12' OC	
<i>Amelanchier laevis</i> (Downy Serviceberry)	12' OC	Multistem
<i>Carpinus caroliniana</i> (American Hornbeam)	12' OC	
<i>Cercis canadensis</i> (Eastern Redbud)	12' OC	
<i>Chionanthus virginicus</i> (White Fringetree)	12' OC	Multistem
<i>Crataegus phaenopyrum</i> (Washington Hawthorn)		
<i>Ostrya virginiana</i> (Hophornbeam)	12' OC	
<i>Magnolia virginiana</i> (Sweetbay Magnolia)	12' OC	Multistem

**Evergreen Tree Species (Overstory)**

<i>Ilex opaca</i> (American Holly)	12' OC	
<i>Juniperus virginiana</i> (Eastern Red Cedar)	12' OC	#20 CG
<i>Pinus rigida</i> (Pitch Pine)	12' OC	
<i>Pinus taeda</i> (Loblolly Pine)	12' OC	
<i>Pinus strobus</i> (Eastern White Pine)	12' OC	
<i>Pinus virginiana</i> (Virginia Pine)	12' OC	
<i>Thuja occidentalis</i> (American Arborvitae)	12' OC	#20 CG

**Shrub Species**

<i>Calycanthus floridus</i> (Eastern Sweetshrub)	5' OC	
<i>Clethra alnifolia</i> (Summersweet)	5' OC	
<i>Cornus sericea</i> (Redosier Dogwood)	5' OC	
<i>Ilex glabra</i> (Inkberry)	5' OC	
<i>Ilex verticillata</i> 'Winter Gold' (Winterberry)	5' OC	
(Provide 10% male plants of OED approved compatible varieties)		
<i>Ilex verticillata</i> 'Winter Red' (Winterberry)	5' OC	
(Provide 10% male plants of OED approved compatible varieties)		
<i>Rhus aromatica</i> (Fragrant Sumac)	5' OC	
<i>Rhus glabra</i> (Smooth Sumac)	5' OC	
<i>Sassafras albidum</i> (Sassafras)	5' OC	



<i>Viburnum acerifolium</i> (Mapleleaf Viburnum)	5' OC
<i>Viburnum dentatum</i> (Southern Arrowwood Viburnum)	5' OC
<i>Viburnum lentago</i> (Nannyberry)	5' OC
<i>Viburnum nudum</i> (Witherod Viburnum)	5' OC
<i>Viburnum prunifolium</i> (Blackhaw Viburnum)	5' OC

Note: B&B indicates Balled and Burlapped. Cal. indicates Caliper inches. OC indicates On-center Spacing. CG indicates Container-grown.

**3.13.16 Zone 5 Revegetation Plantings**

Primary Aesthetic Intent: Zone 5 shall revegetate areas that are suitable for tree plantings within the project right-of-way but will not be credited towards reforestation requirements under the MD Reforestation Law. The DBT shall provide this planting zone in areas that do not meet the minimum area and depth requirement for reforestation and do not warrant screening/buffering for adjacent land uses.

- A. Revegetation Areas shall be designed and constructed according to the design criteria for Zone 4 Reforestation Plantings with the exception of the minimum area requirements and density of trees.
  - 1. The DBT shall demonstrate every effort to plant all areas feasible for woody vegetation. OED-LPD shall confirm minimum areas for maintenance requirements.
  - 2. Refer to the Zone 4 Reforestation Plantings list for species and sizes for use in Zone 5.
  - 3. Provide 200 trees per acre and 150 shrubs per acre.
- B. Do not substitute Revegetation Plantings for Reforestation Plantings required under the MD Reforestation Law. Revegetation Plantings do not qualify for credit under the law.
- C. Clearly label and differentiate Revegetation and Reforestation Plantings on the Landscape Plans.







**3.13.17 Zone 6 Interchange Gateway Plantings**



Primary Aesthetic Intent: Zone 6 falls within interchanges that form community gateways and shall be utilized to replace existing plantings impacted by Contract improvements in high visibility locations. Zone 6 plantings will replace existing landscape plantings at the following I-695 gateway interchanges: MD 26 Liberty Rd, MD 140 Reisterstown Rd, MD 139 Charles St, MD 45 York Rd, MD 146 Dulaney Valley Rd, and MD 147 Harford Rd.

The limits of this Zone shall extend in either direction from the roadway intersecting I-695 along I-695 to the ends of the on or off ramp gore areas.

The DBT will design and construct Zone 6 plantings in accordance with the following:

-  A. Replacement plantings shall consist of individual and massed trees and shrubs, and planting beds containing trees, shrubs, and/or perennials. The DBT shall select tree and shrub species that provide added aesthetic interest with flowers, fruit, fall color, bark texture or color. Selections may also include tough perennial species, such as ornamental grasses, which tolerate harsh roadside growing conditions.
-  B. Replacement plantings to be installed adjacent to existing landscape plantings to remain are to relate to the existing plantings by using similar species and design approach. The DBT may design replacement landscaping to reduce the amount of regular landscape maintenance subject to approval by MDOT SHA.
-  C. Installation of container grown or B&B trees and shrubs or Shrub Seeding shall occur outside of highway clear zones or locations where woody plants are removed during vegetation management operations. Refer to Zone 2 Meadow Establishment for locations where woody plants are not permitted and regular mowing will not be required or feasible.
- D. Masses of shrubs and large ornamental grasses are to be installed in mulched landscape beds, closely spaced to minimize weed growth. Beds shall be designed for plantings to cover the extent of the beds and to out-compete weeds and minimize future maintenance. Extend the mulched bed to include trees within 6 ft. of the mulched bed edge.
-  E. Perennials and Ornamental Grasses may be used in locations where perennial plantings are to be replaced in kind, where new plantings abut existing perennial plantings to remain, and in locations where woody plants are likely to be damaged due to snow removal operations.
-  F. At bridge abutments, woody plants that grow taller than 3 ft. shall be offset from the bridge parapet at least 10 ft. at the top of the slope, gradually increasing to 25 ft. offset at the bottom of the slope.
-  G. In locations where more than 75 percent of existing shrub, perennial, or ornamental grass plantings are impacted, the DBT shall remove the entire area of impacted plantings and replace with an equivalently sized area consisting of landscape plants which grow to a larger size at maturity. The replacement plantings:
  - a. Will not create sight distance or safety concerns and comply with the *Landscape Design Guide* and this performance specification.
  - b. Clearly delineate a mowing edge for regular or infrequent mowing.

- c. Will not require more frequent maintenance than the existing plantings, as determined by MDOT SHA.
- d. Are consistent with the design of adjacent areas of landscaping to remain, as determined by MDOT SHA.
- e. Provide multi-season aesthetic interest.

H. Select tree and shrub species from the plant lists below. Additional species and cultivars may be used at the approval of OED-LPD.

**PLANT MATERIAL:**


<u>Botanical Name (Common Name)</u>	<u>Maximum Spacing</u>	<u>Minimum Size</u>
<b>Shade Tree Species (Overstory)</b>		
<i>Acer rubrum</i> cultivars. (Red Maple)	25' OC	2" Cal., B&B
<i>Acer saccharum</i> 'Bonfire' (Bonfire Sugar Maple)	25' OC	2" Cal., B&B
<i>Acer saccharum</i> 'Green Mountain' (Green Mountain Sugar Maple)	25' OC	2" Cal., B&B
<i>Acer saccharum</i> 'Legacy' (Legacy Sugar Maple)	25' OC	2" Cal., B&B
<i>Betula nigra</i> 'BNTF' (Dura Heat River Birch)	20' OC	8' Ht. multi., B&B/#15 CG
<i>Cladrastris kentuckea</i> (Yellowwood)	20' OC	2" Cal., B&B
<i>Liquidambar styraciflua</i> (Sweetgum)	20' OC	2" Cal., B&B
<i>Nyssa sylvatica</i> (Blackgum)	25' OC	2" Cal., B&B/#25 CG
<i>Platanus x acerifolia</i> cvrs (London Plane Tree)	30' OC	2" Cal., B&B
<i>Quercus coccinea</i> (Scarlet Oak)	25' OC	2" Cal., B&B/CG
<i>Quercus rubra</i> (Red Oak)	30' OC	2" Cal., B&B/#25 CG
<b>Ornamental Tree Species (Understory)</b>		
<i>Acer ginnala</i> 'Flame' (Flame Maple)	15' OC	2" Cal., B&B
<i>Amelanchier canadensis</i> (Canadian Serviceberry)	15' OC	5' Ht. multi, B&B/#7 CG
<i>Amelanchier laevis</i> (Downy Serviceberry) & cvrs.	15' OC	5' Ht. multi, B&B/ #7 CG
<i>Cercis canadensis</i> (Eastern Redbud)	15' OC	2" Cal., B&B
<i>Chionanthus virginicus</i> (White Fringetree)	15' OC	5' Ht. multi, B&B/#7 CG
<i>Crataegus phaenopyrum</i> (Washington Hawthorn)	15' OC	2" Cal., B&B
<i>Crataegus viridis</i> 'Winter King' (Winter King Hawthorn)	15' OC	2" Cal., B&B
<i>Lagerstroemia indica</i> cvrs (Crape Myrtle)	15' OC	5' Ht. multi, B&B/#7 CG
<i>Magnolia liliflora</i> 'Jane' (Jane Magnolia)	15' OC	5' Ht. multi, B&B/#7 CG
<i>Magnolia virginiana</i> (Sweetbay)	15' OC	5' Ht. multi, B&B/#7 CG

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<i>Prunus x 'Okame'</i> (Okame Cherry)	15' OC	2" Cal., B&B
<i>Prunus serrulata 'Kanzan'</i> (Kanzan Cherry)	15' OC	2" Cal., B&B
<i>Prunus x yedoensis</i> (Yoshino Cherry)	15' OC	2" Cal., B&B

**Evergreen Tree Species**

<i>Ilex opaca</i> (American Holly)	15' OC	5' Ht., B&B
Approved cultivars per SSCM Section 920		
<i>Ilex x 'Nellie R. Stevens'</i> (Nellie Stevens Holly)	15' OC	5' Ht., B&B
<i>Juniperus virginiana 'Corcorcor'</i> (Emerald Sentinel Red Cedar)	15' OC	5' Ht., B&B/#20 CG
 <i>Magnolia grandiflora 'Brackens Brown Beauty'</i> (Brackens Brown Beauty Southern Magnolia)	20' OC	5' Ht., B&B
 <i>Magnolia grandiflora 'Edith Bogue'</i> (Edith Bogue Southern Magnolia)	15' OC	5' Ht., B&B
<i>Picea abies</i> (Norway Spruce)	15' OC	5' Ht., B&B
<i>Picea omorika</i> (Serbian Spruce)	15' OC	5' Ht., B&B
<i>Pinus taeda</i> (Loblolly Pine)	15' OC	5' Ht., B&B
<i>Pinus strobus</i> (Eastern White Pine)	15' OC	5' Ht., B&B
<i>Thuja occidentalis</i> approved cvrs. (American Arborvitae)	15' OC	5' Ht., B&B/#20 CG

**Shrub Species**

Medium to Large Size

<i>Aronia arbutifolia 'Brilliantissima'</i> (Red Chokeberry)	5' OC	3' Ht., #5 CG
<i>Aronia melanocarpa &amp; cultivars.</i> (Black Chokeberry)	5' OC	3' Ht., #5 CG
<i>Calycanthus floridus</i> (Eastern Sweetshrub)	5' OC	3' Ht., #5 CG
<i>Cornus sericea</i> (Redosier Dogwood) & cultivars	5' OC	3' Ht., B&B/#5 CG
<i>Hamamelis virginiana</i> (Witch Hazel)	5' OC	3' Ht., B&B/#5 CG
<i>Ilex verticillata 'Winter Gold'</i> (Winterberry)	5' OC	3' Ht., B&B/#5 CG
(Provide 10% male plants of OED approved compatible varieties)		
<i>Ilex verticillata 'Winter Red'</i> (Winterberry)	5' OC	3' Ht., B&B/#5 CG
(Provide 10% male plants of OED approved compatible varieties)		
<i>Rhus aromatica</i> (Fragrant Sumac)	5' OC	3' Ht., #3 CG
<i>Rhus glabra</i> (Smooth Sumac)	5' OC	3' Ht., #3 CG
<i>Rhus typhina</i> (Staghorn Sumac)	5' OC	3' Ht., #3 CG
<i>Viburnum acerifolium</i> (Mapleleaf Viburnum)	5' OC	3' Ht., B&B/#5 CG
<i>Viburnum dentatum</i> (Southern Arrowwood Viburnum)	5' OC	3' Ht., B&B/#5 CG
<i>Viburnum lentago</i> (Nannyberry)	5' OC	3' Ht., B&B/#5 CG
<i>Viburnum nudum</i> (Witherod Viburnum)	5' OC	3' Ht., B&B/#5 CG
<i>Viburnum prunifolium</i> (Blackhaw Viburnum)	5' OC	3' Ht., B&B/#5 CG

Small to Medium Size

<i>Ilex verticillata</i> 'Maryland Beauty' (MD Beauty Winterberry) (Provide 10% male plants of OED approved compatible varieties)	3' OC	24" Ht., #5 CG
<i>Itea virginica</i> 'Henry's Garnet' (Henry's Garnet Sweetspire)	3' OC	24" Ht., #5 CG
<i>Jasminum nudiflorum</i> <i>Rhus aromatica</i> 'Gro-Low' (Grow Low Fragrant Sumac)	3.5' OC	18" Spd., #3 CG

**Perennials Species**

<i>Amsonia tabernaemontana</i> (Eastern Bluestar)	24" OC	#1 CG
<i>Baptisia australis</i> (Wild Blue Indigo)	30" OC	#1 CG
<i>Calamagrostis x acutiflora</i> 'Karl Foerster' (Karl Forester Feather Reed Grass)	30" OC	#1 CG
<i>Calamagrostis brachytricha</i> (Korean Feather Reed Grass)	30" OC	#1 CG
<i>Leymus arenaris</i> 'Blue Dune' (Blue Lyme Grass)	30" OC	#1 CG
<i>Nepeta f.</i> 'Walker's Low' Walker's (Low Catmint)	30" OC	#1 CG
<i>Panicum virgatum</i> 'Cloud Nine' (Cloud Nine Switchgrass)	3' OC	#1 CG
<i>Panicum virgatum</i> 'Dallas Blues' (Dallas Blues Switchgrass)	3' OC	#1 CG
<i>Panicum virgatum</i> cvrs. (other Switchgrass cultivars)	30" OC	#1 CG
<i>Perovskia atriplicifolia</i> (Russian Sage)	3' OC	#1 CG
<i>Solidago rigida</i> (Stiff Goldenrod)	24" OC	#1 CG
<i>Sorghastrum nutans</i> 'Indian Steel' (Indian Steel Grass)	30" OC	#1 CG

Note:

On slopes steeper than 3:1, single-stemmed deciduous trees may be reduced to 1.5 in. caliper stock, B&B/#15 CG, provided (3) 1.5 in. caliper trees are provided in lieu of (2) 2.0 in. cal. trees.

B&B indicates Balled and Burlapped. Cal. indicates Caliper inches. OC indicates On-center Spacing. CG indicates Container-grown. Container class indicated is minimum approved.

**3.13.18 Zone 7 Stream Restoration Plantings**

Primary Aesthetic Interest: Zone 7 shall revegetate the banks and floodplain of restored stream areas to provide additional streambank stability, shade, and improved aquatic habitat. Create or replace a vegetated stream buffer starting at the edge of the stream at the normal baseflow elevation and extending 50 ft horizontally, to the edge of

disturbed area, or the edge of MDOT SHA ROW or permanent easement, whichever distance is less.

Stream Restoration Plantings shall be designed as follows:

- A. Plantings shall consist of naturalized arrangements of native deciduous tree and shrub species of the Piedmont region of central Maryland native trees. Species hydrologically appropriate to site conditions are to be selected.
- B. Turfgrass Establishment or Turfgrass Sod Establishment shall not be used within Stream Restoration Planting areas. Stream Restoration areas shall receive Shrub Seeding, Meadow Establishment, or other native seeding as approved by OED-LPD, with Type D SSM or approved equivalent for temporary stabilization for seed establishment. Seeding shall be selected based on hydrologic conditions.
- C. Live stakes shall be installed to improve streambank stability and increase shade and aquatic habitat. Live Stakes shall be installed in the streambank area extending from the normal base flow elevation to either 3 ft above the normal base flow elevation measured vertically, or 12 ft. from the normal base flow elevation measured horizontally, whichever distance is less. Provide at least 3 species of live stakes in at least 2 rows. Live stakes are to be spaced no more than 3 ft. apart.
- D. Provide tree, shrub and live stake plantings at the following minimum sizes and quantities per acre:
  - Overstory Shade Trees: (70) 1 in. cal. #10 CG  
(90) 5 ft. ht. single stem #5 CG
  - Understory Ornamental Trees: (30) 1 in. cal. #10 CG *or*  
5 ft. height multistem #7 CG  
(50) 5 ft. ht. single stem #5 CG
  - Evergreen Trees: (10) 5 ft. ht. B&B  
(15) 3 ft. ht. #7 CG
  - Shrubs: (175) 24 in. ht. #3 CG
- E. Stream Restoration Plantings that meet the area requirements for Zone 4 Reforestation may be credited toward Zone 4 Reforestation requirements for the Contract, except where the stream restoration plantings are a mitigation permit condition for impacts to wetlands, waterways, or floodplains.
  - 1. If Stream Restoration Plantings are to be used by the DBT to fulfill the requirements of TMDL tree planting mitigation areas under Zone 4 Reforestation, a total of (100) overstory and understory trees per acre must be 2 in. caliper.



**STREAM RESTORATION PLANT MATERIAL:**

<b>BOTANICAL NAME</b>	<b>COMMON NAME</b>
<b>Major Deciduous Trees</b>	
Select species from the Zone 4 Plant Material List.	
<b>Minor Deciduous Trees</b>	
Select species from the Zone 4 Plant Material List.	
<b>Shrubs</b>	
Select species from the Zone 4 Plant Material List and the following:	
<i>Alnus serrulata</i>	Hazel Alder
<i>Cephalanthus occidentalis</i>	Common Buttonbush
<i>Cornus ammomum</i>	Silky Dogwood
<i>Cornus racemosa</i>	Gray Dogwood
<i>Lindera benzoin</i>	Spicebush
<i>Physocarpus opulifolius</i>	Ninebark
<b>Live Stake Species</b>	
<i>Cornus amomum</i>	Silky Dogwood
<i>Cornus sericea</i>	Red Osier Dogwood
<i>Cephalanthus occidentalis</i>	Buttonbush
<i>Salix nigra</i>	Black Willow
<i>Salix discolor</i>	Pussy Willow
<i>Sambucus nigra ssp. canadensis</i>	American Black Elderberry
<i>Viburnum dentatum</i>	Arrowwood Viburnum
<i>Viburnum lentago</i>	Nannyberry

**3.13.19 Zone 8 SWM Facility Plantings**

Primary Aesthetic Intent: Zone 8 shall provide temporary and permanent vegetation for stormwater management facilities and adjacent areas. Design, construct, and establish SWM Facility Plantings to provide permanent stabilization and landscaping as required by the MDOT SHA Plan Review Division (OHD-PRD) and as follows. Landscape plantings required as part of the stormwater management facilities shall be coordinated with the proposed or existing adjacent landscape plantings to ensure a contextually appropriate, unified planting theme. Landscaping required for stormwater management purposes includes, but not limited to, Turfgrass Establishment, Turfgrass Sod Establishment, Meadow Establishment, perennials, shrubs, and trees, and shall be shown on the Landscape Plans. Plantings shall be coordinated with the stormwater management plans to ensure they meet all MDE and MDOT SHA requirements, as well as these Specifications.

Landscaping in Zone 8 shall meet the following requirements:

**3.13.19.01 Establishment of Vegetative Stabilization in all SWM facilities**

- A. The DBT shall design, construct, and establish 95% vegetation coverage in areas draining into SWM Facilities prior to construction of facilities as required by OHD-PRD. Permanent vegetation such as Turfgrass, Meadow, or other native herbaceous species may be specified to stabilize areas surrounding SWM Facility prior to facility construction. Temporary seeding may be approved by OED-LPD, in conformance with 2019 SSCM 704 provided 95% coverage is maintained throughout the duration of SWM construction. Tilling in areas of temporary seeding for the establishment of permanent vegetation is not permitted unless an approved erosion and sediment control device is in place.
- B. The DBT shall establish and maintain 95% permanent vegetation coverage in all areas of topsoil or bioretention soil mix within SWM facilities, except in areas stabilized with wood mulch, stone mulch, or riprap or where standing water is intended, such as in wet ponds and wet swales. Vegetative coverage requirements may be reduced in areas that remain permanently inundated.
- C. With the exception of grass swales, DBT shall minimize or restrict the use of Turfgrass Establishment and Turfgrass Sod Establishment within SWM Facilities to locations where regular mowing will occur, on stabilized maintenance access roads, and where required by OHD-PRD.
- D. In locations where turfgrass or shredded hardwood bark mulch is not required, Specify appropriate native seed mixes such as Meadow Establishment. Use native seed mixes in areas planted with plugs, container grown herbaceous plants, and other landscaping. Mixes of other native species appropriate to soil, hydrologic conditions, or growing season may be specified pending approval of OED-LPD.
- E. Specify Type A Soil Stabilization Matting (SSM) with Turfgrass Establishment or Type D SSM with Meadow Establishment in SWM Facilities where other types of mulch (straw, wood cellulose, hardwood bark mulch) are not permitted per the LDG or where straw mulch will not remain in place due to temporary and permanent water elevations in SWM Facilities. Use of other types of SSM may be required by the Highway Hydraulics Division (HHD), although use Type D SSM with all broadleaf meadow species.

### **3.13.19.02 Planting Requirements by SWM Facility Types**

The DBT shall design, build, and maintain stormwater management facilities as required by MDE and the Office of Highway Development. Design and criteria for different facility types will vary as follows and is supplemental to the General SWM criteria provided in 3.13.19.01. Facility types not listed below shall be designed in accordance with the MDOT SHA Drainage Manual and other pertinent references and guideline listed in the Contract Specifications.



- A. Grass Swale: The permanent vegetative treatment for grass swales is Turfgrass Sod Establishment or Turfgrass Establishment with Soil Stabilization Matting (SSM).
- B. Bioswale: The permanent vegetative treatment for bioswales is native meadow, which may be Upland or Lowland Meadow Establishment, or Bioretention Meadow Establishment, with Type D Soil Stabilization Matting (SSM).
  - 1. The DBT shall establish and maintain 95% native vegetation coverage throughout the limits of the swale until approval of the as-built plans for SWM. Additional plantings of container-grown, deep-rooted perennials, typically plugs, may be used to expedite establishment of native vegetation but are only required in bioswales on check dams.
  - 2. Turfgrass Establishment and SSM or Turfgrass Sod Establishment may be approved for bioswales in locations where tall vegetation may obstruct safety sight lines. Where approved, 95% coverage will be required for turfgrass areas throughout the swale limits.
  - 3. Use container-grown plantings of deep-rooted perennials or grasses on check dams to provide additional reinforcement. Minimum spacing of plantings on check dams will vary depending on container class as follows:
    - a. Plug (2 in. dia. by 5 in. depth): 12 in. on center spacing
    - b. #SP4: 18 in. on center spacing
    - c. #1CG: 24 in. on center spacing
  - 4. Species for check dams:

<b>BOTANICAL NAME</b>	<b>COMMON NAME</b>
<i>Andropogon gerardii</i>	Big Bluestem
<i>Elymus virginicus</i>	Virginia Wild Rye
<i>Panicum virgatum</i>	Switchgrass
<i>Panicum amarum 'Dewey Blue'</i>	Dewey Blue Beachgrass
<i>Schizachyrium scoparium</i>	Little Bluestem
<i>Sorghastrum nutans</i>	Indian Grass

- C. Dry Pond: The permanent vegetative treatment for dry ponds is to be Turfgrass or native meadow.
  - 1. Native meadows may be Short, Upland, Lowland, or Wet Meadow Establishment per 2019 SSCM Section 707 or another custom native seed mix approved for the project. Where SSM is recommended in the Landscape section of the Estimating Manual, provide SSM suited for the specified permanent vegetation.

2. Permanently vegetate areas of dry ponds located within wetlands or Waters of the US buffers with native meadow with SSM. Locations with base flow or standing water may require plantings of containerized stock to provide vegetative stabilization if required by the Office of Highway Development, Environmental Programs Division, or the State or Federal permitting agencies.
3. Side slopes of dry ponds shall be used for achieving reforestation, revegetation and/or screen plantings, except where woody plants are restricted as per MD Pond Code 378, where plantings are prohibited by the Highway Hydraulics Division (HHD), or where otherwise prohibited by the LDG.

D. Sand Filter: In lieu of vegetation to stabilize the bottom of the sand filter, as approved by HHD or PRD, use crusher-run No. 2 aggregate, washed free of fines, river jack stone, or other stone. Stone that will be visible from roadways, residences, or commercial properties upon completion of SWM Facility construction, shall be natural in color, such as dark gray, blue-gray, reddish-brown, or similar. White is unacceptable.

**3.13.19.03 Planting Requirements for Micro-bioretenention**

The DBT shall design Micro-bioretenention facilities as required by the HHD. Unlike the other types of facilities listed, areas of Bioretention Soil Mix (BSM) in Micro-bioretenention facilities are stabilized with 3-inch depth shredded hardwood bark mulch and planted with native plants. The vegetative stabilization and planting requirements vary from other types of SWM facilities in this project as follows:

- A. Provide perimeter tree and shrub plantings to shade, screen, and improve the aesthetics of Micro-bioretenention facilities. Use the following table to calculate required minimum perimeter plantings for each facility:

<b>PLANT TYPE</b>	<b>SIZE/ROOT</b>	<b>MAXIMUM SPACING</b>	<b>QTY. PER 100 LF PERIMETER</b>
Shade Tree	2 in. cal. /B&B	N/A	1
Understory Tree (single leader)	1.75 in. cal./B&B	N/A	2
Understory Tree (multi-stemmed)	6 ft. ht./B&B or #7 CG	N/A	
Evergreen Tree	6 ft. ht./B&B	N/A	
Shrub	30 in. ht. #5 CG	5 ft. OC	10
Perennial	#1 CG	30 in OC	30
*Note: Where site constraints do not permit use of large deciduous trees, substitute 2 understory trees or 5 shrubs.			

- B. Establish permanent vegetation on side slopes to obtain 95% coverage. Turfgrass Establishment with Type A SSM or Turfgrass Sod Establishment shall be used on side slopes above the level of water volume retained during

rain events. Native meadow establishment, using Upland Meadow, Lowland Meadow, Bioretention Meadow or other approved native seed, with Type D SSM may also be used on side slopes, provided 95% coverage is obtained. Perimeter plantings shall be installed on side slopes where feasible.

- C. Where bioretention soil mix is present, the DBT will be required to design and establish native herbaceous and woody plants in 3-inch depth shredded hardwood bark mulch. Seeding will not be used to establish vegetation in areas containing shredded hardwood bark mulch. The density of plantings will vary based on the size and type of stock at installation. Provide plants from at least 3 different genera.



PLANT TYPE	SIZE/ROOT	MAXIMUM SPACING	QTY. PER 100 SF BSM SURFACE AREA
Shrub	30 in. ht. #5 CG	5 ft. OC	2
Perennial	#1 CG	30 in OC	16
Perennial	#SP4 CG	24 in OC	25
Perennial	Plug (2 in. diam. by 5 in. depth)	18 in. OC	50

**MICRO-BIORETENTION PLANT MATERIAL:**

BOTANICAL NAME	COMMON NAME	TYPICAL SPACING	MINIMUM SIZE
<b>Major Deciduous Trees</b>			
Acer rubrum 'Autumn Flame'	Autumn Flame Maple	30' OC	2'' Cal. B&B
Acer rubrum 'Brandywine'	Brandywine Maple	30' OC	2'' Cal. B&B
Betula nigra	River Birch	20' OC	8' Ht. Multi-stem, 3-5 stems B&B/#15 CG
Celtis occidentalis	Hackberry	30' OC	2'' Cal. B&B
Liquidambar styraciflua 'Happdell'	'Happidaze' Sweetgum	25' OC	2'' Cal. B&B
Liquidambar styraciflua 'Rotundiloba'	Rotundiloba Sweetgum		2'' Cal. B&B
Nyssa sylvatica	Black Gum	30' OC	2'' Cal. B&B/#25 CG
Quercus bicolor	Swamp White Oak	30' OC	2'' Cal. B&B
Quercus coccinea	Scarlet Oak	30' OC	2'' Cal. B&B
Quercus palustris	Pin Oak	30' OC	2'' Cal. B&B
Quercus phellos	Willow Oak	30' OC	2'' Cal. B&B/#25 CG
Tilia americana	Basswood	30' OC	2'' Cal. B&B
<b>Minor Deciduous Trees</b>			
Select species from the Zone 4 Plant Material List.			

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<b>Evergreen Trees</b>			
<i>Ilex opaca</i>	American Holly	15' OC	5' Ht. B&B SHA approved varieties
<i>Juniperus virginiana</i>	Eastern Red Cedar	15' OC	5' Ht. B&B/#20 CG
<i>Magnolia virginiana</i>	Sweetbay Magnolia	15' OC	5' Ht. B&B/#15 CG
<i>Pinus rigida</i>	Pitch Pine	20' OC	5' Ht. B&B
<i>Pinus taeda</i>	Loblolly Pine	20' OC	5' Ht. B&B
<i>Pinus virginiana</i>	Virginia Pine	20' OC	5' Ht. B&B
<b>Shrubs</b>			
Select species from the Zone 4 Plant Material List and the following:			
<i>Cephalanthus occidentalis</i>	Common Buttonbush	30 in. ht.	#5 CG
<i>Cornus ammomum</i>	Silky Dogwood	30 in. ht.	#5 CG
<i>Cornus racemosa</i>	Gray Dogwood	30 in. ht.	#5 CG
<i>Physocarpus opulifolius</i>	Ninebark	30 in. ht.	#5 CG
<i>Sambucus nigra ssp. canadensis</i>	American Black Elderberry	30 in. ht.	#5 CG
<b>Container Grown Herbaceous Species</b>			
<i>'Cape' Ammophila breviligulata Fernald</i>	'Cape' American Beachgrass	Max. spacing as noted in 3.13.19.03	Size as noted in 3.13.19.03
<i>Amsonia tabernaemontana</i>	Eastern Bluestar		
<i>Andropogon virginicus</i>	Broomsedge		
<i>Asclepias incarnata</i>	Swamp Milkweed		
<i>Asclepias tuberosa</i>	Butterfly Weed		
<i>Aster novae-angliae</i>	New England Aster		
<i>Aster novi-belgii</i>	New York Aster		
<i>Carex retrorsa</i>	Retrose Sedge		
<i>Eragrostis spectabilis</i>	Purple Lovegrass		
<i>Eupatorium dubium</i>	Joe-pye Weed		
<i>Helianthus angustifolius</i>	Swamp Sunflower		
<i>Heliopsis helianthoides</i>	False Sunflower		
<i>Hibiscus moscheutos</i>	Swamp Rose Mallow		
<i>Iris versicolor</i>	Blue Flag		
<i>Iris virginica</i>	Virginia Blue Flag		
<i>Juncus effusus</i>	Soft Rush		
<i>Leymus arenarius 'Blue Dune'</i>	Blue Lyme Grass		
<i>Liatris spicata</i>	Blazing Star		
<i>Lupinus perennis</i>	Sundial lupine		
<i>Oenothera fruticosa</i>	Sundrops		
<i>Panicum amarum Elliott</i>	Bitter panicgrass		
<i>Panicum virgatum (species and approved cultivars)</i>	Switchgrass (species and approved cvs)		
<i>Rudbeckia Triloba</i>	Browneyed Susan		

<i>Schoenoplectus pungens</i> var. <i>pungens</i> ( <i>Scirpus pungens</i> )	Common Three-Square		
<i>Scirpus cyperinus</i>	Woolgrass		
<i>Schoenoplectus validus</i> ( <i>Scirpus validus</i> )	Soft-Stemmed Bulrush		
<i>Solidago sempervirens</i>	Seaside goldenrod		
<i>Sparganium americanum</i>	Bur-reed		
<i>Spartina pectinata</i>	Freshwater Cordgrass		
<i>Symphotrichum laeve</i> var. <i>laeve</i>	Smooth Blue Aster		
<i>Thalictrum pubescens</i>	King of the Meadow		
Notes: 1. All plugs to be 2" diameter, and 5" depth unless otherwise noted. 2. B&B indicates Balled and Burlapped. CG indicates Container Grown. OC indicates On Center Spacing.			

**3.13.19.04 Planting Requirements for Submerged Gravel Wetlands**

The DBT shall design and construct plantings in Submerged Gravel Wetlands (SGW) as required by the Highway Hydraulics Division (HHD) and Plan Review Division (PRD) as follows.

- A. Provide perimeter tree and shrub plantings to shade, screen, and improve the aesthetics of SGW facilities. Use the following table to calculate the required minimum perimeter plantings for each facility:

<b>PLANT TYPE</b>	<b>SIZE/ROOT</b>	<b>MAXIMUM SPACING</b>	<b>QTY. PER 100 LF PERIMETER</b>
Shade Tree	2 in. cal. /B&B	N/A	1
Understory Tree (single leader)	1.75 in. cal./B&B	N/A	2
Understory Tree (multi-stemmed)	6 ft. ht./B&B or #7 CG	N/A	
Evergreen Tree	6 ft. ht./B&B	N/A	
Shrub	30 in. ht. #5 CG	5 ft. OC	10
*Note: Where site constraints do not permit use of major deciduous trees as indicated in the <i>LDG</i> , substitute 2 minor deciduous trees, 2 understory evergreens, or 5 shrubs.			

- B. Stabilize areas of wetland soils in SGW, typically located on the floor of the facility, with native seeding and Type D SSM and planted with container-grown native plants. Specify and establish native seeding and plantings as necessary to establish permanent vegetation to obtain 95% coverage.

- 1. Do not use woody plants within the limits of wetland planting soils.

2. Native seeding may consist of Bioretention Meadow Establishment, Wet Meadow Establishment, Lowland Meadow Establishment, Upland Meadow Establishment, or a custom native mix submitted in writing and approved by the MDOT SHA.
3. Utilize container-grown herbaceous plant species listed in 7.05.08.03 Planting Requirements for Microbioretention, native plants listed in the PPL for SWM, or other native species and sizes as approved by the MDOT SHA. The density of plantings will vary based on the size and type of stock at installation. Provide plants from at least 3 different genera.



PLANT TYPE	SIZE/ROOT	MAXIMUM SPACING	QTY. PER 100 SF BSM/WETLAND SURFACE AREA
Perennial	#1 CG	30 in. OC	16
Perennial	#SP4 CG	24 in OC	25
Perennial	Plug (2 in. diam. by 5 in. depth)	18 in. OC	50

**3.13.20 Zone 9 Noise Barrier Plantings**



Primary Aesthetic Intent: Zone 9 shall provide Turfgrass or Short Meadow Establishment, stone mulch, or naturalized, low maintenance landscaping to impacted areas on the highway side of noise barriers to minimize required landscape maintenance and limit opportunities for graffiti. Plantings will visually tie into adjacent noise barrier plantings to remain or other adjacent planting zones.



**A. Narrow Areas Less than 10Ft:** In locations where the distance between the traffic barrier and the noise barrier is 10 ft. or less, the DBT shall provide a low maintenance treatment of Turfgrass or Short Meadow Establishment. Where mowing access is limited due to reduced width or absent roadway shoulders or the daytime use of roadway shoulders for traffic, decorative stone mulch is to be used in lieu of vegetation. Decorative stone mulch may consist of:

1. River jack stone in natural mixed colors.
2. Washed gravel in natural mixed colors.
3. Crusher run stone, free of fines and in natural colors except for white, light gray, or black.

**B. Medium Width Areas 10-50 ft.** Areas where the distance between the travel lanes and noise barrier is greater than 10 ft. but less than 30 ft shall be landscaped primarily with medium and large shrubs, and columnar, medium, and small trees in accordance with the LDG.

1. Refer to the LDG for restrictions regarding where med/large columnar trees can be used between noise barriers and roadside.
2. Only salt tolerant plants shall be used.



3. Native tree and shrubs and selections/cultivars of native species are preferred. Non-invasive, non-native species may also be selected from the Preferred Plant List.
4. Trees reaching 50 ft ht. or taller at maturity are not to be used.

**C. Wide Areas over 50 ft.** Areas where the distance between the travel lanes and noise barrier is greater than 50 ft. may be landscaped as a naturalized area.

1. The DBT shall landscape this area in accordance with Zone 3 minimum densities and with sufficient density to screen the view of the noise barrier from the travel lanes to reduce opportunities for graffiti.
2. Areas that meet the requirements of Zone 4 Reforestation may be used to satisfy the requirements of this portion of Zone 9.
3. Refer to the LDG for restrictions regarding where med/large columnar trees can be used between noise barriers and roadside. In addition to the requirements in the LDG, trees reaching 50 ft ht. or taller at maturity are not to be used within 50 ft. of travel lanes.
4. Only salt tolerant species are to be used within 50 ft. of travel lanes.
5. Native tree and shrubs and selections/cultivars of native species are to be selected from the Preferred Plants List. Use of non-native species are to be used only with approval of MDOT SHA.

**3.13.21 Invasive Species and Hazard Tree Management**

The Design Builder shall develop an invasive and undesirable vegetation management plan for and implement management of invasive and undesirable species and removal of potentially hazardous/higher risk trees.

The invasive species and prohibited weeds list below shall be treated and removed within the limits of disturbance (LOD) by the DBT.

<b>Invasive Species Management</b>		
<b>Invasive and Prohibited Species to be Controlled and Removed</b>		
<i>Acer platanoides</i> Norway Maple	<i>Hedera helix</i> English Ivy	<i>Perilla frutescens</i> Perilla
<i>Ailanthus altissima</i> Tree of Heaven	<i>Heracleum mantegazzianum</i> Giant Hogweed	<i>Phalaris arundinacea</i> Canary Reed Grass <sup>2</sup>
<i>Albizia julibrissin</i> Mimosa	<i>Humulus japonicas</i> Japanese Hops	<i>Phragmites australis</i> Phragmites
<i>Alliaria petiolata</i> Garlic Mustard	<i>Ligustrum obtusifolium</i> Border Privet	<i>Polygonum cuspidatum</i> Japanese Knotweed
<i>Allium vineale</i> Wild Garlic	<i>Ligustrum sinense</i> Chinese Privet	<i>Polygonum perfoliatum</i> Mile-a-minute
<i>Alecia quinata</i> Chocolate Vine	<i>Ligustrum japonicum</i> Japanese Privet	<i>Pueraria montana var. lobata</i> Kudzu
<i>Ampelopsis brevipedunculata</i> Porcelain Berry	<i>Ligustrum vulgare</i> European Privet	<i>Pyrus calleryana</i> Callery Pear
<i>Artemisia vulgaris</i>	<i>Lonicera japonica</i>	<i>Ranunculus ficaria</i>

Mugwort <i>Bambusa vulgaris, Phyllostachys aurea, Pseudosasa japonica</i> and other Bamboo	Japanese Honeysuckle <i>Lonicera maackii</i> Amur Honeysuckle	Lesser Celandine <i>Rosa multiflora</i> Multiflora Rose
<i>Berberis thunbergii</i> Japanese Barberry	<i>Lonicera morrowi</i> Morrow's Honeysuckle	<i>Sorghum bicolor</i> Shattercane
<i>Carduus sp. &amp; Cirsium sp.</i> Thistles (Canada, Plumeless, Bull and Musk)	<i>Lonicera tatarica</i> Tartarian Honeysuckle	<i>Sorghum halepense</i> Johnsongrass
<i>Celastrus orbiculatus</i> Oriental Bittersweet	<i>Lythrum salicaria</i> Purple Loosestrife	<i>Toxicodendron radicans</i> Poison Ivy <sup>1</sup>
<i>Centaurea maculosa</i> Spotted Knapweed	<i>Microstegium vimineum</i> Japanese Stiltgrass	<i>Ulmus parvifolia</i> Chinese Elm or (Lacebark Elm)
<i>Dipsacus fullonum</i> Common Teasel <sup>2</sup>	<i>Miscanthus sinensis</i> Eulalia	<i>Ulmus pumila</i> Siberian Elm
<i>Elaeagnus umbellata</i> Autumn Olive	<i>Oplismenus hirtellus ssp. Undulatifolius</i> Wavyleaf Basketgrass	<i>Vitis sp.</i> Grape Vine
<i>Euonymus alatus</i> Burning bush	<i>Paulownia tomentosa</i> Princesstree	<i>Wisteria floribunda</i> Japanese Wisteria <i>Wisteria sinensis</i> – Chinese Wisteria
<p>Note:</p> <p>1. Treat and remove only in locations where necessary to minimize exposure of workers or where appropriate to prevent spread into regularly mowed areas or adjacent privately-maintained areas.</p> <p>2. Species in wetlands, 25' nontidal wetland buffers, and waters of the US must receive appropriate state/federal authorization prior to treatment and control.</p>		

- A. The DBT's LTE shall promptly identify and oversee the pruning or removal of trees within the limits of disturbance or outside the limits of disturbance and within MDOT SHA Rights-of-Way or easements that are determined by an ANSI 300 Level 2 tree assessment to pose a probable or imminent risk for causing injury or property damage.
- B. The DBT shall develop a management program and schedule detailing proposed methods for control and removal of invasive species/prohibited weeds for review and approval by OED-LPD. The program and schedule shall include the following:
  - 1. Schedule of invasive vegetation management operations, including mechanical and chemical methods of control for initial, intermediate, timing and follow-up treatments (for re-growth);
  - 2. List of tools and pesticides to be used;
  - 3. Submit copies of Licenses and Certifications for work as required by applicable State and Federal Law;
  - 4. PDF's of maps developed in CADD, GIS, or other software approved in advance by OED-LPD, graphically indicating areas of treatment.
- C. The DBT shall apply for a Toxic Materials Permit 60 days prior to applying pesticides in aquatic areas for review by Maryland Department of the Environment (MDE) and Maryland Department of Natural Resources DNR) in accordance with Environmental



Article 9-314(b)(4) Annotated Code of Maryland and COMAR 26.08.03.02. The DBT shall also comply with requirements of Maryland General Permit No. 11-PE (Discharges from the Application of Pesticides).

- D. Herbicides shall be applied in accordance with the product label, MDA pesticide regulations, and applicable State and Federal Laws.
- E. Conduct invasive species management operations as appropriate before, during, and after installation of proposed landscape treatments. The DBT's schedule shall provide sufficient lead time between herbicide application and plant installation or seeding.
- F. The DBT shall continue to treat and remove invasive species listed above until Final Acceptance of Trees, Shrubs, and Perennials for the Project.
- G. Installed landscape plantings or existing plantings to be retained that are damaged by herbicide application shall be replaced at no cost to the MDOT SHA. Prune damaged portions of trees and shrubs or remove and replace unacceptable plants as per 2019 SSCM Section 710 damaged by invasive species management operations at no cost to the MDOT SHA.

**3.13.22 Other Requirements**

**3.13.22.01 CONTOUR GRADING**

The DBT shall perform contour grading throughout the limits of the project Right-of-Way. Contour grading for both cut and fill conditions shall be performed so that the resultant landforms are natural in appearance, blend smoothly with the surrounding landscape and built features, facilitate positive drainage, and minimize opportunities for erosion. Grading shall be performed to maintain desirable existing vegetation and accommodate project landscape plantings. Changes in slopes shall be rounded to appear smooth and natural. Slopes to be routinely mowed areas shall be no steeper than 4:1.

**3.13.22.02 SWM Fence**

SWM fencing shall be constructed at Structural SWM facilities where safety grading is not feasible as required by SHA's Stormwater Management Site Development Criteria manual. SWM fencing shall be black vinyl coated chain link fencing 3.5 feet in height, be placed to be visually unobtrusive, and installed in accordance with the SHA's Pond Fencing Guidelines. Chain link fencing used at SWM facilities shall have a top rail run continuously between terminal posts at the top of the chain link. Chain link shall be tied to the top rail at two-foot maximum spacing. The top rails shall conform to the brace rail and brace rail attachment specifications. No brace rail is required when top rails are used. A tension wire shall be run continuously between terminal posts near the bottom of the fabric and be attached to the fabric with hog ring fasteners at eighteen-inch intervals. A twelve-foot wide double gate shall be

constructed at each SWM facility requiring fencing. Fencing at Non-Structural (ESD) SWM facilities shall not be provided.

### **3.13.22.03 SWM Naturalized Grading and Forms**

The DBT shall perform naturalized grading and layout design for the Structural SWM facilities. Contour grading for both cut and fill conditions shall be performed so that the resultant landforms are natural in appearance, blend well with the surrounding landscape and built features, facilitate positive drainage, and minimize opportunities for erosion. Grading shall be performed to maintain desirable existing vegetation and accommodate project landscape plantings. Changes in slopes shall be rounded to appear smooth and natural. Slopes to be routinely mowed shall be no steeper than 4:1. Forms or shapes of the facilities shall replicate those forms found in nature of the local area. Rectangles, squares, and parallelograms are not natural forms. See PR 11 for grading and layout design requirements for Non-Structural (ESD) facilities.

## **3.13.23 Landscape Submittals**

### **3.13.23.01 Forest Impact Plans**

The Forest Impact Plans shall be prepared and formatted at a minimum scale of 1" = 100' and shall indicate forest impacts based on the most current limit of disturbance (LOD). Forest Impact Plans shall indicate the quantities of impacts on each plan sheet for each individual area identified and shall include a summary of quantity totals for the entire package of drawings. Forested wetlands shall not be included in the Forest Impact calculations as wetland impacts are quantified and mitigated separately. The DBT shall update the Forest Impact Plans throughout construction and provide a completed set to SHA following completion of construction activities impacting tree and forest areas.

### **3.13.23.02 Tree Impact Avoidance and Minimization Report**

The Design-Build Licensed Tree Expert, Certified Arborist, Maryland Licensed Landscape Architect, or Registered Forester shall prepare a Tree Impact Avoidance and Minimization Report consistent with the 2019 SSCM Section 120 - Tree Preservation and a Tree Preservation Program. The report shall detail, with supplemental maps or plans as necessary, all impacts to trees and forest areas as well as impact reduction and tree preservation measures. Submit the Report to the Office of Environmental Design, Landscape Programs Division (OED-LPD) for approval, prior to installation of erosion and sediment controls.

The DBT shall include in the report:

- A. The DBT's plan to maintain compliance with applicable Federal and State Quarantines of regulated materials.

- B. Location, size, species, and condition, and critical root zone diameter of all Specimen and Champion trees within the limits of disturbance and within 50 ft. of the limits of disturbance.
- C. Estimated percentage root and canopy impacts to Specimen and Champion trees located outside of the limits of disturbance, a determination of whether each tree is to be removed or preserved, and a list of any protection or impact reduction measures. Including tree protection fence in the list of protection or impact reduction measures in the report is not required for individual trees as fence locations will be shown on the erosion and sediment control plans.

In addition to the information provided in the Report, tree protection measures and tree removals are to be shown on the Erosion and Sediment Control Plans.

### **3.13.23.03 Permits and Approvals**

The DBT shall provide copies of all pertinent permits and approvals to the MDOT SHA, including but not limited to:

- A. Roadside Tree Permit
- B. Reforestation Site Review Approvals
- C. Forest Conservation Act (FCA) Approvals
- D. Toxic Materials Permit
- E. Exemption letters
- F. Locations of offsite FCA or other reforestation banking sites, with banking acreages and other documentation as required.

### **3.13.23.04 Preliminary Landscape Plans**

The DBT shall prepare Preliminary Landscape Plans. The DBT shall be responsible for coordinating the plans for the Landscaping with all other elements of work to be performed under the Contract including, but not limited to: Final grading; storm drain and stormwater management BMP locations and outfalls; cross culvert outfalls; utilities; signage; and lighting. The DBT shall demonstrate that areas were maximized and optimized for plantings and that the DBT worked cooperatively toward this goal. Landscaping required as part of the stormwater management plans shall be included on the Landscape plans to ensure a unified planting theme is created for the project.

If conditions change during the design process that affect the design integrity of the approved Preliminary Landscape Plan, it is the responsibility of the DBT Landscape Architect to immediately inform the MDOT SHA of the situation and recommend remedies for consideration by the MDOT SHA.

The Preliminary Landscape Plan shall be formatted as a roll plan at a minimum scale of 1" = 100' and may include: graphics, sketches, and illustrations to convey the Landscape Architect's design intent in complying with the requirements of the RFP.

The preliminary plans shall include, but are not limited to: Existing conditions, including adjacent natural and manmade features; limits of construction phasing; location and extent of planting zone types; anticipated types of plantings, such as overstory and understory, and clear labels or a legend to identify these elements. Provide proposed roadway tree preservation areas; reforestation areas; plant types, locations and potential species selections; stormwater and ESD plantings; cut and fill lines; limit of disturbance lines; right-of-way lines, and other information deemed necessary for adequately evaluating the proposed planting locations.

### **3.13.23.05 Preliminary Landscape Review Meeting.**

The DBT shall conduct a review meeting with OED-LPD via the MDOT SHA Design Project Manager to discuss and review the Preliminary Landscape Plans. This meeting should be scheduled early in the design process to ensure adequate opportunity for coordination and integration with other engineering and design disciplines. The DBT shall prepare meeting minutes and distribute them to attendees for review and comments. After concurrence by OED-LPD of the Preliminary Landscape Plans, the DBT may then begin to develop and advance the Landscape Plans to a Pre-final level of completion while continuing close coordination and communication with other engineering and design disciplines.

### **3.13.23.06 Pre-Final Landscape Plans**

The pre-final Landscape Plans shall undergo a multi-disciplinary review to identify and resolve any conflicts. Plans shall be prepared at a scale no smaller than 1" = 30' with match lines and station limits reflecting those of the proposed Roadway Plans. Plans shall include all proposed plant species, cultivars, sizes, densities, symbology, labels, limits of mulch and landscape beds, material schedules and locations for the project.

Plans shall also include all information from other disciplines, including, but not limited to: existing and proposed roadway and site conditions; limits of disturbance; right-of-way lines; existing grades; proposed grades; stormwater management BMP locations; required setbacks from travel lanes; all existing and proposed utilities and required setbacks; all barriers, fences, signage, lighting, and other fixtures that may pose a potential conflict within the project site; location and extent of planting zone types; plant species and locations; and clear labels and legends to indicate all elements of the drawings. If the DBT or the MDOT SHA determines a conflict from one or more of these elements, the DBT shall be responsible for modifying the Landscape Plans, while retaining the intent of the design.

### **3.13.23.07 Pre-Final Landscape Review Meeting.**

The DBT shall conduct a review meeting with all engineering and design disciplines and OED-LPD to discuss and review the pre-final Landscape Plans. This meeting should be scheduled well in advance of the submittal of the Final Landscape Plans to ensure adequate opportunity for coordination and all required revisions. The DBT shall prepare meeting minutes, which will include a list of compiled comments, and distribute them to attendees for review and comments. A comment response letter shall be prepared by the DBT and shall be submitted prior to the submission of the Final Landscape Plans. This meeting may be eliminated with approval from the MDOT SHA.

### **3.13.23.08 Final Landscape Plans**

Final Landscape Plans shall be prepared as a continuation of the Semi-Final Landscape Plans. Plans shall address and resolve all comments identified during the Semi-Final review period. Plans shall include all plant species, cultivars, sizes and locations for the project. The plans shall include all proposed roadside, stormwater management, wetland, and stream restoration plantings and shall be submitted at a scale no smaller than 1" = 50'. The plans shall include a chart/table outlining sizes of planting zones in acres, and quantities of plants proposed, noting any differences in quantities from previous phases in the form of a chart/table. The stormwater plantings shall include the surface area of treatments and perimeter length, in addition to quantities of plantings. Plans shall include signs, utilities, roadside barriers and other elements that impact planting areas to demonstrate that the greatest amount of planting area was utilized.

### **3.13.23.09 Plant Material Sources**

The DBT shall obtain plants from nurseries that employ IPM Best practices and shall conform to 2019 SSCM Section 920 of the Standard Specifications.

### **3.13.23.10 Invasive Species Control Plan**

The DBT shall prepare and submit a detailed Invasive Species Control Plan to MDOT SHA to provide a record of invasive management methods utilized, frequency of treatments, and species treated. The DBT will provide inspection reports from treated sites, noting most common invasive treatment and presences of woody invasive trees, shrubs, and vines; herbaceous vines; and bamboo likely to re-invade the site. Refer to 3.13.21 for requirements and treatments for removal of invasive species and prohibited weeds.

### **3.13.23.11 Soil Test Reports**

The DBT shall comply with the SHA Environmental Guidelines for Construction Activities. Soil testing results for salvaged and furnished topsoil and subsoil will be compiled and provided to the MDOT SHA as part of the as-built documents for the contract.

**3.13.23.12 Nutrient Management Plan/Report**

The DBT shall comply with the MDOT SHA Environmental Guidelines for Construction Activities and prepare Nutrient Management Plans (NMP) when required by MD Law. Copies of all NMP's are to be compiled and submitted to the MDOT SHA.

**3.13.24 As-Built Plans for Landscape, Reforestation and Forest Impacts**

The DBT shall submit as-built plans which document all post design changes, field adjustments, and substitutions to the Landscape Plans. The as-built plans shall document actual forest impacts, onsite reforestation, including TMDL reforestation areas, offsite reforestation, and Roadside Tree Law mitigation plantings to verify compliance with the applicable DNR-FS approvals and/or permits.

- A. Plans shall include all plant species, cultivars, sizes and locations for the project. The plans shall include all proposed roadside, stormwater management, wetland, and stream restoration plantings and shall be submitted at a scale no smaller than 1" = 50'. The plans shall include a chart/table outlining sizes of planting zones in acres, and quantities of plants proposed, noting any differences in quantities from previous phases in the form of a chart/table. The stormwater plantings shall include the surface area of treatments, in addition to quantities of plantings. Plans shall include signs, utilities, roadside barriers and other elements that impact planting areas to demonstrate that the greatest amount of planting area was utilized.
- B. As a part of the landscape as-builts, the Design Build Landscape Architect shall conduct a project audit to confirm the actual project impacts to forest areas and on and offsite mitigation provided. In addition, the DBT shall quantify cumulative TMDL reforestation impacts and document onsite TMDL reforestation mitigation. TMDL reforestation areas are to be provided in GIS-compatible digital format.
- C. The Design-Build Landscape Architect shall provide a signed and sealed certification for each area at Final Acceptance indicating that the installed plantings are in accordance with the as-built plans and noting any field changes of species.

**3.13.25 Final Acceptance**

**3.13.25.01 Landscape Warranties**

Installation Phase Acceptance for Trees, Shrubs and Ornamental Grasses/Perennials shall conform to 2019 SSCM Section 710. The DBT shall provide a warranty and maintain all landscape plantings for one year after Acceptance for Maintenance of plantings and landscape work. Acceptance for Maintenance for plantings and landscape work shall be implemented after all plant materials in the project have been planted, are true to species and minimum size, are in a healthy and thriving condition



and are in accordance with 2019 SSCM Section 710 and the applicable Special Provisions.

During this one-year warranty period, the DBT shall provide all required plant care and maintenance. This work shall include, but not limited to: watering, weeding, fertilizing, pest control, invasive plant control, mulching, pruning, and replacement of any plant materials that are not in a healthy and thriving condition typical for the species. All work shall be in accordance with 2019 SSCM Section 710 and the applicable Special Provisions.

**3.13.25.02 Landscape Warranty Area Plan**

The DBT shall submit to SHA-LPD for review and approval a plan delineating the proposed areas to be warranted. The areas shall be noted with anticipated dates of Installation Phase Acceptance.

**3.13.25.03 Stormwater Facility Landscape Final Acceptance**

Landscaping in Stormwater management facilities shall be maintained by the DBT until approval of the SWM as-built drawings. Maintenance shall include mowing of turf areas, control of invasive species as per the approved invasive species management program, repair of eroded areas, re-seeding bare areas, repairing and replacing soil stabilization matting, and replacement plantings in Bioretention Soil Mix (BSM) to maintain required minimum planting density.

A. The following shrub and perennial survival rates will be required within BSM in the event that SWM as-built approval occurs after the completion of the Plant Establishment Phase:

<b>PLANT TYPE</b>	<b>SIZE</b>	<b>SURVIVAL RATE %</b>
Tree	Per Zone 8	100%
Shrub	Per Zone 8	90%
Perennial	#1 CG	90%
Perennial (#SP4)	#SP4 CG	80%
Perennial (Plug)	Plug 2 in. diam. by 5 in. depth.	70%

**3.13.25.04 Turfgrass Final Acceptance**

Turfgrass Final Acceptance shall conform to 2019 SSCM Section 705. The DBT shall submit a turfgrass establishment certification package that consists of field photographs and completed turfgrass inspection checklists. All acceptable turfgrass areas shall have a uniform dark green color and have achieved the minimum density per 2019 SSCM 705.03.10.

**3.13.25.05 Meadow Final Acceptance**

Meadow Final Acceptance shall conform to 2019 SSCM Section 707. The DBT shall submit a meadow establishment certification package that consists of field photographs and completed meadow inspection checklists. All acceptable meadow areas shall be as specified in SP 707.03.11.

**3.13.25.06 Turfgrass Sod Final Acceptance**

Turfgrass Sod Final Acceptance shall conform to 2019 SSCM Section 708. The DBT shall submit a turfgrass establishment certification package that consists of field photographs and completed turfgrass sod inspection checklists.

**3.13.25.07 Invasive Species Control Acceptance**

The DBT shall inspect treatment areas and certify that site has no more than 15% invasive species consisting of trees, shrubs, woody or herbaceous vines, bamboo, thistle, Johnsongrass, or Miscanthus. MDOT SHA right-of-way locations within 100 ft of manicured/maintained properties in urban and suburban settings shall be visually free from woody and vining invasive species to the maximum extent practicable. The Design-Builder will also certify that the project is in compliance with invasive species control requirements included as permit conditions.



**TC 3.14 GEOTECHNICAL PERFORMANCE SPECIFICATION**

**3.14.01 General**

The Administration has not completed a preliminary geotechnical subsurface investigation for this project. It is the Design-Build Team's responsibility to perform a complete geotechnical program including, but not limited to subsurface investigation, analyses, and design, as necessary to complete the design and construction of this project. The subsurface investigation, analyses, design and construction shall be performed in accordance with this Geotechnical Performance Specification and all applicable reference and guidelines listed in TC 3.08. It is the Design-Builder's responsibility to obtain written clarification for any unresolved ambiguity prior to proceeding with any subsurface investigation, analyses, design and construction.

**3.14.02 Requirements**

**3.14.02.01 Geotechnical Subsurface Investigation**

**a) Geotechnical Planning Report**

The Design-Builder shall prepare a Geotechnical Planning Report and submit to Office of Materials Technology's Engineering Geology Division for review and approval. The subsurface investigation shall not start until the Geotechnical Planning Report is approved.

The Geotechnical Planning Report shall include the understanding of the project, the discussion of potential geotechnical challenges of the project, the rationale of the supplemental geotechnical investigation plan, and the proposed schedule. The Geotechnical Planning Report shall also include a Quality Assurance/Quality Control (QA/QC) plan for its subsurface investigation, analyses, design, and construction. See TC 3.14.04.01 "Geotechnical Planning Reports" for detailed submittal requirements of the Geotechnical Planning Report.

The Geotechnical Planning Report shall identify all personnel that will be involved during the geotechnical investigation and those personnel shall meet the requirements specified in GS 2.1 of Maryland State Highway Administration Standard Specifications for Subsurface Explorations. In addition, all field investigations and laboratory testing shall be performed under the direct supervision of a Maryland-registered professional engineer with a minimum of five (5) years experiences in the performance and supervision of geotechnical engineering projects.

The Geotechnical Planning Report shall identify all laboratories to perform the laboratory testing and include the list of testing for which each laboratory is certified by AASHTO Materials Reference Laboratory (AMRL). All laboratories conducting geotechnical testing shall be AASHTO Materials Reference Laboratory (AMRL) certified. The laboratories shall only conduct those tests for which the laboratory is certified.

The Geotechnical Planning Report shall include the energy efficiency of each SPT drill rig to be used for the project. The amount of driving energy shall be measured using ASTM D4633 - Standard Test Method for Energy Measurement for Dynamic Penetrometers. If energy efficiency of SPT drill rig is not available at the time of developing the Geotechnical Planning Report, the Design-Builder shall include a schedule to conduct the energy measurement for drill rigs. The energy efficiency information of each drill rig shall be also included on each boring log. Boring logs without energy efficiency information of the drill rig being used will not be acceptable.

**b) Field Investigation**

The subsurface investigation shall be performed in accordance with the Technical Specification of Maryland State Highway Administration Standard Specifications for Subsurface Explorations. It is Design-Builder's responsibility to obtain, prior to the start of the subsurface investigation work, all permits, utility clearances and licenses required by any of all Federal, State, County, or local laws or regulatory agency requirements in accordance with GS 2.15 of Maryland State Highway Administration Standard Specifications for Subsurface Explorations.

The soil and rock samples obtained by the Design-Builder for the subsurface investigation are the property of the Administration. The Design-Builder shall deliver all samples to Field Exploration Division, Office of Materials Technology upon completion. The Design-Builder shall submit two copies of Digital Flash Drives to the Field Exploration Division, Office of Materials Technology with all original driller's logs, final boring logs in PDF format, and final boring logs in gINT file format. Field Exploration Division, Office of Materials Technology is located at 7450 Traffic Drive, Hanover, MD 21076, Phone: 1-866.926.8501 (Toll free).

The Standard Penetration Test shall be performed every 2 feet in the upper 10 feet and every 5 feet thereafter. All roadway embankments shall have one Standard Penetration Test location performed at least every 400 feet along the roadway embankment. All testing locations shall be performed to a depth of at least twice the height of the embankment beneath the anticipated bearing elevation (i.e. to a depth sufficient to characterize settlement and stability issues) or to auger refusal, whichever is shallower. If soft strata encountered extending to a depth greater than twice the embankment height, the exploration depth should be great enough to fully penetrate the soft strata into competent material. All cut excavations shall have one Standard Penetration Test location performed at least every 300 feet along the cut area. All testing locations shall be performed to a depth of at least 25 feet below the anticipated bottom depth of the cut or to auger refusal, whichever is shallower.

**c) Laboratory Testing**

Soil index property testing for classification purposes shall be carried out in accordance with current ASTM standards for USCS and AASHTO soil classification and should include, but not limited to, moisture contents, grain size distribution analyses and Atterberg limits.

Consolidation properties shall be determined using laboratory odometer testing of undisturbed thin-walled tube samples of cohesive soils in accordance with ASTM D 2435 standard.

Undrained shear strength,  $S_u$ , shall be determined using Consolidated undrained (CU), unconsolidated undrained (UU) testing or in situ testing such as Cone Penetrometer Test (CPT), Flat Plate Dilatometer Test (DMT), or Vane Shear Test (VST). Strength measurements from hand torvanes, pocket penetrometers, or unconfined compression tests, or correlated from SPT shall not be used to determine undrained shear strength. If in situ testing is used to determine the undrained shear strength, the undrained shear strength shall be calibrated with the appropriate level of triaxial testing. CPT testing results shall be correlated with soil borings and laboratory triaxial testing to back-calculate the cone factor for the specific soil types under evaluation. The DMT results should be corrected and correlated to undrained shear based on the FHWA Publication FHWA-SA-91-044.

The drained shear strength of cohesive soils,  $c'$  and  $\phi'$ , shall be evaluated by consolidated drained (CD) triaxial tests, or consolidated undrained (CU) triaxial tests with pore pressure measurements. The drained shear strength of cohesive soils,  $c'$  and  $\phi'$ , shall not be evaluated by direct shear tests. The drained shear strength of soils that have both  $\phi'$  and  $c'$  shall be treated as if the soil were either cohesive soils or cohesionless soils. The drained friction angle of granular deposits shall be evaluated by correlation to the results of SPT testing, CPT testing, or other relevant in-situ tests.

In laboratory tests, the rate of shearing load application shall be sufficiently slow to ensure substantially complete dissipation of excess pore pressure in the drained tests, or, in undrained tests, complete equalization of pore pressure throughout the specimen.

Parameters obtained from in-situ testing, without correlation with soil index and validation by a qualified engineer shall not be allowed for design purposes. Laboratory testing conducted on undisturbed samples shall be performed no more than 7 calendar days after sample retrieval.

The Administration has established maximum allowable Total Soil Shear Strength and Maximum Allowable Effective Soil Shear Strength design parameters shown in Table 2-1 and **Table 2-2** 2-2 for use in design. These soil shear strength design parameters may not be exceeded without laboratory testing and the express written permission of the Administration.

**Table 2-1 Maximum Allowable Total Soil Shear Strength**

Soil Type		Peak		Residual	
		c (psf)	$\phi$ (degrees)	c <sub>r</sub> (psf)	$\phi_r$ (degrees)
USCS	Description				
GW, GP, GM, GC	Stone and Gravel	0	34	0	18
SW	Coarse Grained Sand	0	17	0	7
SM, SP	Fine Grained Sand	0	17	0	7
SP	Uniform Rounded Sand	0	15	0	6
ML, MH, SC	Silt, Clayey Sand, Clayey Silt	1,500	15	1,200	6
SM-ML	Residual Soils	900	14	700	6
CL-ML	NC Clay (Low Plasticity)	1,500	0	900	0
CL, CH	NC Clay (Med-High Plasticity)	2,500	0	1,250	0
CL-ML	OC Clay (Low Plasticity)	2,500	0	1,400	0
CL, CH	OC Clay (Med-High Plasticity)	4,000	0	2,000	0

**Table 2-2 Maximum Allowable Effective Soil Shear Strength**

Soil Type		Peak <sup>(1)</sup>		Residual	
		c' (psf)	$\phi'$ (degrees)	c <sub>r</sub> ' (psf)	$\phi_r'$ (degrees)
USCS	Description				
GW, GP, GM, GC	Stone and Gravel	0	40	0	34
SW	Coarse Grained Sand	0	38	0	32
SM, SP	Fine Grained Sand	0	36	0	30
SP	Uniform Rounded Sand	0	32	0	32
ML, MH, SC	Silt, Clayey Sand, Clayey Silt	0	30	0	27
SM-ML	Residual Soils	0	27	0	22
CL-ML	NC Clay (Low Plasticity)	0	35	0	31
CL, CH	NC Clay (Med-High Plasticity)	0	26	0	16
CL-ML	OC Clay (Low Plasticity)	0	34	0	31
CL, CH	OC Clay (Med-High Plasticity)	0	28	0	16

(1) The same maximum peak effective shear strength parameters shall be used for peak effective internal friction angle of normally consolidated cohesive soils and to the fully-softened internal friction angle of overconsolidated soils.

The selection of soil shear strength design parameters for borrow materials requires that the Design-Builder obtain soil shear strength parameters from all potential borrow pit sources. Evaluation of the soil shear strength design parameters requires that a composite bulk sample be obtained from the borrow source and have the following laboratory tests performed:

- a) Moisture Density Relationship (Modified Proctor)
- b) Grain Size Distribution with wash #200 Sieve
- c) Moisture-Plasticity Relationship Determination (Atterberg Limits)
- d) Natural Moisture Content
- e) Consolidated Undrained (CU) Triaxial Shear Test with pore pressure measurements (sample remolded to 97% of Modified Proctor with moisture -1 percent to +2 percent of optimum moisture content) to obtain drained and undrained shear strength parameters

### **3.14.02.02 Geotechnical Analyses and Design**

#### **a) Software and Spreadsheets**

Software and spreadsheets used for geotechnical analysis and design shall be consistent with AASHTO, FHWA and MDOT SHA guidelines and specifications. The Design-Build team shall provide background information about the software or spreadsheet, assumption made and their limitations, calculation procedure, references, definition of parameters, units, equations used, input values and output values. The Administration reserves the right to accept or reject the use of a particular software or spreadsheet. The calculation results of software or spreadsheet shall also be checked with hand-calculations.

#### **b) Roadway Slopes (Fill Embankment and Cut Slopes)**

The need for geotechnical analyses (settlement, bearing, slope stability) for roadway depends on the height of the slope, slope ratio, subsurface conditions, ground water table, adjacent structures, the type of materials being used for fill embankment or materials encountered for cut slope, etc. The Design-Builder shall evaluate the need for subsurface exploration and the need for slope stability, settlement, bearing capacity analyses.

Geotechnical analyses shall be performed for the critical sections. The Administration requires geotechnical analyses (settlement, bearing, slope stability, etc.) being performed for slopes meeting any one of the following scenarios:

- 1) Slopes steeper than 2H:1V;
- 2) Slope higher than 5 feet;
- 3) Slope in soft soil (e.g. wetland);
- 4) Ground water table near or above the toe of the slope;

- 5) Slopes supporting structures, e.g. building retaining wall, bridge, etc.;
- 6) Rock slopes or excavation into rock;

Roadway slope in excess of 20 feet in height shall include a bench at least 10-feet in width at the mid height of the slope. For fill embankment higher than 10 ft, geotextile inclusion shall be placed every three feet (vertical spacing) along the edge of fill embankments per SP 200 Geotextile Inclusion.

All slopes shall be designed to minimize erosion by rainfall and runoff. Adequate drainage and erosion control provisions shall be incorporated in the design and construction of embankments. Drainage and erosion control provisions and means to control seepage shall be incorporated in the design and construction of the cut slopes. The Design-Builder shall have a record of water levels and the slope stability calculation shall model the effect of seepage in the slope stability calculations. The seepage line shall be intercepted with the use of slope drains or horizontal drains or any other techniques to enhance the stability of cut slopes. If the toe of the slope is adjacent to pond or water, the toe of the slope shall be protected by riprap.

Permanent roadway soil slopes (fill embankment or cut slopes) shall not be steeper than 2H: 1V without reinforcement. Reinforced soil slopes shall be designed and constructed per SP 200 Reinforced Soil Slope and SP 900 Geosynthetic for Reinforced Soil Slope, or SP 200 Soil Nail Slope.

### **c) Slope Stability**

Slope stability analyses shall be conducted using limit equilibrium methodologies using a computer program such as ReSSA or similar computer program. The use of slope stability design charts shall not be acceptable. The Simplified (Modified) Bishop, Simplified Janbu, Spencer, or Morgenstern and Price may be used for rotational and irregular surface failure mechanisms. Simplified (Modified) Bishop Method is required.

Circular, sliding, compound and wedge type failures shall be analyzed for potential occurrence for each critical location. For all slope stability analyses, linear Mohr-Coulomb model shall be used for soil strength model unless it is approved by the Administration. The evaluation of global slope stability shall accommodate potential seepage forces, water infiltration, surficial water runoff and any weak deposits and seams that are adversely impacted by water flow.

Below are the requirements of the minimum safety factor:

- 1) A minimum factor of safety of 1.3 is required for fill embankment slopes not steeper than 2H:1V for both global stability and surficial stability analyses.
- 2) A minimum factor of safety of 1.5 is required for cut soil slopes not steeper than 2H:1V for global stability and surficial stability.
- 3) A minimum factor of safety of 1.5 is required for soil slopes supporting structures.

- 4) Reinforced soil slopes shall be designed and constructed per SP 200 Reinforced Soil Slope and SP 900 Geosynthetic for Reinforced Soil Slope, or SP 200 Soil Nail Slope.

**d) Settlement**

The settlement analyses shall include immediate settlement, consolidation settlement, secondary settlement, and time for settlement. Fill embankments shall be designed to keep estimated total long-term settlements limited to one (1) inches during a period of 50 years after construction. Differential settlements within fill sections and across fill/structure interfaces shall be limited to 1/300.

**e) Ground Improvement**

The use of ground improvement techniques to increase soil shear strength or to reduce compressibility in order to increase the safety factors for external and internal stability and to reduce settlements to the allowable range will be allowed in the design. Techniques such as soil-cement, vertical drains, surcharge, stone columns, vibro compaction, dynamic compaction, lime columns, cement columns, deep mix methods, rammed aggregate pier, and grouting may be considered.

All ground improvement systems shall be designed using current practice and procedures. The performance of all ground improvement techniques shall be verified with a pre-production, post-production field testing program (e.g SPT, CPT, DMT, load testing, etc.), and instrumentation developed to demonstrate that the proposed methods and design will provide the ground improvement level required to satisfy the performance requirements specified herein.

**f) Alternative Materials**

Alternative embankment materials for reducing load and settlement such as foamed concrete, expanded polystyrene and fired/expanded clay shale may be considered for use on the project upon approval by the Administration. Recycled materials such as wood chips/products and by-products from steel and coal production such as slags and fly ashes, will not be accepted. The Contractor shall submit the following for alternative materials proposed for use and approval on the project:

- 1) The purpose of materials;
- 2) Design calculations;
- 3) Material design specification,
- 4) Material strength and engineering properties,
- 5) Construction and placement specification,
- 6) Material quality control plan specification,
- 7) Long-term performance history,

- 8) Certification and test data demonstrating compliance with all MDE and EPA requirements for use of recycled materials, and
- 9) Material Safety Data Sheets from the material supplier.

### **3.14.03 Construction**

The Design-Builder is responsible for any and all damage (including, but not limited to settlement and vibrations) to property, structures, or utilities, both inside and outside of the State Right-of-Way, caused by the Work on the Project, and shall appropriately mitigate for these damages.

The Design-Builder is responsible for the temporary support of excavation and it shall be designed in accordance with all applicable OSHA standards and AASHTO requirements including, but not limited to, the appropriate lateral earth pressures, hydrostatic pressure, surcharges and construction loading. Detailed design of all components shall be completed by the Design-Builder, including but not limited to, temporary decking, sheeting, bracing and tie-backs.

The Design-Builder shall prepare instrumentation plans, where appropriate, to monitor existing facilities, temporary construction support structures and in-progress construction of permanent facilities for effects of construction activities such as excavation by blasting, pile driving and nearby construction equipment traffic. Monitoring may include vibrations, ground accelerations, tilt or rotation, and vertical and lateral movement during and after construction.

The Design-Builder shall prepare a report detailing the proposed program of instrumentation and monitoring, establishing threshold values of monitored parameters, and describing the response plans that will be implemented when threshold parameters are exceeded. After the Administration's review and comment on the instrumentation plan, threshold values and response plan, the Design-Builder shall provide, install and monitor the instrumentation during and after construction and interpret the data. Construction instrumentation monitoring reports shall be submitted to the Administration prior to opening the instrumented work for subsequent construction. Corrective actions shall be taken where the instrumentation data so warrant.

The instrumentation plan shall provide that potentially affected facilities are protected against damage due to the construction of the Work. Limiting values of movement (horizontal and vertical), vibration and acceleration for each facility within the zone of influence of the Work shall be established by the Design-Builder. To establish these limiting values, the designer shall consider the nature of buildings and facilities within the sphere of influence of the construction activities, including their use, foundation systems, structural design and current condition. Records of facilities, where available, shall be examined during the design stage and, where no record exists, assessments shall be made and clearly stated. These assessments shall be subject to verification at the commencement of the construction phase prior to the adjacent construction activity.

In addition to the instrumentation plan, the Design-Builder shall conduct preconstruction and post-construction surveys for nearby structures and facilities that may be affected by construction activities. The minimum distance for preconstruction and post-construction surveys is 500 feet



from existing facilities, temporary construction support structures and construction of permanent facilities to construction activities such as excavation by blasting, pile driving, and nearby construction equipment traffic.

The Design-Builder shall prepare and submit instrumentation monitoring plans to either monitor facilities that may be affected by construction activities or to monitor field performance of specific construction elements in accordance with the following criteria and requirements. The Design-Builder's Instrumentation Engineer shall have a minimum of 5 years of experience in planning instrumentation programs, monitoring, analyzing instrumentation data and providing control and threshold values.

- 1) The extent of the monitoring program will depend on the size and type of the facilities. The instrumentation program shall be implemented to monitor potential settlement, stability of fill or cut slopes and stability of surrounding structures;
- 2) The type and distribution of instrumentation shall demonstrate an understanding of the need, purpose and advantages of using each proposed instrument;
- 3) The plan shall include consideration of environmental effects such as temperature, rain, sun, wind, corrodibility, and electromagnetic wave interference;
- 4) Responsibilities for the instrumentation plan, procurement, installation, recording, maintenance and protection shall be the Design-Builders;
- 5) The instrumentation plan will provide construction-related control information and accommodate the collection of long-term performance data;
- 6) Test installations may be performed to demonstrate the compliance and acceptability of instrumentation in relation to the Contract requirements;
- 7) If instruments fail or are damaged, they shall be replaced at no cost to the Administration and the Design-Builders Geotechnical Engineer may require that all work cease in the area to be monitored by the instruments, with the concurrence of the Administration;
- 8) Monitoring shall be initiated a minimum of 15 days prior to construction of the features being monitored to establish baseline readings; and,
- 9) The results of the vibration measurements shall be used to develop attenuation curves for predicting vibrations at varying distances from the source.

#### **3.14.04 Submittals**

All submittals will be subject to review and approval as per TC 3.05.18. All submittals shall be prepared, signed and sealed by a Professional Engineer licensed in the State of Maryland. All submittals shall be submitted to the Administration at least 30 days prior related activities (e.g. mobilization, construction, procurement of materials supply, etc.). Copies of these submittals shall also be sent to the Project Engineer and the Engineering Geology Division, Office of Materials Technology (OMT) located at 7450 Traffic Drive, Hanover, MD 21076, Phone: 1-866.926.8501 (Toll free).

### **3.14.04.01 Geotechnical Planning Reports**

The Design-Builder shall prepare Geotechnical Planning Reports for the project per TC 3.14.02.01. The Geotechnical Planning Reports shall include a detailed method statement describing the general philosophy and methods of investigation, preliminary design and analysis and selection of the anticipated means of construction for the included Project elements. The method statement shall indicate how material and design details are chosen to match selected construction methods and construction details and the soil, rock, and groundwater environment for the site.

For each Geotechnical Planning Report, the Design-Builder shall include the information required per TC 3.14.02.01(a) and the following technical information, as a minimum:

- a) Description of geology and various ground types to be encountered along the alignment;
- b) A description of the geotechnical information that was collected and analyzed in developing the Design-Builder's Geotechnical Planning Report;
- c) Assessment of the engineering properties of all soil types, including the expected average and range of soil strengths and deformation properties and the preliminary design parameters for all soil and rock types;
- d) A narrative describing the interpretation of the pertinent geotechnical data used as a basis for preliminary selection, design, and installation of the proposed foundation elements;
- e) A description of the planned Design-Builder's subsurface investigation (See TC 3.14.02.01(b) "Field Investigation").
- f) The Geotechnical Planning Reports shall define the investigation, engineering and design approach that will be followed in order to develop the most technically, and environmentally acceptable and durable foundations, cut and fill slopes, retaining structures, pavements, storm water management, and geotechnical designs for the elements included in the Geotechnical Planning Report.
- g) The Geotechnical Planning Report should also include a set of full-size or half-size plans and cross sections of the areas covered by the report, and a copy of any reports or references referred in the report.
- h) The Geotechnical Planning Report should include calibration information and the efficiency of all hammers and sampling assembly to be used for the project.

### **3.14.04.02 Geotechnical Subsurface Investigation Summary Report**

The Design-Builder shall prepare Geotechnical Subsurface Exploration Summary Report after the completion of the subsurface investigation including field testing and laboratory testing. The

Geotechnical Subsurface Investigation Summary Report shall include the following, at a minimum:

- a) Scope work of the project and the report;
- b) Location plan showing borings, geophysical testing and other in-situ testing;
- c) Field testing procedures;
- d) Final typed boring logs updated with laboratory testing results;
- e) Electronic copy of the gINT data of subsurface investigation data;
- f) Results of any in-situ testing and geophysical testing;
- g) Description of subsurface conditions, including groundwater, and subsurface profiles;
- h) Results of laboratory tests;
- i) Values assigned to soil parameters for design;
- j) Descriptions of geological and geotechnical risks and approach to respond to risk (e.g. settlement problems, stability, potential for sinkhole, etc.);
- k) Discussion of geotechnical analyses and designs to be performed;
- l) Discussion of construction considerations and needs such as blasting, sinkhole remediation, instrumentation, pre/post construction survey;
- m) Calibration information and the efficiency of all hammers and sampling assembly used for the project.
- n) A set of full-size plans and cross sections of the area covered by the report,
- o) Copies of any reports or references referred in the report.

#### **3.14.04.03 Final Geotechnical Reports**

The Design-Builder shall prepare Final Geotechnical Reports after the completion of the corresponding Geotechnical Subsurface Investigation Summary Report and prior to releasing constructed elements for subsequent work. The Final Geotechnical Reports shall include the following, at a minimum:

- a) The corresponding Geotechnical Planning Report;
- b) The corresponding Geotechnical Subsurface Investigation Report;
- c) Location map and results of borings, rock coring, geophysical testing and other in-situ testing;
- d) A detailed description of geological and subsurface conditions for each Project element (including a description of site stratigraphy);
- e) Field investigation procedures;

- f) Discussion of groundwater conditions;
- g) Results of laboratory tests;
- h) Values assigned to all applicable soil parameters for design;
- i) All pertinent data and complete discussions of all geotechnical analyses and design;
- j) All relevant design calculations and computer program output/inputs checked and initialed by a Professional Engineer licensed in the State of Maryland;
- k) Conclusions and recommendations for structure foundations, embankments, cut slopes, retaining walls, ground improvement, requirements for backfill materials, etc.;
- l) Groundwater problems encountered, means of dewatering and/or other solutions;
- m) Designs for support of excavation;
- n) Discussion of pre-construction survey;
- o) Recommendations of instrumentation monitoring and post-construction survey;
- p) Special provisions developed;
- q) A set of full-size plans and cross sections of the area covered by the report,
- r) Copies of any reports or references referred in the report.

#### **3.14.04.04 Geotechnical Instrumentation Reports**

The Design-Builder shall prepare Geotechnical Instrumentation Reports during the construction per Geotechnical Final Report. The Geotechnical Instrumentation Reports shall include the following, at a minimum:

- a) Qualifications of instrumentation personnel;
- b) Instrumentation location plans;
- c) Instrumentation installation records and calibration data for acquisition equipment used to collect the required instrumentation data.
- d) Instrumentation data and post-construction survey;
- e) Recommendations;
- f) A set of full-size plans and cross sections of the area covered by the report;
- g) Copies of any reports or references referred in the report.

## **TC 3.15 UTILITY PERFORMANCE SPECIFICATION**

### **3.15.01 Utility Statement**

#### **3.15.01.01 General**

The Design-Build Team's attention is called to the requirements of Section GP-5.05, GP-7.13 and GP-7.17.

##### **3.15.01.01.01 Buy America Steel/Iron Materials**

This section applies to projects partially or totally funded with Federal Funds. The prime contractor or its subcontractors shall comply with Section 165 of the Surface Transportation Assistance Act of 1982 as amended by Section 1041 (a) and 1048(a) of the Intermodal Surface Transportation Efficiency Act of 1991 with regard to the furnishing and coating of iron and steel products.

The prime contractor or its subcontractors shall supply certifications to the Project Engineer from the manufacturer of all coating, iron or steel products which document that the steel and iron have been manufactured and the coatings for iron or steel have been applied by the manufacturer in the United States. The Project Engineer shall forward copies of the certifications to the Office of Materials Technology for review and approval prior to such items being incorporated into the permanent work. Certifications shall extend to materials utilized in manufactured and fabricated products purchased by the Contractor.

Products manufactured of foreign steel or iron materials may be used, provided the cost of such products as they are delivered to the project does not exceed 0.1% of the total contract amount, or \$2500, whichever is greater. If supplier or fabricator wishes to use a partial fabrication process where domestic and foreign source components are assembled at a domestic location, the "as delivered cost" of the foreign components should include any transportation, assembly and testing costs required to install them in the final product.

This applies to all iron, steel and coating materials used for utility work incorporated into the project including materials/items supplied by the Utility Company.

#### **3.15.01.02 Utilities within Project Limits**

The Design-Build Team (DBT) is alerted to the presence of overhead and underground utilities including, but not limited to, gas, electric, communication, fiber optic, MDOT SHA conduit, poles and service connections that are located within the limits of the MDOT SHA right of way and within the limits of the construction project. It is the responsibility of the DBT to avoid, protect, coordinate, and relocate these utilities as necessary to maintain service, safety, and project schedule with minimal disruption to the traveling public or utility customers.

The DBT is responsible to coordinate with the Utility Companies on the overall project design, schedule, and construction. The DBT is also responsible to coordinate any and all Utility Owner design, schedule and relocations by working directly with the Utility Owners. As the

DBT has the flexibility to determine how to perform certain operations and how much space will be needed to perform those operations, the relocations will be based on the Utility companies' safety and clearance requirements. It may be necessary for the DBT to utilize non-typical methods in some cases to avoid impacting utility facilities. Associated costs will be incidental to the overall contract lump sum.

**Utility Owner Contact Information:**

<p><b>District 4 Utility Engineer</b>  Michael Pasquariello  320 West Warren Road  Hunt Valley, MD 21030  Telephone: 410-229-2341  Email: MPasquariello@mdot.maryland.gov</p>	<p><b>MDOT SHA Owned Traffic Signals</b>  Hanover Complex Signal Shop  7491 Connelley Drive  Hanover, MD 21076  Telephone: 410-787-7652</p>
<p><b>MDOT SHA Owned Street Lighting</b>  Terry 'Will' Clark  District 4 Maintenance Section  320 West Warren Road  Hunt Valley, MD 21030  Telephone: 410-229-2361  Email: tclark3@mdot.maryland.gov</p>	<p><b>CenturyLink</b>  Reynaldo Delos Reyes  3005 Big Woods Rd  Ijamsville, MD 21754  Telephone: 703-935-5324  Email: reynaldo.delosreyes@centurylink.com</p>
<p><b>AT&amp;T</b>  Gary Wigfield  4800 Winchester Blvd  Frederick, MD 21703  Telephone: 301-865-3877  Email: gw1349@att.com</p>	<p><b>Colonial Pipeline</b>  Todd McClellan  929 Hoods Mill Road  Woodbine, MD 21797  Telephone: 410-970-2141  Email: TMcClell@colpipe.com</p>
<p><b>Baltimore County Sewer</b>  Dave Bayer  111 W. Chesapeake Ave, Room 200  Towson, MD 21204  Telephone: 410-887-3783  Email: dbayer@baltimorecountymd.gov</p>	<p><b>Comcast – Baltimore County East &amp; Harford</b>  Allen Capps  21 W Aylesbury Rd  Timonium, MD 21093  Telephone: 410-513-3253  Email: Allen_Capps@cable.comcast.com</p>
<p><b>Baltimore County Water</b>  Mike Mazurek  111 W. Chesapeake Ave, Room 200  Towson, MD 21204  Telephone: 410-887-3783  Email: mmazurek@baltimorecountymd.gov</p>	<p><b>Comcast – Baltimore County West</b>  Phil Holland  7195 Troy Hill Drive  Elkridge, MD 21075  Telephone: 410-497-0232  Email: Phil_Holland@cable.comcast.com</p>
<p><b>Baltimore Gas Electric – Electric</b>  Suzanne Maxa-Albers  2900 Lord Baltimore Dr.</p>	<p><b>Crown Castle</b>  Bill Muehlberger  9270 Commerce Hwy</p>

Baltimore, MD 21244 Telephone: 410-470-4494 Email: Suzanne.Maxa-Albers@exeloncorp.com	Pennsauken, NJ 08110 Telephone: 585-362-0019 Email: Bill.Muehlberger@crowncastle.com
<b>Baltimore Gas Electric - Electric Transmission</b> Kenneth Garvey 1068 North Front Street, Room 200 Baltimore, MD 21202 Telephone: 410-470-6836 Email: kenneth.d.garvey@bge.com	<b>Verizon Business</b> Adam Rice 12379 Sunrise Valley Drive, Suite A Reston, VA 20191 Telephone: 703-391-5767 Email: adam.rice@verizon.com
<b>Baltimore Gas Electric - Gas</b> Barry Herbert Jr 2900 Lord Baltimore Dr. Baltimore, MD 21244 Telephone: 410-470-7925 Email: Barry.HerbertJr@bge.com	<b>Zayo</b> Doug Schuele 13861 Sunrise Valley Dr., Suite 450 Herndon, VA 20171 Telephone: 443-527-4399 Email: doug.schuele@zayo.com
<b>MDOT SHA Intelligent Transportation System Devices (ITS)</b> MDOT SHA OOM Communications Telephone: 410-747-8590 ITS Operations Telephone: 410-787-7662 Email: <a href="https://chart.maryland.gov/">https://chart.maryland.gov/</a>	

**3.15.01.03 Utilities Coordinator**

The DBT shall provide a Utility Coordinator with experience in coordinating the relocation of utilities on major roadway projects. Responsibilities for this position include, but are not limited to, continuous coordination with all Utility Companies, establishment and continual updates of schedules for the relocation of utilities, creation and maintenance of the utility conflict matrix, tracking progress of Utility Owner design and utility construction, coordination with DBT design and construction personnel to ensure they are minimizing impacts to and protecting existing utility facilities, facilitation of issues and conflicts pertaining to utilities as they arise, organize and facilitate at least monthly Utility Coordination Meetings, including preparation of the agenda and distribution of meeting minutes.

**3.15.01.04 Utility Coordination Meetings**

The DBT shall conduct and facilitate a utility coordination meeting as soon as possible after notification as the successful proposer. Attendees shall include:

- DBT Design-Build Manager and/or Construction Manager
- DBT Utility Coordinator

- The MDOT SHA Design Project Manager
- The MDOT SHA Construction Project Engineer
- The MDOT SHA District 4 Utility Engineer
- The MDOT SHA Area Engineer
- The MDOT SHA CHART Representative
- A responsible officer of any necessitated subcontractors
- Utility Owners and/or their representatives

At a minimum, the following shall be discussed at this meeting:

- Status of DBT design and construction
- Potential utility impacts and avoidance and minimization efforts
- Constructability review with utility owners to identify potential conflicts between utility relocations that require sequencing in order to execute the relocations.
- DBT planned design and construction schedule and coordination between utility relocation design and construction schedule
- Schedule for utility relocations including how they will be facilitated within the DBT's design and construction
- Issue resolution
- Schedule for future utility coordination meetings

The DBT Utility Coordinator shall prepare all meeting minutes and distribute them to the team for review, comments, and final acceptance of meeting minutes within five (5) calendar days from the meeting date.

### **3.15.01.05 Utility Coordination**

The DBT shall incorporate and make provisions in the design for all utility relocations. The DBT shall establish and maintain ongoing coordination with Utility Owners to fulfill the following requirements:

- a) Obtain plans from the Utility Companies and coordinate with District Utilities to obtain approval in accordance with the RFP. The DBT will review utility plans and shall provide concurrence that the existing and proposed utilities are not in conflict with each other and the DBT's proposed improvements.
- b) Ensure adequate protection of their utilities.
- c) Maintain utility service at all times during construction of the project including providing temporary connections.
- d) Identify all potential conflict areas both overhead and underground and perform test holes to verify conflicts.



- e) Create and maintain a utility conflict matrix until all relocations are determined.
- f) Incorporate and accommodate utility relocations in the schedule and sequence of construction.
- g) Conduct alternative studies to avoid utility relocations.
- h) Provide the design and construction associated with any utility service connections to existing and proposed Traffic Control Devices. The DBT shall be responsible for all conduits, manholes, cabling, meter cans, and disconnect switches as required by the utility to obtain the electrical utility connection. Monthly energy use charges and the final connection fees will be the responsibility of MDOT SHA.
- i) Provide construction stakeout, clearing and grubbing, and tree trimming for any required utility relocations.

 **3.15.01.06 Utility Relocations by Others**

The DBT shall make every effort to not impact any utilities. Any utility relocations determined to be unavoidable shall be brought to the Administration's attention immediately. The DBT shall make a written request in letter form requesting approval of the utility relocation with all necessary information attached, including but not limited to plans, justification of why the relocation is unavoidable, alternatives investigated and estimates, to allow the Administration to make an informed decision on the utility relocation request. MDOT SHA will respond in writing notifying the DBT if the relocation is approved or not. Approval of any relocation is at the sole discretion of MDOT SHA and approval or disapproval of a relocation shall not be basis for any additional cost to the Administration nor be cause for any contract claims or time extensions.

If the Administration approves of a relocation, the effected utility company shall prepare the designs and perform relocation of all its impacted facilities within the project limits, unless noted otherwise. It is the responsibility of the DBT to coordinate any approved relocations with the DBT's design, schedule and sequence of construction so that there are no delays to the utility relocations or MDOT SHA's project. Delays to the DBT's schedule associated with the anticipated sequencing of utilities shall not be basis for any additional cost to the Administration nor be cause for any contract claims or time extensions.

**3.15.01.06.01 BGE Electric**

BGE maintains aerial and underground facilities within the project limits. BGE will design and relocate their facilities for impacts, approved by the Administration, which are unavoidable.

It is the responsibility of the DBT to coordinate any BGE design and relocations with the DBT's design, schedule and sequence of construction so that there are no delays to the

utility relocations or the DBT's schedule. A minimum of 3 feet of cover shall be maintained on underground facilities and all work shall adhere to BGE Standards.

**3.15.01.06.02 BGE Gas**

BGE Gas owns and maintains natural gas pipes within the project limits. BGE will design and relocate their facilities for impacts, approved by the Administration, which are unavoidable.

It is the responsibility of the DBT to coordinate any BGE design and relocations with the DBT's design, schedule and sequence of construction so that there are no delays to the utility relocations or the DBT's schedule. The DBT shall maintain a minimum of 3 feet of cover over BGE mains and encasements at all times. All work in the vicinity of BGE gas infrastructure shall adhere to BGE Standards.

**3.15.01.06.03 Verizon of Maryland**

Verizon of Maryland maintains aerial and underground facilities within the project limits. Verizon will design and relocate their facilities for impacts, approved by the Administration, which are unavoidable.

It is the responsibility of the DBT to coordinate any Verizon design and relocations with the DBT's design, schedule and sequence of construction so that there are no delays to the utility relocations or the DBT's schedule. A minimum of 3 feet of cover shall be maintained on underground facilities and all work shall adhere to Verizon Standards

**3.15.01.06.04 Comcast**

Comcast Television maintains aerial and underground facilities within the project limits. Comcast Television will design and relocate their facilities for impacts, approved by the Administration, which are unavoidable. Comcast Television will initiate their overhead and underground relocation upon notification that any BGE and Verizon overhead relocation work has been completed.

It is the responsibility of the DBT to coordinate any Comcast Television's design and relocation with the DBT's design, schedule and sequence of construction so that there are no delays to the utility relocations or the DBT's schedule. A minimum of 3 feet of cover shall be maintained on underground facilities and all work shall adhere to Comcast Standards

**3.15.01.06.05 Baltimore County Water/Sewer**

Baltimore County maintains underground facilities within the project limits. If the Administration approves of a relocation, the Administration may have the utility relocation design and construction performed by a third party concurrent with the project or by the

DBT as part of their project. If the Administration determines it is in the best interest of the Administration to have the utility relocation design and construction performed by DBT, the Administration will notify the DBT in writing in letter form.

It is the responsibility of the DBT to coordinate Baltimore County water and sewer design and relocations (performed by them or a third party) with the DBT's design, schedule and sequence of construction so that there are no delays to the utility relocations or DBT's schedule. A minimum of 3 feet of cover shall be maintained on the underground facilities.

#### **3.15.01.06.06 AT&T**

AT&T maintains aerial and underground facilities within the project limits. AT&T will design and relocate their facilities for impacts, approved by the Administration, which are unavoidable.

It is the responsibility of the DBT to coordinate any AT&T design and relocations with the DBT's design, schedule and sequence of construction so that there are no delays to the utility relocations or the DBT's schedule. A minimum of 3 feet of cover shall be maintained on underground facilities and all work shall adhere to AT&T Standards.

#### **3.15.01.06.07 CenturyLink**

CenturyLink maintains aerial and underground facilities within the project limits. CenturyLink will design and relocate their facilities for impacts, approved by the Administration, which are unavoidable.

It is the responsibility of the DBT to coordinate any CenturyLink design and relocations with the DBT's design, schedule and sequence of construction so that there are no delays to the utility relocations or the DBT's schedule. A minimum of 3 feet of cover shall be maintained on underground facilities and all work shall adhere to CenturyLink Standards.

#### **3.15.01.06.08 Crown Castle**

Crown Castle maintains aerial and underground facilities within the project limits. Crown Castle will design and relocate their facilities for impacts, approved by the Administration, which are unavoidable.

It is the responsibility of the DBT to coordinate any Crown Castle design and relocations with the DBT's design, schedule and sequence of construction so that there are no delays to the utility relocations or the DBT's schedule. A minimum of 3 feet of cover shall be maintained on underground facilities and all work shall adhere to Crown Castle Standards.

#### **3.15.01.06.09 Verizon Business**

Verizon Business maintains aerial and underground facilities within the project limits. Verizon Business will design and relocate their facilities for impacts, approved by the Administration, which are unavoidable.

It is the responsibility of the DBT to coordinate any Verizon Business design and relocations with the DBT's design, schedule and sequence of construction so that there are no delays to the utility relocations or the DBT's schedule. A minimum of 3 feet of cover shall be maintained on underground facilities and all work shall adhere to Verizon Business Standards.

**3.15.01.06.10 Zayo**

Zayo maintains aerial and underground facilities within the project limits. Zayo will design and relocate their facilities for impacts, approved by the Administration, which are unavoidable.

It is the responsibility of the DBT to coordinate any Zayo design and relocations with the DBT's design, schedule and sequence of construction so that there are no delays to the utility relocations or the DBT's schedule. A minimum of 3 feet of cover shall be maintained on underground facilities and all work shall adhere to Zayo Standards.

**3.15.01.06.10 Colonial Pipeline**

Colonial Pipeline maintains facilities within the project limits. Colonial Pipeline will design and relocate their facilities for impacts, approved by the Administration, which are unavoidable.

It is the responsibility of the DBT to coordinate any Colonial Pipeline design and relocations with the DBT's design, schedule and sequence of construction so that there are no delays to the utility relocations or the DBT's schedule. A minimum of 3 feet of cover shall be maintained on underground facilities and all work shall adhere to Colonial Pipeline Standards.

 **3.15.01.07 Utility Relocations by Design-Build Team**

 **3.15.01.07.01 MDOT SHA Traffic Control and Intelligent Transportation Systems (ITS) Devices Utility Service Connections**

The DBT shall coordinate the design and construction of any and all utility service connections to existing and proposed Traffic Control and ITS Devices with the Utility Company. The DBT shall be responsible for all conduits, manholes, cabling, meter cans and disconnect switches as required by the utility to obtain the electric utility connection. The DBT shall review all existing and proposed traffic signal structures and related equipment to ensure clearance from all existing and proposed utility lines are in compliance with OSHA, MOSH and the High Voltage Line Act. Relocations and/or adjustments may be necessary to obtain the clearance that is required by the MDOT SHA Office of Traffic and Safety to ensure the signals can be maintained in compliance with the High Voltage Line Act. NO EXCEPTIONS will be made.



**3.15.01.07.02 Existing and New MDOT SHA Fiber Optic Cable for ITS**

MDOT SHA has existing fiber resources available for the project from the MDOT SHA Radio Shop on US 40 along western I-695 to the north leg of I-83 and continues north along I-83 to the MDOT SHA District 4 office on Warren Road. MDOT SHA intends to allocate six (6) strands of fiber through these limits for this project. This fiber connects to the MDOT SHA network at these two locations, which connects the fiber with CHART TMC in Hanover. As-built plans containing details pertaining to the type of fiber and fiber routing have been provided on ProjectWise.

The DBT shall design and construct any connections to these 6 strands for the Design-Builder's project. This work requires the Design-Builder to have a Maryland Department of Information Technology (DoIT) approved Master Contractors in the required Functional Area perform the work. A listing of the DoIT approved contractors can be found on the DoIT website and can be accessed as follows:

Go to <https://doit.maryland.gov/contracts/Pages/CW2016FunctionalAreas.aspx>

Click on "Contracts"

Click on "All Master Contracts"

Click on "Cable and Wiring Materials and Services"

Click on "Functional Area I – Structured Cable & Wiring"



**3.15.01.07.03 New Fiber Optic Cable**

The DBT shall design and construction on any new fiber optic cable required for the Design-Builder's improvements.

**3.15.01.07.03.01 Guidelines and References**

Design and construction of New Fiber Optic Cable shall be in accordance with this Specification, including but not limited to TC 3.21, and the relevant requirements of the Guidelines and References listed in TC 3.08. for additional requirements.

**3.15.01.07.03.02 Coordination with Other Work**

The DBT shall coordinate New Fiber Optic Cable design and construction to avoid conflicts to all other utilities and facilities.

**3.15.01.07.03.03 Materials**

The DBT shall coordinate New Fiber Optic Cable design and construction to avoid conflicts to all other utilities and facilities. Refer to Section TC 3.21.15.02 for additional requirements.



**3.15.01.08 Permitting**

The Utility Owner is to obtain the required utility permits from the Administration and other permitting agencies as necessary. The DBT shall obtain any other approvals with regard to utility work that is performed by the DBT including service connections. If the DBT has

reasonable cause to believe that a Utility Owner performing construction work on the site does not have necessary approvals, or is in violation of the approvals, the DBT shall notify the Administration immediately after discovery.

**1 3.15.01.09 Existing Utility Services**

The DBT must identify all impacted service connections within the limits of the project. The DBT must communicate with the Utility Companies and use all means necessary to locate existing services and protect as necessary. Should a service require relocation, the DBT is responsible for the coordination and work required to relocate, reconnect and remove the existing service. Utility services must be maintained at all times during construction, unless written permission is obtained from the Utility Owner.

**1 3.15.01.10 Existing Utility Locations**

The DBT must notify Public Service Companies of work intentions 48 hours before work is to begin, by calling MISS UTILITY at 1-800-257-7777 or by applying for utility locates online at: <http://www.missutility.net/>. All notifications to the above Utility Companies and "MISS UTILITY", at 1-800-257-7777, shall be given 48 hours (two full working days) in advance of working in the area of each specifically affected utility. The notification to "MISS UTILITY" is required whenever any excavating or similar work is performed. The DBT is responsible for following the MISS UTILITY process prior to any excavation or work associated with this project. Utility locations shown on the plans are for the convenience of the DBT and shall not be considered accurate or complete unless it has been located and verified by a test hole. The cost for this coordination shall be included in the overall contract lump sum and the time needed should be considered in the project schedule.

**1 3.15.01.10.01 Utility facilities owned by the MDOT SHA**

Regarding stake out of State Highway Administration owned facilities, please make note of our new notification procedures. MDOT SHA is now part of MISS UTILITY., and we also charge fees for our locates. The DBT must provide the contract number (**BA0065172**) when contacting MISS UTILITY for locates in order to avoid paying fees for locating MDOT SHA owned facilities. This provision is required whether the DBT contacts MISS UTILITY via the internet or by phone. Failure of the DBT to comply with this requirement may result in a locate fee by MDOT SHA for which the DBT will not be allowed to recover. When processing online, you shall complete the LOCATE REQUEST FORM. On this form, toward the bottom is the Section -EXCAVATION INFORMATION. Under this section, in the blank space to the right of "Work Being Done For" type **-BA0065172**. This will allow MISS UTILITY to know what District number and highway agency that you are working for.

Regarding the marking of MDOT SHA owned facilities, the DBT shall contact the following (a minimum 72-hour advance notice is required):

Intelligent Transportation System (ITS) devices: MDOT SHA OOM Communications 410-747-8590 AND ITS Operations 410-787-7662.



MDOT SHA Owned Street Lighting: District 4 Maintenance Section, Terry 'Wil' Clark,  
410-229-2361

MDOT SHA owned traffic signal facilities: Hanover Complex Signal Shop 410-787-7652.

 **3.15.01.11 Protection of Existing Utilities during Construction**

The DBT shall maintain a minimum of three (3) feet of cover over all existing utilities that will be left in service during construction. MDOT SHA utility clearances are listed in the MD Department of Transportation SHA Utility Policy. Some Utility Owners have provided their minimum clearances which are listed under TC 3.15.01.06. MDOT SHA and Utility Owner clearances must be adhered to. If there is a discrepancy, it is DBT's responsibility to work out a resolution with MDOT SHA and the Utility Owner. In the event that this requirement cannot be met, the DBT shall immediately contact the impacted Utility Owner to determine alternative means of protection.

 **3.15.01.11.01 Utility Damage**

The DBT shall locate all existing utilities, including Administration owned utilities, and be responsible for their safety. Should any existing utilities or Administration owned facilities be damaged or destroyed due to the operations of the DBT, the Utility Owner must be immediately notified and the damaged or destroyed components shall be immediately replaced or repaired as necessary to restore the facilities to a satisfactory operating condition as directed by the Utility Owner. The DBT shall be responsible for completing a Utility Damage Report form to use in the event a utility or Administration owned facility is damaged. The DBT must attach pictures of the damage to the utility damage report. The DBT shall complete and submit a Utility Damage Report within 24 hours of the damage to the MDOT SHA Project Engineer and the District Utility Engineer. Refer to Appendix "A" for a copy of the report.

 **3.15.01.12 Surface Utility Frames**

The DBT shall make all adjustments to surface utility frame and covers located in pavement and concrete, not limited to manholes, water valves, water meters. The DBT must coordinate with the Utility Owner on the specifications and schedule. This work is to be included in the overall contract lump sum.

 **3.15.01.13 Utilities: Guidelines and Technical Requirements**

All utilities within the Project area, designed and/or constructed by the DBT, shall be placed in accordance with applicable OSHA, MOSH, Utility Owner Regulations, Governmental Rules, including the Administration's utility regulations and policies, MD Department of Transportation SHA Utility Policy Manual and Utility Procedure Manual, the applicable Utility Standards, Maryland Tariff, and other requirements specified in the Contract Documents. The DBT is to ensure the technical requirements are maintained while designing proposed improvements around and/or near utility facilities.

Appendix

"A"

**UTILITY DAMAGE  
REPORT**

**UTILITY DAMAGE INFORMATION**

Exact Location: \_\_\_\_\_  
\_\_\_\_\_

Date & Time of Incident: \_\_\_\_\_ Reported By: \_\_\_\_\_  
Repaired By: \_\_\_\_\_

**UTILITY OWNER INFORMATION**

Utility Owner: \_\_\_\_\_  
Utility Owner Contact: \_\_\_\_\_  
Time Utility Owner Contacted: \_\_\_\_\_

**LOCATOR INFORMATION**

Locator Service: \_\_\_\_\_  
Date of Locate Request: \_\_\_\_\_  
Locate Expiration: \_\_\_\_\_ Date: \_\_\_\_\_  
Locate Log Number: \_\_\_\_\_ Was Line Marked: \_\_\_\_\_  
Distance from Damage to Mark: \_\_\_\_\_

**CONTRACTOR INFORMATION**

Name of Supervisor: \_\_\_\_\_  
Name of Foreman: \_\_\_\_\_  
Name of Witness: \_\_\_\_\_

**SIGNATURES**

Contractor's Supervisor: \_\_\_\_\_  
Utility Owner: \_\_\_\_\_  
Locator Service: \_\_\_\_\_

**DESCRIPTION OF DAMAGE:**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



**TC 3.16 MAINTENANCE OF TRAFFIC, HAUL ROUTES AND ACCESS DURING CONSTRUCTION PERFORMANCE SPECIFICATION**

**3.16.01 General**

The Design-Builder shall develop and implement a Transportation Management Plan (TMP) in accordance with the requirements of this specification including performance requirements, standards and references, design and construction criteria, maintenance during construction, and required reviews.

This performance specification provides the flexibility to establish a TMP and to adapt Maintenance of Traffic (MOT) operational changes throughout the Project life to produce benefits or savings to the Administration or the Design-Builder without impairing the essential functions and characteristics of the Project, such as safety, mobility, traffic operations, durability, desired appearance, maintainability, environmental protection, drainage, and other permitted constraints.

Work zone impacts, including impacts on the environment and surrounding communities, shall be kept to a minimum, and shall be considered when developing and implementing the Transportation Management Plan. To that end, a Transportation Management Plan Report shall be developed by the Design-Builder. The TMP Report shall include transportation management strategies and how these strategies are implemented to manage work zone impacts.

**3.16.02 Guidelines**

Maintenance of Traffic shall be in accordance with this Maintenance of Traffic (MOT) Performance Specification and the relevant requirements of the Guidelines and References in TC 3.08.

**3.16.03 Performance Requirements**

The Administration's responsibilities include the following activities:

- A) Maintaining Quality Assurance (QA) of any MOT analysis, work zone impact management strategies and temporary traffic control plans from the Design-Builder;
- B) Liaising with and monitoring the Design-Builder's performance for compliance with this Contract's requirements;
- C) Maintaining documentation for the TMP as developed by the Design-Builder;
- D) Providing a trained individual to monitor the TMP during construction;
- E) Monitoring implementation of the TMP to verify that strategies are being implemented on schedule and in the manner planned, and that they are effectively managing the work zone impacts.

This project requires the Design-Builder to have a team experienced in Maintenance of Traffic, including work zone design, work zone traffic analysis, and traffic control devices and setups.

Traffic Manager:

The Design-Builder shall provide a Traffic Manager (TM) on-site whose sole responsibility is to supervise and continuously monitor the installation and maintenance

of all traffic control devices. The TM shall be equivalent to, meet the requirements of, and perform all duties of Section 104.18 of the Administration's Standard Specifications for Construction and Materials. The Design-Builder shall authorize the TM to direct traffic changes to ensure safe and continuous traffic flow and to direct traffic operations after a traffic incident has occurred. A TM shall be available at all times and be on-site within a ½ hour throughout the duration of the Project. The TM shall document all daily maintenance of the traffic control setups, including but not limited to maximum queue lengths/delays, work zone modifications, incidents, and suggested improvements. Minimum qualifications of the TM include successful completion of Administration's Temporary Traffic Control Traffic Managers Training Course and five years' experience in work zone traffic control.

Flaggers:

The Design-Builder shall provide flaggers with a current American Traffic Safety Services Association (ATSSA) flagger certification. The flaggers provided shall maintain their flagger certification throughout the life of the Project.

### **3.16.03.01 Maintenance of Traffic - General Requirements**

All maintenance of traffic design and implementation shall be performed in accordance with the following performance requirements:

- A) Provide for the safe and efficient passage of pedestrians (including those with disabilities), bicycles, and vehicular traffic through and around construction zones;
- B) Prohibit use of new permanent pavement construction as haul route(s);
- C) Minimize negative impacts on residents, commuters, and businesses;
- D) Provide convenient and logical rerouting of traffic (by using advance warning systems and directional and informational signing, lighting, and striping) to provide "driver friendly" detours and to maximize the safety of the traveling public;
- E) Maintain and provide access at all times to properties for owners, customers, visitors, and emergency vehicles;
- F) Provide a safe travel corridor while minimizing any unnecessary investment in the existing infrastructure that is being replaced;
- G) Develop and coordinate MOT activities with the Maryland State Police, local law enforcement, and other emergency service agencies to ensure public safety and emergency response times are not compromised;
- H) Coordinate MOT activities and Traffic Control Plans with other construction projects;
- I) Provide Traffic Control Plans (TCPs) for each major phase of construction (see TC 3.16.06 of this performance requirements);
- J) Provide for a Public Outreach campaign to be implemented in cooperation with the Administration per the requirements in TC 3.22; and

- K) Develop an incident management plan for accidents occurring within the Project limits, including accident prevention strategies, emergency procedures, reporting requirements, and mitigation strategies.

**3.16.04 Design and Construction Criteria**

**3.16.04.01 Traffic Through Construction Zones**

The Design-Builder shall perform the following:

- A) Implement Traffic Control Plans for all roadways within the Project limits in a manner that safely and efficiently accommodates traffic at all times.
- B) Design temporary traffic control plans and implement maintenance of traffic setups using design speeds to determine buffer and taper lengths, clear zone distances, attenuator arrangements, acceleration and deceleration length, and other temporary traffic control elements.
- C) Provide all material, labor, equipment, and personnel to effectively carry out the TMP. All equipment and tools shall be in good operating condition and shall be kept in proper adjustment throughout the duration of the project. All materials and supplies shall be of good quality and suitable for the assigned work.
- D) Provide and use all safety equipment including (but not limited to) hard hats, safety vests and clothing required by State and Federal regulations and Administration policies and procedures.
- E) Begin maintenance of traffic activities at the start of construction work (including preparatory MOT work), or when first hauling construction materials and/or equipment, whichever is earliest and continue MOT activities until Completion of the Project.
- F) Arrange and host a pre-traffic switch meeting with the Administration and all affected agencies at least two weeks prior to switching traffic.
- G) Identify desired full roadway, bridge or ramp closures (for any period of time) and submit a request in writing to the Administration for review and concurrence during the design review process.
- H) Correct all traffic control deficiencies immediately upon notification or observance of the deficiency.
- I) Design temporary traffic control plans using temporary raised pavement markers such that all temporary markings are supplemented with temporary raised pavement markers for positive guidance during darkness.
- J) Design temporary traffic control plans in a manner that reduces conflict areas.
- K) Design all geometric aspects of temporary roadways based on the design speed, and appropriate design vehicle (double trailers, emergency response vehicles, WB-67, etc.) as noted in TC 3.09.
- L) Design all active roadways to accommodate drainage such that there are no puddles or icing on the traveled roadway or shoulders.

- M) Ensure appropriate MOT and flagging procedures are employed during all phases of construction, including mobilization activities;
- N) Coordinate with the Administration as necessary to provide all MOT items (bathroom facilities, temporary signs, traffic barrier, etc.) including relocating and/or installing new traffic control devices as required for each construction phase for the Automated Speed Enforcement (ASE) deployment and/or work zone speed limit reduction(s) on I-695.

#### **3.16.04.02 Public Information and Outreach**

Actively assist the Administration in providing advance information to the public regarding construction phasing, detour routes, and expected travel impacts, and coordinate these activities through frequent meetings with the Community Outreach Manager, SHA's Office of Communications, and District - 4 Community Liaison. Coordinate with the Administration regarding special events that may affect traffic patterns through and around the Project limits and adjust the TMP and TCPs as needed and as outlined in TC 3.22.

#### **3.16.04.03 Public Access**

Maintain access to all businesses, residences, local streets and private driveways at all times, including all temporary approaches to, crossings of, and intersections with roads and streets. Consider any special access needs of property owners and tenants, such as business hours, delivery schedules and circulation patterns.

#### **3.16.04.04 Pedestrian and Bicycle Traffic**

The Design - Builder shall maintain all existing pedestrian and bicycle access along existing facilities at all times during construction. The pedestrian access way shall be fully compliant with all applicable regulations for accessibility, as defined by the Americans with Disabilities Act (ADA). Whenever an existing pedestrian access route in the public right of way is blocked by a construction, alteration, or maintenance activity, an alternate accessible pedestrian route must be provided.

Recreational trails, including bicycle paths, shall also be maintained and kept in good condition. Access to all recreational facilities shall be provided and coordinated with the appropriate governing agency.

#### **3.16.04.05 Schools and Public Transportation Agencies**

The Design-Builder shall coordinate with the local schools, appropriate Board of Education, and public transportation agencies for both city and local counties to maintain bus, private vehicle, and pedestrian access to education facilities and public transportation services in the area. Access to bus stops shall also be maintained. Construction impacts on school bus and public transportation routes shall be coordinated with the local agencies. Construction staging shall be developed with the goal to minimize impacts to existing school bus routes.

**3.16.04.06 Detour Routes**

Design, place, and maintain all traffic detours required during construction. Wherever possible, use State routes of a similar roadway caliber (i.e. similar number of travel lanes and similar roadway classification as the road being closed) for detour routes. Any use of non-state routes will require the approval of the local municipality or controlling agency over that route. The Design- Builder is also responsible for obtaining all necessary permits from the respective agencies for temporary roadways, including construction and/or haul routes.

Detour routes shall be required when complete road or ramp closures or elimination of a particular movement or movements at an intersection approach are necessary. Proposed detour routes shall be included in the Traffic Control Plans and reviewed through the design review process (see TC 3.16.06). Complete closures of roadways will not be permitted without the express written approval of the Administration (or Baltimore County for county roadways) as part of the design review process prior to the closure. Specific identification and written documentation of the proposed closure, including traffic and operational impacts, shall be provided to the Administration during the design review process for each request.

**3.16.04.07 Motorist Guidance**

The Design - Builder shall provide guidance and signage to and along the entire length of every detour route to motorists who are diverted around or traveling through the construction areas. Signing that is not in compliance with the Maryland MUTCD or Category 1 of the Administration's Book of Standards shall be corrected within 24 hours, unless the sign is a critical regulatory or warning sign, in which case the sign shall be corrected within 6 hours of notice. If the deficiency is caused by an accident, the 6 hours begins when access to the area is available.

For closures of surface streets or changes in roadway configurations, the Design-Builder shall provide guide signs in accordance with the TCP for that particular phase, Maryland MUTCD and Category 1 of the Administration's Book of Standards. At least seven (7) calendar days before a road closure or major change in the roadway configuration or travel pattern, the Design-Builder shall utilize portable variable message signs warning motorists of the pending changes. Messages to be displayed shall be submitted to the Administration for review and comment. The Design-Builder shall coordinate motorist guidance activities with the Community Outreach Manager.

**3.16.04.08 Work Zone Intelligent Transportation Systems (ITS)**

Utilize existing and future CHART and Administration system-wide variable message signs (VMS) as part of the TMP. It is the responsibility of the Design - Builder to coordinate the operation of these signs and the implementation of the appropriate messages with the Administration.

**3.16.04.09 Construction Access and Haul Routes**

Provide all construction roads required for delivery of fill, asphalt, concrete, bridge girders, and all other materials required for the Project. It is the responsibility of the Design - Builder to obtain all necessary permits from all applicable agencies for construction, maintenance, and removal of temporary roadways, including construction and/or haul roads.

**3.16.04.10 Local Roadway Crossings**

The Administration will allow construction traffic to cross roadways that intersect with the Project as long as the crossing is maintained within the Project right-of-way. Proper flagging procedures and/or temporary traffic signals are required to facilitate construction traffic crossing local roadways. The Design -Builder shall ensure that delays incurred to local roadways as a result of at-grade crossing operations do not exceed the mobility thresholds established by the Administration's "Work Zone Lane Closure Analysis Guidelines".

**3.16.04.11 Emergency Response**

The Design-Builder shall cooperate with the Maryland State Police, local law enforcement, and other emergency service providers in their response to accidents, fires, spills, or other emergencies in any area affected by the Project, including those on the construction site and on traffic lanes open to the public. The Design-Builder shall cooperate in all Administration investigations of accidents and other incidents along the Project.

The Design-Builder shall work with emergency service providers and address their concerns about emergency access to and in the corridor, which may include installing gates to allow emergency personnel to access the Project area. The Design-Builder shall coordinate emergency services efforts as follows:

**Baltimore County Fire Department**

Public Safety Building  
700 East Joppa Road  
Towson, Maryland 21286  
Phone: 410-887-4500  
Fax: 410-853-1883

**Fire Chief**

Joanne R. Rund  
Phone: 410-887-4511  
Fax: 410-853-1883  
Email: [jrund@baltimorecountymd.gov](mailto:jrund@baltimorecountymd.gov)

**Emergency Medical Services**

Fire Director Richard Schenning  
Phone: 410-887-4860  
Fax: 410-887-8512  
Email: [Fire-EMS@baltimorecountymd.gov](mailto:Fire-EMS@baltimorecountymd.gov)

**SPECIAL PROVISIONS**  
MAINTENANCE OF TRAFFIC, HAUL ROUTES  
AND ACCESS DURING CONSTRUCTION

CONTRACT NO. BA0065172

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**Fire Marshal's Office**

Fire Director Marcus Johnson  
Phone: 410-887-4880  
Fax: 410-832-8511  
Email: [mdjohnson@baltimorecountymd.gov](mailto:mdjohnson@baltimorecountymd.gov)

**Fire Communications**

Fire Director Christian Griffin  
Phone: 410-307-2040  
Fax: 410-307-2053  
Email: [cgriffin@baltimorecountymd.gov](mailto:cgriffin@baltimorecountymd.gov)

**Public Safety Education**

Battalion Chief David Bycoffe  
Phone: 410-887-4501  
Email: [fireinfo@baltimorecountymd.gov](mailto:fireinfo@baltimorecountymd.gov)

**Public Information**

Elise Armacost, Director of Public Affairs  
Phone: 410-887-2892  
Fax: 410-832-8508  
Email: [earmacost@baltimorecountymd.gov](mailto:earmacost@baltimorecountymd.gov)

**Baltimore County Police Department**

Public Safety Building  
700 East Joppa Road  
Towson, Maryland 21286  
[bcopd@baltimorecountymd.gov](mailto:bcopd@baltimorecountymd.gov)  
Phone: 410-887-2214  
Fax: 410-821-8887

**3.16.04.12 Field Verification of Traffic Operations**

The Design-Builder shall be responsible for monitoring queues and delays during Maintenance of Traffic operations. If the thresholds established in the Administration's "Work Zone Lane Closure Analysis Guidelines" are exceeded, the Design-Builder shall modify the Maintenance of Traffic plans or incorporate other mitigation strategies to reduce the queues and delays below the threshold levels. All proposed changes shall be submitted to Administration for review.

**3.16.04.13 MOT Restrictions**

Refer to Special Provision - Section 104.01 -Traffic Control Plan, for work restrictions and temporary lane closure and/or shoulder closure requirements.

**3.16.04.14 Advance Notification Requirements**

The Design-Builder shall submit to the Administration a lane closure permit request form for approval of each lane closure. Lane closures will not be allowed without an approved written closure request.

<b>Type of Lane Closure Request</b>	<b>Minimum Advanced Notice</b>	<b>Maximum Days for Approval</b>
1	30 Days	45 Days
2	10 Days	21 Days
3	7Days	14 Days
4	3Days	14 Days

Type 1 - Planned and acceptable closures of an arterial or local street, traffic switches, new road openings, or changed traffic patterns.

Type 2 - A lane(s) closure that would have significant impact on traffic, such as temporarily stopping traffic completely (traffic drags), closing two (2) or more lanes, or flagging operations.

Type 3 - A lane closure that would have minor or no impact on the flow of traffic, such as closing one lane on a three-lane roadway during off-peak hours.

Type 4 – A lane closure that would close a shoulder (right or left).

For Type 1 closures, the Design-Builder shall make provisions in the MOT Phase Plan for local traffic to access properties and businesses at all times on the closed arterial or local street.

Type 1 and 2 closures will require extensive media and stakeholder notification effort and coordination among various local and State agencies. The Design-Builder shall assist with all notification and coordination efforts.

All notice periods exclude weekends and holidays.

The lane/shoulder closure request shall be submitted on a Lane/Shoulder Closure Request Form provided by the Administration and shall be submitted electronically. The information provided on the form shall include, but not limited to, the following:

- 1) Location: Roadway name or State route number;
- 2) Project Number;
- 3) Direction: West/East/North/South;
- 4) Lane Closure Type: 1, 2, 3 or 4;
- 5) Duration: Date and Times;
- 6) Limits: Beginning or work zone to end or work zone;
- 7) Nature of work and justification of lane/shoulder closure;
- 8) Number of remaining lanes on roadway;
- 9) Lane(s)/Shoulder(s) to be closed-specifically left, right, middle, left middle, right middle, shoulder, etc.;
- 10) Ramp location to be closed;



- 11) Traffic Control Plan sheet number;
- 12) Appropriate Administration typical application;
- 13) Point of Contact: Field Inspector;
- 14) Contact Information;
- 15) Any detours required;
- 16) Notes: Any other pertinent information that may be needed to facilitate in clarifying closures; and
- 17) State Police request and required number of troopers.

The Design-Builder shall contact and notify the Administration 30 minutes prior to initiating all lane closures and after removing all lane closures.

#### **3.16.04.15 Approval of Temporary Traffic Control Devices**

All items for the maintenance of traffic shall be crashworthy in conformance with NCHRP Report 350 or MASH Criteria. When conformance with NCHRP Report 350 is required, the manufacturers' certifications that the devices comply with the specified criteria shall be reviewed by the Design-Builder and approved in writing, and copies of the certifications and approvals shall be provided to Administration for consultation and written comment.

All maintenance of traffic products, including temporary pavement markings, used on the Project shall be listed on the Administration's Office of Traffic and Safety's Qualified Producers and Products Lists (QPL) for Temporary Traffic Control Devices and Miscellaneous Items, unless submitted and approved through the Administration's Maryland Product Evaluation List (MPEL) Program.

#### **3.16.04.16 Use of 'Point of Presence' (POP) Sign and 'Completed As Promised' (CAP) Pennant Requirements**

The Design-Builder shall install 'Point of Presence' (POP) Sign and 'Completed As Promised' (CAP) pennant per SP CATEGORY 800 - CONSTRUCTION NOTICE SIGNS of this RFP and the POP Details provided in the Additional Information on ProjectWise. Replacement of the POP sign due to a change in date shall be at no additional cost to the Administration.

The 'Point of Presence' (POP) Sign provides the motorist with information about existing or upcoming roadway construction. The POP sign can describe the type of construction and the anticipated completion date.

The POP sign is to be used in conjunction with Limit of Work Identification Sign (LOWI) on this project and is to be paid for using only State funding. The POP sign should be installed in advance of the LOWI sign, in each direction of travel along impacted highways. The signs are not to be installed along roadways that are closed to traffic or along directions of travel which are not impacted by the construction. Additional signs may be required depending on the Design-Builder's proposed project and staging.

All signs are to be installed in accordance with Maryland Book of Standards and the most current edition of the Maryland Standard Specifications for Construction and Materials.

The sheet aluminum POP sign shall display one of two messages based on improvements- 'Roadway Improvements' or 'Roadway Resurfacing'. It is available in two sizes depending upon roadway conditions as dictated in Standards MD 104.01-04 and MD 104.01-05.

The Project shall be considered 'Completed as Promised' when impacts to traffic operations no longer exist. Upon Final Inspection of the project and prior to the acceptance for maintenance by the Administration, the contractor shall affix a 'Completed As Promised (CAP) Pennant' overlay. The sign will remain in place for a period of 30 days, at which time the contractor shall remove the entire sign and wood supports. The material shall become the property of the contractor.

### **3.16.05 Development and Review of the Transportation Management Plan**

The Transportation Management Plan (TMP) shall include Traffic Control Plans (TCP), as well as Transportation Operations (TO) and Public Information and Outreach (PI&O) strategies. The TMP shall:

- A. Evaluate work zone impacts and develop strategies to mitigate those impacts through the use of improved transportation operations and management of the transportation system (Refer to TC 3.16.05.01). Impacts and strategies shall be documented in a TMP Report.
- B. Include traffic control plans that accommodate project and site-specific considerations (Refer to TC 3.16.06).
- C. Include strategies to communicate with the public and concerned stakeholders, before and during the project, through the development of a public outreach plan.



#### **3.16.05.01 Transportation Management Plan Report**

The Design - Builder is responsible for developing a temporary traffic control system that best meets the performance requirements and construction activities. Therefore, maintenance of traffic design shall be done concurrently with a work zone impacts assessment and traffic analysis. This effort shall be documented in a Transportation Management Plan (TMP) report.

The report shall include discussion of the following and all supporting documentation:

- (A) Work zone impacts assessment for the proposed MOT;
- (B) Traffic analyses for each phase of MOT;
- (C) Work zone impact management strategies.

#### **3.16.05.02 TMP Report Format**

- (A) All the pages within the report shall be numbered and dated.

- (B) The report shall be placed in an 8 ½ by 11 inch, 3-hole binder that allows for insertion of revisions and removal of old data.
- (C) The Design-Builder shall make revisions to the report as required to keep reports current with design and construction activities. The date of the revision shall be placed on all pages. Pages to be added, replaced or removed shall be designated. Revisions shall be 3-hole punched for easy placement in the reports.
- (D) The final approved report shall be converted to a Portable Document Format (pdf) file, including all maps and exhibits. The electronic file shall be delivered to the Administration for their records.
- (E) Sections for inclusion in the TMP include:
  - 1. Introduction (Cover Page, Table of Contents, Professional Engineer Certification, etc.)
  - 2. Executive Summary
  - 3. TMP Roles, Responsibilities and Contact Information
  - 4. Project Description, including goals and constraints
  - 5. Existing Conditions
  - 6. Work Zone Impacts Assessment (Refer to TC 3.16.05.03)
  - 7. Work Zone Traffic Analysis (Refer to TC 3.16.05.04)
  - 8. Work Zone Impact Management Strategies (Refer to TC 3.16.05.06)
  - 9. Access and Mobility Plan (Refer to TC 3.16.05.07)
  - 10. Contingency Plan (Refer to TC 3.16.05.08)
  - 11. Incident Management Plan (Refer to TC 3.16.05.09)
  - 12. Public Outreach Proposal (Refer to TC 3.22 - Public Outreach)
  - 13. Implementation and Monitoring Plan (Refer to TC 3.16.05.10)
  - 14. Supporting Documentation (e.g., Traffic Control Plans)

**3.16.05.03 Work Zone Impacts Assessment**

Identify how the project's construction phasing, temporary traffic control zone design, and work zone impact mitigation efforts will impact the project area, how they will affect each other, and how they might adversely impact specific areas, if any. Issues to be considered and discussed in this section of the TMP include:

- A) Identification of High-level Construction/Traffic Control Approaches, including proposed construction phasing, traffic control and management, and construction schedule. Discussion may include need for lane closures, total roadway closures, shoulder closures, use of shoulder for travel during construction, use of detour routes and times related to these needs (off-peak, night-work, weekend work, intermittent

closures, etc.). High-level maintenance of traffic plans shall be developed that include, but are not limited to, all major traffic shifts, use of temporary roadways, temporary traffic signals, and access modifications to businesses or residences. The duration of each phase shall be noted on the plan. The plans may take the format of 8.5"x11", 11"x17", or plan-sized (22"x34") sheets. These high-level Maintenance of Traffic plans will be used as a basis for the development of the Traffic Control Plans.

- B) Identification of Safety Issues, including pre-existing safety issues and safety implications of proposed construction approach(es). Pre-existing safety issues may include crash history, curve and gradient issues, line of sight issues, weather related safety issues, lack of adequate shoulder width or prevailing speeds. Examples of safety issues from proposed construction approach (es) include implication of night work, lane width issues, lane-closure related safety issues, channelization and work area separation issues, construction staging areas, construction traffic access issues, and management/enforcement of speed in advance of and through the work zone.
- C) Identification of Community Impacts and Related Issues, including accessibility issues and other coordination issues. This involves the identification of work zone impacts on the community businesses and residents likely to be affected by the project. Examples include business access relocation ramp-closure related access issues, detour related mobility impacts, and pedestrian and bicycle related impacts. Other coordination issues may include utility related issues and construction noise issues.
- D) Identification of Combined Impacts and Coordination Issues, including identification of nearby and/or concurrent projects and assessment of potential combined impacts of these projects at the corridor/network level.

#### **3.16.05.04 Work Zone Traffic Analysis**

The Design-Builder shall develop opening year traffic volumes and analyze all Maintenance of Traffic Phases to ensure that there are no operational or safety issues. Work Zone traffic analysis shall be performed in accordance with the methods and tools described in the "Work Zone Lane Closure Analysis Guidelines". Mobility impacts shall be limited to the allowable mobility thresholds as described in the "Work Zone Lane Closure Analysis Guidelines".

The Administration recognizes that specific work activities and time periods may make it infeasible to comply with the threshold levels contained in the Work Zone Lane Closure Analysis Guidelines. These circumstances shall be outlined in the TMP. For these situations, the Design-Builder shall analyze other MOT alternatives to reduce the mobility impacts below thresholds. If the MOT Alternatives Analysis does not produce an option that reduces impacts below thresholds, the Design-Builder shall propose additional impact management strategies (transportation operations and/or public information and outreach strategies) to minimize the impact, subject to review and approval by the Administration.

Elements to be included in the traffic analysis portion of the TMP include:

- A) **Traffic and Travel Characteristics at the Project Location** - Include a summary of traffic and travel characteristics in the project area. This may include recurring congestion issues (pre-existing bottlenecks, high-volume areas, etc.) and non-recurring congestion issues (special event traffic issues, weather related delays, potential for incident related traffic congestion, etc.), heavy vehicle volumes, directional traffic, and recreational or seasonal traffic issues.
- B) **Traffic Analysis Strategies** - Include a brief description on how the expected traffic conditions during construction were determined. Include source and date of traffic data. Any traffic reduction factors or other parameters assumed for the calculations should be documented.
- C) **Identify Measures of Effectiveness** - List the measure of effectiveness used for the analysis, such as capacity, volume, queue, travel time, diversion rates, safety, adequacy of detour routes, etc.
- D) **Analysis Tool Selection Methodology and Justification** - List the traffic analysis tools used. Include a brief summary on how the tool was selected and criteria used to select the most appropriate tool.
- E) **Mobility Implications of Construction Approach (es)** - Discuss construction approaches that have the potential to impact mobility during the project. This may include lack of shoulders during construction that may require incident management strategies, doing work at night to reduce traffic delays, or traffic capacity and management issues that may exist on a proposed detour route.
- F) **Analysis Results** - Compare existing and construction traffic conditions and operations, with and without work zone impact management strategies (where included). Detour route analysis should be included where detours will be used. Traffic analysis should also address, in a more quantitative manner than the general impacts assessment, the impacts on:
  - 1. Access for residences, businesses, and non-emergency services
  - 2. Access for pedestrians, bicyclists and persons with disabilities
  - 3. Emergency service impacts (fire, ambulance, police, and hospitals)
  - 4. Safety
  - 5. Adequacy of detour routes
  - 6. Intersection traffic control (signal timing, signage, etc.)
  - 7. Heavy vehicle traffic (including over-height, over-weight vehicles)
  - 8. Transit operations (bus stops, school buses, other transit operations)
  - 9. Seasonal impacts (beach traffic, etc.)

### **3.16.05.05 Approved Analysis Techniques and Software**

The Design - Builder may utilize the following software packages for analysis of Maintenance of Traffic Plans.

- A) For arterial maintenance of traffic operations, the Design-Builder may use QuickZone 2.0, MD QuickZone 2.0, Quewz-98, Lane Closure Analysis Program (LCAP), Highway Capacity Software (HCS 2010), Synchro/SimTraffic (version 6.0 or higher), or approved equal (as appropriate) to determine the queuing, delays, and level of service impacts caused by the maintenance of traffic plans.
- B) For freeway maintenance of traffic operations, the Design - Builder may use QuickZone 2.0, MD QuickZone 2.0, Quewx-98, LCAP, CORSIM, VISSIM, HCS 2010, or approved equal (as appropriate) to determine the queuing and level of service impacts caused by the maintenance of traffic plans.

#### **3.16.05.06 Additional Work Zone Impact Management Strategies**

In addition to the impact management strategies and MOT requirements included in this Performance Specification, the Design-Builder shall list any additional work zone impact management strategies that will be included and discuss anticipated traffic and/or safety impacts of the strategy. The Design-Builder is encouraged to provide additional, cost-effective services to enhance the overall Transportation Management Plan. Additional services should adhere to the standards and be a supplement to the services outlined in this Performance Specification. Any such enhancements may be implemented at any time during the Project and are subject to the Administration's written acceptance.

#### **3.16.05.07 Access and Mobility Plan**

The Design-Builder shall develop an Access and Mobility Plan depicting haul routes and access points. The Access and Mobility Plan shall be reviewed through the design review process with participation by the Administration. Plans shall be presented on paper no smaller than 11"x17" with appropriate scale.

#### **3.16.05.08 Contingency Plan**

The Design-Builder shall develop a contingency plan that specifies actions that will be taken to minimize traffic impacts should unexpected events (unforeseen traffic demand, inclement weather, etc.) occur in the work zone. This plan should also address activities under the Contractor's control within the work zone. The contingency plan should include, but not be limited to, the following:

- A) Information that clearly defines trigger points which require lane closure lifting (i.e., inclement weather, length of traffic queue exceeding thresholds);
- B) Decision tree with clearly defined lines of communication and authority;
- C) Specific duties of all participants during lane closure operations, such as coordination with Maryland State Police;
- D) Standby equipment and availability of personnel for callout.

**3.16.05.09 Incident Management Plan**

The Design-Builder shall develop an incident management plan for accidents occurring within the Project limits, including accident prevention strategies, emergency procedures, reporting requirements, and mitigation strategies. The incident management plan shall meet the following requirements:

- A) The Design-Builder shall provide immediate response to emergencies by trained personnel from an incident response team per the requirement of TC 3.22 - Public Outreach.
- B) Immediately following the initiation of actions necessary for the security of people and property, the Design-Builder shall coordinate with the Administration on the investigation(s) of accidents and/or other incidents.
- C) At a minimum, the Design-Builder shall provide documentation to the Administration with details on:
  - 1. Cause of disruption (i.e., whether it is construction oriented or not);
  - 2. Actions being taken to alleviate the problem;
  - 3. Responsible parties for the actions; and
  - 4. Anticipated duration of the disruption.
- D) The Design-Builder shall establish and manage an emergency response telephone tree per the requirements of TC 3.22 - Public Outreach. All appropriate emergency response agencies shall be included on this telephone tree for immediate response in the event of an emergency. The telephone tree shall be divided into areas of expertise so the proper people are called for specific emergency situations

**3.16.05.10 Implementation and Monitoring Plan**

The implementation and monitoring plan shall define processes to ensure that the Transportation Management Plan and associated elements, including the Traffic Control Plans and Incident Management Plan, are developed and implemented efficiently and appropriately, and that they are kept up-to-date with necessary modifications during the project.

**3.16.06 Traffic Control Plans**

MOT Phase Plans shall be developed for each major phase of construction that requires diversion of traffic. MOT Phase Plans shall be presented on paper no smaller than 22"x34" with appropriate scale. The MOT Phase Plans shall be site specific for each separate portion of Work and shall not simply reference typical drawings, taper tables, or illustrations in various Administration Standards, the Maryland MUTCD. The following components shall be included in/with each MOT Phase Plan:

- A) Description of MOT phase with respect to lane, ramp, or road closures and proposed detour routes;
- B) Traffic Analysis/Traffic Modeling for the MOT phase;

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- C) Signal timing plans, if changed;
- D) Temporary roadway and striping plans along with plans for any off-site modifications to local roads to accommodate detoured or diverted traffic including restoration plans to return the site to pre-construction condition;
- E) Appropriate channelizing devices and barrier locations with spacing and type of barricades;
- F) All temporary traffic control devices necessary to safely and efficiently construct a particular portion of Work;
- G) Motorist information and guidance;
- H) Temporary signing, signal, and lighting plans;
- I) Specific sign messages with sign sizes, spacing or referenced distances, and Maryland MUTCD sign designations. The Design-Builder shall provide details for all proposed non-standard Maryland MUTCD signs;
- J) Proposed phased construction of permanent signing;
- K) Proposed phased construction of traffic signals;
- L) Proposed phased construction of lighting systems;
- M) Proposed phased construction of ITS systems;
- N) Pavement marker changes shall be specific and clearly shown on the Traffic Control Plan with respect to lane widths and pavement marking material, color, location, and widths. Dimensions are necessary to assure proper installation of the pavement markings;
- O) Corresponding plans (roadway plans, typical sections, geometrics, ESC, etc.) and other information to illustrate what work will be taking place during the MOT Phase;
- P) Flagging locations; and
- Q) Emergency response information.



**TC 3.17 DRAINAGE, STORMWATER MANAGEMENT, AND EROSION & SEDIMENT CONTROL PERFORMANCE REQUIREMENTS**

**3.17.1 General**

The Design-Builder shall provide drainage systems, stormwater management (SWM), and erosion and sediment control (ESC) required to serve the Project. If the Design-Builder's project improvements directly impact an existing storm drain system (including but not limited to inlets, manholes, cross culverts or pipes, and/or other drainage structures) within the Project Limits or makes a change in the hydraulic condition and/or drainage patterns of an existing storm drain system, the Design-Builder's drainage design shall include assessments of pre- and post-construction conditions, as well as assessments of conditions during construction staging. The Design-Builder shall ensure and demonstrate that the drainage design and construction will not result in adverse impacts to off-site properties. In the design of the drainage facilities, the Design-Builder shall account for all sources of runoff that may reach the Project, whether originating within or outside of the Project Right-of-way (ROW). The Design-Builder shall design the Project, including all drainage and SWM facilities, such that the retrofitted SWM facilities and modified drainage system or newly constructed systems shall not increase flooding to properties outside the Project ROW. Impacted areas under this TC are defined as any direct or indirect impact that causes a temporary and/or permanent change in the hydraulic condition of the existing storm drain system and/or causes a temporary and/or permanent change in drainage patterns resulting from improvements proposed by the Design Builder team within the Project Limits.

**3.17.2 Guidelines and References**

The Design-Builder shall design and construct drainage, SWM, and ESC facilities in accordance with this Drainage, Stormwater Management, and Erosion & Sediment Control Performance Specification and the relevant requirements of the Guidelines and References in TC 3.08. The Design-Builder shall follow 2000 Maryland Department of the Environment (MDE) SWM Manual and revision thereof and all technical and policy documents published by the Maryland Department of the Environment (MDE).

**3.17.3 Requirements**

**3.17.3.1 Surface Drainage Design**

The Design-Builder shall design and construct/reconstruct/relocate all surface drainage conveyances including but not limited to open channels, streams, inlets, closed storm drainage systems, cross culverts and entrance driveway pipes as necessary to complete the work. The Design-Builder shall provide a drainage system that maintains or improves the hydraulic performance and physical condition of the existing drainage system if the Design-Builder's project improvements directly impact an existing storm drain system (including but not limited to inlets, manholes, cross culverts or pipes, and/or other drainage structures) within the Project

Limits or makes a change in the hydraulic condition and/or drainage patterns of an existing storm drain system. Submit the drainage design, per submittal package, as indicated in TC 3.07 – Deliverables, for review and concurrence prior to construction.

Review and approval by regulatory agencies including, but not limited to, MDE and the US Army Corps of Engineers (USACE) is required for waterway crossings, wetland impacts and other drainage/SWM-related elements affecting environmental features. The Design-Builder shall develop supporting documentation, deliver and garner approval for all such project elements in accordance with the Environmental Performance Specification TC 3.20.

**3.17.3.1.1 Surface Drainage Design - General Requirements**

- A. Design and construct all inlets, manholes, cross culverts or pipes, and other drainage structures, as required. Inspect all existing pipes and drainage structures to be used in the Design-Builder's design and assess for structural integrity, traffic bearing capacity based on AASHTO HS-25 Highway Load criteria and hydraulic capacity. Repair or replace any of these existing pipes and drainage structures to be used in Design-Builder's design that are in poor condition or which fail to meet structural integrity, traffic bearing capacity or hydraulic requirements. Compile inspection reports and submit for concurrence. Include photographs and a written report describing the structural integrity of the drainage structure. Design also includes the repairing and regrading of unstable or poorly drained existing outfalls.
- B. Clean all existing pipes to be used in the Design-Builder's design and new pipes and drainage structures that are partially within the storm drain drainage area up to the MDOT SHA ROW according to MDOT SHA Standard Specification for Construction and Materials section 303.03.07 at conclusion of project.
- C. Remove all existing pipes and drainage structures that will not be used in the proposed improvements or abandoned by filling with Flowable Backfill.
- D. Provide completed designs for all temporary and permanent pipe systems, including, but not limited to, extension of cross culverts and associated inlet or outlet protection.
- E. Provide adequate measures to ensure positive drainage after construction for the Design-Builder's improvements within the Project limits. This shall include all areas within the Design-Builder's improvements that do not have positive drainage in the pre-construction condition.
- F. Provide adequate connections to maintain all existing drainage systems. Ensure that adequate drainage is provided during interim paving operations (e.g., constructing asphalt berms to divert flow from base course paving to storm drains in closed sections or other precautions as necessary).

- G. Adverse impacts to upstream or downstream properties, infrastructure, or environmental resources shall not be allowed.

**3.17.3.1.2 Surface Drainage Design - Specific Criteria**

The Design-Builder shall follow these Specific Criteria where conflicts arise between these Specific Criteria and those contained in the Guidelines and References in TC 3.08.

**3.17.3.1.2.1 Cross Culverts**

Refer to Structures Performance Specification TC 3.11.03, and Environmental Performance Specification TC 3.20.03.02, for additional cross culvert design requirements.

- A. Calculate discharges for appropriate return period storms for cross culverts using USDA, NRCS TR-55 and TR-20 hydrology models using the latest NOAA 14 rainfall data unless the drainage area exceeds 200 acres, for which the Design-Builder shall refer to the most recent recommendations of the Maryland Hydrology Panel and associated modeling tools including GISHydro. Use HEC-RAS for floodplain modeling and in design of streams. The use of 2-D hydrodynamic models is acceptable only with prior approval from the Administration and any reviewing, regulatory agencies.
- B. Ensure the 100-year headwater pool at new culverts remains within the right-of-way or easements. For existing, replacement, or extended culverts, where the existing 100-year storm headwater elevations extend beyond the right-of-way or easements, ensure proposed conditions 100-year headwater elevations are at or below the existing 100-year headwater elevations.
- C. Calculate culvert headwater and perform overtopping analysis using the latest version of HY-8 or HEC-RAS. Analyze the outfall using the subroutines and submit the information as part of the drainage reports.
- D. All roadway embankments shall be evaluated utilizing current MDE guidance to determine the applicability of NRCS-MD Small Pond Code 378 and/or MDE Dam Safety Division requirements.
- E. Roadway embankments that qualify as NRCS-MD Code 378 Small Ponds per MDE criteria must be designed and constructed according to NRCS-MD Code 378 Small Pond embankment standards. Roadway embankments that require review and approval of the MDE Dam Safety Division according to MDE guidance documents must be designed and constructed according to MDE Dam Safety Division requirements.
- F. Provide fish and aquatic organism passage as well as land animal passage as

required for the extension or replacement of the existing bridges or culverts as required by MDE wetland and waterways and the US Army Corps of Engineers. Refer to Environmental Performance Specification TC 3.20 for additional information.

**3.17.3.1.2.2 Roadway Drainage Design**

- A. The maximum flow spread in a closed section for a 2-year storm event is 8 ft. and in no case can cover more than one half of any travel lane. Inlets located in high speed roadways and located adjacent to the left lane, the maximum spread is confined by the shoulder or if there is no shoulder, the maximum spread is 4 ft.
- B. The maximum flow across entrances is 1 cfs for the 2-year storm event. Maximum flow from the end of curb and gutter is 0.5 cfs for the 2-year storm event.
- C. Use the roadway inlets and drainage structures in the Administration's "Book of Standards for Highways and Incidental Structures" or approved equal(s) where practicable. Submit for approval non-standard structures prior to construction. Use COG or COS inlets wherever possible. Place concrete aprons around the inlets unless specifically waived for grated inlets within the travel or turning lanes. Use bicycle friendly grates such as reticular (WR, WRM, NR, NRM) or curved vane (CV-S, CV-E) grates for grate inlets within the travel or turning lanes unless specifically exempted. Type K inlets are recommended for ditches and micro-scale Environmental Site Design (ESD) facilities. Ensure that inlets in or immediately adjacent to crosswalks are compliant with the American with Disabilities Act (ADA).
- D. No breaks in curb, such as curb cuts, for drainage purposes. Open-back curb inlets can be used to mimic sheet flow conditions in locations where the Design-Builder chooses to propose linear stormwater management facilities.
- E. Design ditches to ensure positive drainage flow. Do not allow standing water, except for stormwater management.
- F. Design ditch linings using HEC-15 "Design of Roadside Channels with Flexible Linings". Use Soil Stabilization Matting A (SSM A) rather than riprap where practicable. Type A matting is temporary matting and is used in ditches where shear stress is less than 1.75 psf or for slope stabilization. Type B matting, permanent matting designed to reinforce the turf stems, is used in ditches where shear stresses are between 1.75 and 3.0 psf. Type C matting is a soil infilled permanent matting used to reinforce the turf root system and is used in conjunction with type B matting where shear stresses are between 1.75 and

7.0 psf.

- G. Design pipe outfalls using HEC-14 "Hydraulic Design of Energy Dissipaters for Culverts & Channels" calculate outlet velocity and at a minimum, provide outfall protection for the same design storm as the culvert. Provide protection for conditions that indicate a greater outfall velocity may occur at a lesser storm event.
- H. Do not construct concrete lined ditches and concrete slope or channel protection unless prior approval is received from the Administration.
- I. Refer to TC 3.14 - Geotechnical Performance Specification for slope design and construction requirements, and TC 3.20 - Environmental Performance Specification for environmental requirements.
- J. Use of CPP-S may be allowed in non-traffic areas, but design-builder to coordinate with SHA for approval.
- K. Provide pipe slope anchors to secure storm drain pipes installed on slopes exceeding 20%.
- L. All added or replaced storm drain structures must be precast or cast in place concrete.



**3.17.3.1.2.3 Highway Hydraulics Division (HHD) Drainage Investigations**

If the Design-Builder's improvements impacts a system that contains an active HHD Drainage Investigations, the Design-Builder shall address the contributing drainage problems. Known active Drainage Investigations include,

- A. 18-DM-BA-008: Near I-695 outer loop before the Dulaney Valley Road exit: RCP segment is angled from previous segment creating a large joint separation including a hole above the joint separation. Additionally, the endwall has settled and is sitting at an angle. A concrete ditch next to the pipe is washed out and the embankment is unstable.
- B. 18-DM-BA-012: Near I-695 outer loop exit to Harford Road North: Damaged pipe outfall structure and erosion (MD 147 N exit ramp). There are three (3) pipe segments that are separated and displaced. Soil has been displaced above and below the pipes.

**3.17.3.2 Floodplain and Waterway/Wetland Coordination**

The Design-Builder shall coordinate analysis of applicable drainage crossings with MDE, Federal Emergency Management Agency (FEMA) and the Administration. Refer to the Structures Performance Specification TC 3.11.03 and the Environmental Performance Specification TC 3.20 for floodplain requirements.

Prior to construction, the Design-Builder shall notify MDOT-SHA concerning any coordination with property owners adjacent to floodplains and jurisdictional waterways and wetlands within the limits of the upcoming construction project. The Design-Builder shall consider property owner coordination and the potential need for access agreements when developing design and construction schedules. Reference should be made to the MDE Navigating Maryland's Resource Access and Permitting Process for Broadband Projects User's Guide referenced in TC 3.08 - Guidelines and References.

**3.17.3.3 Stormwater Management (SWM)**

The Design-Builder shall provide stormwater management for the project. For SWM design, the Design-Builder is to use the NOAA 14 rainfall data and distribution. The Design-Builder shall obtain all the necessary approvals from SWM/ESC Approval Authority.

A Pre-Permitting meeting must be held once Notice to Award has been issued. This meeting will be scheduled by the Administration upon request by the Design-Builder and will include the Design-Build H&H engineer, Design-Build Construction manager, Design-Build Project Design manager, Design-Build E&S manager, MDOT-SHA Design Project Manager, SWM/ESC Approval Authority reviewer, and MDOT-SHA Highway Hydraulics Division representative. The purpose of the meeting is to preview and discuss the SWM and erosion and sediment control concepts developed by the Design-Builder, submission schedules proposed by the Design-Builder, permitting timeframes, submission requirements and the Administration's quality expectations.

**3.17.3.3.1 SWM Facility Type Selection**

The Design-Builder shall construct SWM facility types based on the following criteria:

- A. Implement the best fit given the site context, the adjacent community, and the local ecology.

- B. Implement non-structural and ESD practices to the maximum extent practicable (MEP) first when feasible.
- C. Implement alternative surfaces and micro-scale practices before larger structural SWM facilities.
- D. Structural SWM facilities are to be considered only when all other ESD options have been exhausted.
- E. Implement SWM facilities that require lower maintenance first. Potential maintenance needs are considered when designing SWM facilities.
- F. Provide soil borings according to the requirements stated in the 2000 Maryland Stormwater Design Manual and the MDE Sediment and Stormwater Plan Review Division Technical Memorandum No. 7 for the appropriate type of structural SWM and ESD facilities.
- G. Due to the potential thermal impacts associated with their long-term impounding of water, the use of SWM facilities with a permanent surface wet pool, excluding forebays, is prohibited in Use III and Use IV watersheds within the impacted areas of the Project limits. Existing SWM facilities with a wet pool within Use IV (recreational trout) waters shall not be modified in any way to provide additional quality or quantity management unless the wet pool is eliminated and the treatment method is acceptable to the Administration and environmental and regulatory agencies.
- H. Avoid the creation of any significant or high hazard dams. Any significant or high hazard dams proposed shall require approval by the Administration in addition to MDE approvals.

### **3.17.3.3.2 Water Quality Bank**

The Design-Builder shall provide Water Quality treatment of stormwater runoff according to aforementioned regulations and guidelines. The Design-Builder shall account for new impervious area, impervious area removed, redevelopment, loss of existing water quality, and treatment provided. The Design-Builder shall complete the MDOT SHA Water Quality Summary Sheet (WQSS), using the most current version. The Design-Builder shall ensure that no debit to the water quality bank for any 6-digit watershed occurs at any time for the project.

If the Design-Builder elects to develop the project in a non-phased/staged traditional milestone development process, as part of a Concept and Site Development submittal package to the SWM/ESC Approval Authority, the Design-Builder will provide a WQSS that is unsigned by the Administration as part of their package. As a part of the Final

submittal to the SWM/ESC Approval Authority, the Design-Builder will provide a WQSS to the Administration two (2) weeks prior to any submission, for review and approval by the Chief of the Highway Hydraulics Division. The Administration will return the signed WQSS to the Design-Builder so they may pursue final design approval.

If the Design-Builder elects to develop the project in a phased/staged developmental process, each phase/stage, will require the Design-Builder to provide a WQSS in conjunction with all completed phases/stages and shall track cumulative water quality credits and debits to ensure that no debit to the water quality bank for any 6-digit watershed occurs at any time for the project. As part of each phase's/stage's Concept and Site Development submittal packages to the SWM/ESC Approval Authority, the Design-Builder will provide a WQSS that is unsigned by the Administration. As part of each phase Final submittal to the SWM/ESC Approval Authority, the Design-Builder will provide a WQSS to the Administration's Design Project Manager two (2) days prior to submission. The MDOT SHA Design Project Manager will sign the WQSS for SWM submittal and return it to the Design-Builder so they may pursue final design approval. At the completion of the overall project, the Design-Builder shall provide a Final Project WQSS. This Final Project WQSS will be the culmination of the WQSSs of all Design-Builder phases/stages, reflecting the as-built condition of the phased construction. The Design-Builder shall provide final Project WQSS to reflect the as-built conditions for HHD and PRD review and approval.

The Design-Builder shall provide a photocopy and an electronic Excel spreadsheet that includes the XML conversion tool upon final design approval to HHD. The Design-Builder shall accompany those copies with a copy of the SWM/ESC approval letter. The Design-Builder shall provide all of the above each time the SWM/ESC approval authority issues a modification to the approval.

#### **3.17.3.3.3 SWM Specific Engineering Criteria Structural SWM Facilities**

The Design-Builder shall comply with the following criteria for the design and construction of Structural SWM facilities found in Chapter 3 of the MDE 2000 Design Manual and Submerged Gravel Wetland facilities with a drainage area larger than half an acre:

- A. Coordinate details for all the new stormwater management facilities throughout the Project and ensure that they are integrated with the concepts for the corridor landscaping. Ensure consistency of facility types, outfall structure designs, detailing, colors, planting palette, landforms, surface area shapes and fencing (if required). Refer to SHA Sediment and Stormwater Guidelines and administrative procedures for further information regarding landscaping design and SWM.



- B. All stormwater management facilities shall be evaluated utilizing current MDE guidance to determine the applicability of NRCS-MD Small Pond Code 378 and/or MDE Dam Safety Division requirements.
- C. Stormwater management facilities that qualify as NRCS-MD Code 378 Small Ponds per MDE criteria must be designed and constructed according to NRCS-MD Code 378 Small Pond embankment standards. Roadway embankments that require review and approval of the MDE Dam Safety Division according to MDE guidance documents and must be designed and constructed according to MDE Dam Safety Division requirements.
- D. Set the riser structures into embankments or place so they are easily accessed for maintenance. Riser structures shall also be placed so they are visually unobtrusive. Risers shall be cast in place or precast as one unit. Refer to the MDE 2000 Stormwater Design Manual for additional SWM specifications.
- E. Ensure trash racks on riser openings are adequately protected from corrosion. Hot-dipped galvanized steel, M 111-80 or epoxy coated steel are preferred. Design trash racks that stand away from and completely enclose the riser opening(s). Attach ends of the steel to a frame that attaches to the structure. Use similar detailing for all trash rack designs on the structure and throughout the Project.
- F. Use concrete slabs to cap outfall structures whenever possible. When open tops are necessary, place a non-horizontally mounted trash rack at an angle of not flatter than 2:1 in order to reduce the potential for clogging.
- G. Use slotted perforated pipes surrounded by aggregate for low flow and dewatering. Geotextile is not acceptable. Anchor pipes extending into ponds against flotation.
- H. SWM embankment plants and materials shall conform with Pond Code MD-378.
- I. Use filter diaphragms for embankment seepage control. Anti-seep collars are not allowed unless specifically approved.
- J. Request Administration to assign a SWM Facility Number for each SWM facility and include in wherever corresponding facility is indicated in contract documents.
- K. Provide adequate access to SWM facilities for maintenance. Ensure each part of the facility is accessible by the equipment needed to maintain or rehabilitate the facility. Underground facilities require that no point within each separate chamber of a facility shall be more than 100 feet from an access point. For

example, a 200-foot-long chamber with a manhole in center meets this requirement since no point in chamber is more than 100 feet from an access point.

- L. The minimum required service life for the structural elements (including pipes) of underground SWM facilities is 50 years. Whenever any of the structural elements are under a roadway, or extend more than 10 feet below the surface, the minimum required service life is 100 years. Pipes shall be reinforced concrete either class IV or class V.
- M. Perform anti-flotation checks and stability checks with a Factor of Safety of 1.5 against overturning for all riser structures.
- N. Construction of structural SWM facilities (i.e. facilities found in Chapter 3 of the 2000 MDE Stormwater Design Manual) will not grant water quality credit above the project requirements, with the exception of bioretention areas with a drainage area of less than 3 acres. Structural facilities shall only be used to obtain credit equal to the project requirement provided they cannot be supplied with ESD facilities.
- O. Set all orifices and draw down devices above the seasonal groundwater table during and after construction.
- P. The Design-Builder to comply with all NRCS-MD Small Pond Code 378 and MDE Dam Safety Division requirements for the applicable SWM facilities.
- Q. Provide a SWM Facility As-Built Certification Data Table for each SWM facility as provided by HHD. The SWM Facility As-Built Certification Data Table columns and rows cannot be edited, deleted, or have any additions without the approval of the Administration.

**3.17.3.3.4 SWM Specific Engineering Criteria for Environmental Site Design (ESD) Facilities**

The Design-Builder shall construct ESD facility types found in Chapter 5 of the 2000 MDE Stormwater Design Manual with the exception of SGW facilities with a drainage area larger than half an acre based on the following criteria:

- A. Check dams shall comply with clear zone criteria. The minimum top width of the check dam shall be 1 foot. Demonstrate the clear zone compliance clearly on plans.
- B. Maximum height of check dams within the clear zone is limited to 1-ft.

- C. Provide side slopes of 4:1 or flatter for all linear ESD facilities (grass swales, dry swales, bio-swales etc. and micro-bioretenion).
- D. Provide adequate access to SWM facilities for maintenance. Ensure the entire facility is accessible by the equipment needed to maintain or rehabilitate the facility.
- E. Do not construct wet swales or any SWM facility that will create permanent pools of water in the median.
- F. Obtain approval from the Administration prior to installing any proprietary items.
- G. Obtain a SWM Facility Number for each SWM facility and include in wherever corresponding facility is indicated in contract documents.
- H. Provide a SWM Facility As-Built Certification Data Table for each ESD facility as provided by HDD. The SWM Facility As-Built Certification Data Table columns and rows cannot be edited, deleted, or have any additions without the approval by the Administration.
- I. Submerged Gravel Wetlands must be located as such that soil type and/or ground water conditions will maintain saturated conditions without the use of an impermeable liner. Submerged Gravel Wetlands shall store 100% of ESDv credit within the surface storage and gradually release the ESDv over 36 hours. Submerged Gravel Wetland stone chimney and subdrains shall be designed to maximize flow path lengths through the submerged gravel layer and minimize short-circuiting. The selected Submerged Gravel Wetland plant species must tolerate the designed inundation levels and durations.

#### **3.17.3.4 Erosion and Sediment Control (ESC)**

The Design-Builder shall design, obtain approval from SWM/ESC Approval Authority, and implement an E&S Plan and Sequence of Construction. Obtain all required approvals prior to commencing earth disturbing activities.

The Design-Builder's Professional Engineer licensed in the State of Maryland must review and certify by signature that the ESC plans have met the requirements of PRD prior the approval authority issuing approval.

The Design-Builder shall submit completed Notice of Intent (NOI) form to the Administration and obtain all approvals necessary to begin construction. The Design-Builder shall incorporate all applicable public notice timeframes into their schedule.

##### **3.17.3.4.1 ESC Specific Design Criteria**

The Design-Builder shall ensure that Erosion and Sediment Control Designers comply with

MDOT SHA Standard Specifications For Construction and Materials section 308.03.05.

The Design-Builder shall clearly delineate the Limit of Disturbance (LOD) on the ESC Plans by including a table of the break points with Station and Offset, northing and easting. Stabilized ground is any graded earth that is not exposed. Stabilized earth can be achieved through multiple methods such as hydro-seeding, erosion control matting, rip rap, sod, pavement etc. Reference the *2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control* for further direction on what is considered stable or refer to the SHA Quality Assurance Inspector if not expressly stated in the above reference. The Design-Builder shall proceed forward with construction once these grading plans have been approved by the SWM/ESC Approval Authority.

The Design-Builder shall cover slopes outside the roadway hinge point, flatter than and including 3:1 slope, with 4 inches of topsoil prior to permanent seeding and mulching. The Design-Builder shall cover slopes within the roadway hinge points, flatter than and including 3:1 slope, with 4 inches of topsoil.

The Design-Builder shall evaluate slopes steeper than 2:1 for slope stability and prepare to promote vegetative growth according to Geotechnical Performance Specification TC 3.14 and Landscape Performance Specification TC 3.13.

### **3.17.3.3.5 Stormwater Facility Maintenance**

The Design-Builder shall maintain all stormwater facilities it constructs until the As-Built plans have been approved by the SWM/ESC Approval Authority and the project has been accepted for maintenance. This may include, but is not limited to, vegetation management, regular mowing, ensuring all potential underdrains and piping is functioning properly, and cleaning all pipes and structures to ensure they are not clogged.

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**TC 3.18 NOISE ABATEMENT PERFORMANCE SPECIFICATIONS****3.18.01 General**

- 1 The requirements of the MDOT SHA Highway Noise Abatement Planning and Engineering Guidelines dated April 16, 2020 must be met for the Design-Builder's improvement as applicable.

The NEPA selected alternative static-dynamic inside shoulder use that does not shift existing lanes of traffic closer to noise sensitive receptors is exempt from noise analyses. If the Design-Builder's improvements meet the definition of a Type I Project in accordance with MDOT SHA Noise Policy and 23 CFR 772.5, the Design-Builder shall conduct a Final Design Noise Analysis, submit a Technical Noise Analysis Report, and prepare a NEPA Reevaluation per the requirements outlined in TC 3.20. The Final Design Noise Analysis and Technical Noise Analysis Report shall meet the requirements of the MDOT SHA Noise Policy and is subject to review and approval by MDOT SHA and FHWA. **Site Constraint Assessment or Extra Cost Assessment shall not be utilized for this project.** The criteria to determine if noise abatement is reasonable and/or feasible will be applied without consideration for site constraints or extra costs.

- 1 The Design-Builder shall use the noise analysis guidelines, spread sheets and protocols found in the additional information of ProjectWise in the sub-folder "Noise – Information and Base Data" found in the "Appendices" folder to develop the Design Year Loudest Hour. The Design-Builder shall then use this information to determine noise impacts as a result of the Design-Builder's project per the MDOT SHA Highway Noise Abatement Planning and Engineering Guidelines dated April 16, 2020.

- 1 The MDOT SHA Highway Noise Abatement Planning and Engineering Guidelines Appendix K – Part-Time Shoulder Use, outlines two parameters for determining impact for Type I Part-Time Shoulder use:

- The build condition peak hour (Design Year loudest hour) noise level must be at or above the appropriate NAC level, which is currently defined as approaching or exceeding the NAC (66 dBA for Residential).

AND

- There must be a perceptible increase in peak hour (Design Year loudest hour) noise level (at least 3 dBA) from the existing condition to the proposed build condition in the design year.


Both parameters must be met for determining impact for Type I Part-Time Shoulder use

If the Final Design Noise Analysis determines that noise abatement is reasonable and feasible, and MDOT SHA concurs with and has approved the analysis, the Design-Builder shall design and construct the noise abatement and all associated features as part of the Design-Builder's project. Noise abatement design and construction shall be entirely within existing MDOT SHA right of way.

If Final Design Noise Analysis is required and determines that noise barriers are reasonable and

feasible, the following specifications and noise barrier standards shall apply.

### 18.02 Noise Abatement Standards

1  Noise Abatement design and construction shall be in accordance with this Noise Abatement Performance Specification and the relevant requirements of TC 3.08 Guidelines and References, including but not limited to MDOT SHA Highway Noise Abatement Planning and Engineering Guidelines dated April 16, 2020. Aesthetic and structural designs shall be in accordance with TC 3.11 and geotechnical designs shall be in accordance with TC 3.14.

#### 3.18.03 Noise Barrier Systems

In order to simplify the barrier design and optimization process, it is intended that the Design-Build Team's acoustical personnel meet with the MDOT SHA OPPE EPLD Noise Team to discuss the Level-Top barrier analysis methodology, the barrier analysis spreadsheet tools, the noise abatement performance specifications, and the approval process. It is recommended that the TNM Data Files in the Additional Information on ProjectWise be used for to develop TNM models for the Build Condition, for these models have already been validated and approved. Z-elevation changes resulting from refined topographic surveys can be applied to the existing TNM object XY coordinates. The consultation and approval process between the Design-Build Team and the MDOT SHA OPPE EPLD Noise Team is defined below for each noise barrier system that is reasonable and feasible:

- a. The Design-Build Team shall provide the TNM results with a 50-dB(A) background noise level adjustment using MDOT SHA's latest barrier analysis spreadsheet tool.
- b. The Design-Build Team shall provide barrier analysis mapping in the noise report, which shows the revised noise levels and insertion losses, benefited hatching, and noise barrier alignment.
- c. The Design-Build Team shall provide the line-of-sight check data for each critical sensitive and limit receptor using MDOT SHA's latest barrier analysis spreadsheet tool along with the supporting *uncalculated* line-of-sight TNM model. For this approach, the Design-Build Team must fill-in each column of the Minimum Acceptable Line-of-Sight Elevations table.
- d. The Design-Build Team shall submit the noise barrier's horizontal alignment design coordinates and CAD line work.
- e. The MDOT SHA OPPE EPLD Noise Team shall review the submitted material for the proposed changes and respond within **10** business days for each barrier system, meaning data for two barrier systems that arrive at the same time could necessitate twice the amount of review time. Written approval will be transmitted via e-mail to the Design-Build Team acoustical lead. Proposed designs that are not approved will be accompanied by recommended actions or solutions that will make the acoustical design acceptable.

The noise barrier system panels and posts shall be designed and constructed to meet Section 455-Noise Barriers and the standard details from the Office of Structures. Any wall that requires drilled shafts for support shall be designed by a Professional Engineer licensed in the State of Maryland.



The depth of the drilled shafts shall be designed by a generally accepted theory with the total horizontal movement at the top of the shaft less than 1". The diameter and reinforcement of the drilled shafts shall match the details from the Office of Structures standard details, or the pre-approved alternate noise barriers.

In addition to the requirements specified by MDOT SHA for its standard noise barrier systems, the Design-Build Team shall design and construct noise barrier systems in coordination with MDOT SHA and as follows.

1. The Design-Build Team shall provide a noise barrier system with a top of barrier profile as smooth and consistent as possible, using the following guidance:
  - a. If using stepped rectangular noise wall panels, step panels in a uniform manner. For example, rather than having three level panels followed by a one-foot step, have four panels, each with 3 inch steps.
  - b. For rectangular noise wall panels, transition uniformly from level sections or between steps of various dimensions. For example ...6" step, 6" step, 6" step, 4" step, 2" step, 2" step, 2" step, 2" step, ...; or level section, 2" step, 4" step, 6" step, 6" step, 6" step, ...
  - c. Do not construct noise walls less than seven (7) feet in height above the finished ground elevation.
2. The Design-Build Team shall provide noise walls with aesthetic designs which are compatible with the structural and engineering aspects of the noise barrier system design applying the following guidance:
  - a. Any stacking of panels shall ensure that the joint(s) between stacked panels is consistent with the specific aesthetic design pattern of the noise barrier system. This consistency applies not just to the panels between two posts but between all panel sections within the noise barrier system. Do not intersperse full height and stacked panels on a continuous section of a noise barrier system. If such consistency cannot be assured, use full height panels.
  - b. No form liner joint seams shall be visible in the constructed noise barrier system unless they are an integral part of the noise barrier system's aesthetic design. This applies to all components of the noise barrier system (panels, posts, caps, etc.) and applies to both full height and stacked panels designs.
  - c. Consistent post spacing shall be used across the entire noise barrier.



- d. Noise barrier panels and posts are integral parts of the aesthetic design of the noise barrier system. Post type and design shall be compatible with the panel design in terms of texture, color, acoustical profile, and scale.
  - e. Incidental items such as access doors, fire hose connections, etc. shall be incorporated in a manner consistent as possible with the aesthetic aspects of the noise barrier systems
  - f. Caulking and coating materials shall be compatible with the aesthetic aspects and acoustical requirements of the noise barrier system
  - g. On stacked panel systems, provide light-tight horizontal joints that preclude visible warping and acoustical leakage
  - h. The anticipated appearance of the completed barrier system, in place, will be criteria for acceptability of the proposed design.
3. The Design-Build Team shall provide noise walls with sound-absorptive treatment on the side facing the highway if a parallel barrier analysis results in an insertion loss degradation of 2 dB(A) or more, as follows:

If a “parallel” section is created from the barrier alignments, either between noise barriers or between noise barriers and retaining walls, then the Design-Build Team shall determine the width-to-height (W:H) ratio, where the width is the distance between the barriers and the height is the average barrier height above the roadway, which may exceed the average barrier height. A section with a W:H Ratio of 10:1 or less will require an absorptive finish on the noise barrier panels. A section with a W:H Ratio between 10:1 and 20:1 will require a parallel barrier analysis be conducted using FHWA TNM. Insertion loss degradations of 2 dB(A) or more will require an absorptive finish on the noise barrier panels. A section with a W:H Ratio in excess of 20:1 will not require an absorptive finish.

If a TNM parallel barrier analysis was performed, then that model shall be provided along with any supporting files (CAD, spreadsheets). The MDOT SHA OPPE EPLD Noise Team will transmit written approval via e-mail to the Design-Build Team acoustical lead. Proposed changes that are not approved will be accompanied by recommended actions or solutions that will make the absorptive finish limits acceptable.

4. The Design-Build Team shall coordinate with the appropriate local fire department officials to determine the need, if any, for fire hose connections and/or access doors along the noise walls. If such access is required by the local fire department, the designated locations shall be noted on the plans. Locks and Signs for doors shall be as follows:
- Lock: Sargent Double Cylinder Deadlock (484 US26D LA-KWY) with Satin Chrome Finish or Approved Equal. All locks shall be keyed to match the ‘ICC’ key. Only one lock manufacturer shall be used for the entire

project. The “ICC” key is defined as a Sargent LA keyway, with biting number 756476.

- Signs: Each access fire door and fire dry standpipe connection location shall be provided with a conspicuous sign mounted on the existing noise wall panel, centered at the top of the wall panel that contains the door and hydrant, that reads “ACCESS DOOR AND FIRE DEPARTMENT CONNECTION FOR FIRE DEPARTMENT USE ONLY”. Signs shall be mounted with a minimum four (4) stainless steel, hex washer head masonry screws with a minimum ¼” diameter and 1 ¼” length.

Signs shall be permanently marked with two-inch, red letters on a white background and shall be constructed as per Section 813. In bottom right hand corner, signs shall be permanently marked with ½ inch, black letters on a white background and read “KEY: ICC”.

5. The Design-Build Team shall submit shop drawings for each noise wall section of the noise barrier systems, providing the following specific information:
  - a. Beginning and ending stations of the noise wall section
  - b. Horizontal and vertical alignments of the noise wall section
  - c. Elevations of the top of panel, bottom of panel, and panel joints (if applicable)
  - d. Panel locations by station and offset
  - e. Post locations by station and offset
  - f. Existing and proposed ground locations
  - g. Special post and panel details
  - h. Post, panel, and foundation connection details
  - i. Lifting devices
  - j. Fire hose and access door locations and details
  - k. Special drainage details associated with the noise barrier system
  - l. Utility locations

- m. Certification by the Design-Build Team's acoustical expert that the barrier system design represented by the shop plans meets all of the project's acoustical requirements.

Shop drawings shall be submitted per TC 4.01 - Working Drawings. MDOT SHA will in no way be responsible for work done without approved shop drawings.

6. **Aesthetic inspection and approval:** Prior to fabrication of the noise barrier system(s) the Design-Build Team will erect one (1) full size panel and two (2) full size posts at the fabrication location for inspection and approval by MDOT SHA. This inspection will be solely for the purpose of approving the aesthetic appearance of the post and panel and will not replace any structural and/or material requirements of this contract. The post and panel will be inspected in their ultimate aesthetic condition with all surfaces finished and treatments. If approved, the post and panel may be used as part of the permanent noise barrier system, assuming that they also meet all of the structural and material requirements of this contract.
7. **Methods and equipment inspection and approval:** Prior to installation of the noise barrier system(s) the Design-Build Team will erect a test wall section composed of a minimum of four (4) posts and three (3) panels at the project site in a location directed by MDOT SHA. This section, if approved, will become a portion of the permanent noise barrier system. MDOT SHA will use the erection of this test wall section to determine if the Design-Build Team's methods and equipment are sufficient to produce a sound barrier system that meets the requirements of the contract documents. The Design-Build Team may revise its methods and equipment at any time during the positioning of the test section in order to satisfactorily meet the contract requirements. If the test wall does not meet the construction tolerances or the aesthetic and/or acoustical requirements of the contract, the test walls or portions thereof will be removed and disposed of by the Design-Build Team at no additional cost to MDOT SHA. The test wall will be rebuilt until determined by MDOT SHA to meet the contract requirements.

## **TC 3.19 CONSTRUCTION REQUIREMENTS PERFORMANCE SPECIFICATION**

### **3.19.01 Construction Standards**

All construction work for this project shall be in accordance with the current edition of the MDOT SHA Standard Specifications for Construction and Materials, project specific Special Provisions, the "standard" Special Provisions, the Special Provision Inserts, and all provisions included in Part III of this RFP.

#### **3.19.01.01 Book of Standards**

Details and dimensions of drainage structures, TCPs, traffic barriers, etc., shall comply with the Administration's "Book of Standards, Highway and Incidental Structures."

#### **3.19.01.02 Specifications for Construction and Materials**

Shall comply with the Maryland Department of Transportation State Highway Administration 2019 Standard Specifications for Construction and Materials, including all Special Provision Inserts and these Special Provisions.

#### **3.19.01.03 Industry Standards**

The Design-Build Team shall adhere to industry standards pertaining to civil construction, such as ASTM and AASHTO or Utility and utility owners' specifications and standards. If an item of work is not covered by the Administration's specifications and standards, the materials and construction methods used shall meet the appropriate, nationally accepted industry standards and be submitted to the Administration for approval.

#### **3.19.01.04 Utility Details**

All Utility work shall be done in accordance with the latest edition of the utility owners' details and specifications and MDOT SHA Utility Manual.

### **3.19.02 Construction Stakeout**

The Design-Build Team shall refer to SP 107 - CONSTRUCTION STAKEOUT FOR DESIGN-BUILD PROJECTS for project specific requirements.

The Design-Build Team shall engage a Registered Professional Land Surveyor, licensed in the State of Maryland, to determine all lines and elevations for various parts of the Work, as the work progresses:

- A. Verify that the field locations of the established horizontal controls and benchmarks correspond with figures shown on the Design-Build Team's Contract Drawings.
- B. Establish vertical references and axis lines showing elevations and other lines and dimensional reference points as required for the execution of the work.
- C. Field check facilities and surveys thereof as required by the technical sections of the Specifications.
- D. Stake out the limit of disturbance including all wetland areas and tree protection fencing at all Tree Preservation Areas.
- E. Stakeout the Right-of-Way Line, including, but not limited to, fee acquisition, easements, and Lines of Division.

- F. All stakeout performed by Design-Build Team shall be made accessible for the Administration's inspection.
- G. Perform additional stakeout and/or verification as requested by the MDOT SHA Construction Project Manager

### **3.19.03 Maintenance of Traffic**

All maintenance of traffic work is to comply with the approved traffic control plans, traffic control standards, the MD Manual on Uniform Traffic Control Devices (MD MUTCD), MD Standard Sign Book, and special provisions.

- a. Advanced Notice Requirements

The Design-Build Team shall notify the MDOT SHA Construction Project Manager in advance of implementing any changes in traffic patterns as per requirements of the Maintenance of Traffic Performance Specification.

- b. Schedules/Sequences of Construction

The Design-Build Team shall schedule work phasing and tie-in operations so as not to be working intermittently throughout the area. Schedule and pursue excavation and other construction activities to permit making the connection without unnecessary delays. Perform utility work in conformance with the maintenance of traffic requirements shown on the approved Drawings and/or as indicated in the Standards.

- c. Protection of Work

Pursuant to the General Provisions, the Design-Build Team is responsible for protection of the work and safety of the public.

Various mitigation measures may be required as unforeseen conditions develop during construction operations. Potential conditions to consider are: open excavations, the use of decking or plates to close trenches, vibration or other geotechnical monitoring, temporary wedge material to prevent pavement edge drop-off, temporary shielding as both a physical and/or visual barrier, the installation of temporary channelizing devices and/or traffic barriers.

### **3.19.04 Erosion and Sediment Control**

Except as noted below, all work shall be done in accordance with the erosion and sediment control (ESC) plans to be prepared by the Design-Build Team and as approved by the SWM/ESC Approval Authority.

- a. Compliance Requirements

Ensure daily stabilization for land disturbance within any drainage areas adjacent to wetlands and streams in the design and implementation of the ESC plans. Provide resources to provide immediate stabilization for the contract at all times.

Keep an erosion and sediment control manager (ESCM) on site at all times. The sole responsibility of the ESCM will be to ensure compliance with MDOT SHA standards and that all measures adhere to the Maryland Standards and Specifications for Soil Erosion and

Sediment Control. The ESCM must strictly perform ESC related work. Daily erosions and sediment control meetings between the ESCM and MDOT SHA Erosion and Sediment Control (ESC) Inspector will be held to discuss the status of the project and the daily ESC report. Weekly meetings between the ESCM, MDOT SHA ESC Inspector, Independent Environmental Monitor (IEM) and Regional Environmental Coordinator (REC) will be held to discuss the status of the project and the ESC reports for the week.

1 At any time, the QA Inspector may request the contractor to disclose the total graded area throughout the project that is not stabilized. The contractor shall limit the amount of area disturbed at any given time as much as possible and comply with the all stabilization requirements.

1 b. Plan Adjustments and Revisions

**It is the Design-Build Team's responsibility to perform constructability reviews of all plans prior to submission to the SWM/ESC Approval Authority and prior to them being deemed Ready for Construction as defined in TC 3.05.18, Design Review and Coordination.**

Any proposed adjustment or revision must comply with all Federal, State, and local laws, ordinances, and regulations pertaining to environmental protection.

For minor field adjustments of temporary ESC measures, the contractor must submit a request to the MDOT SHA QA OED Toolkit as a concurrence. Minor field adjustments of temporary ESC measures that must be submitted to the MDOT SHA QA OED Toolkit shall not include adding, deleting or changing of the control type or material.

If the request submitted to the MDOT SHA QA OED Toolkit is approved by the MDOT SHA Quality Assurance (QA) Inspector, Independent Environmental Monitor, MDOT SHA Project Engineer (PE) for Construction, and MDOT SHA Design Project Manager, minor field adjustments of the of temporary ESC measures may be made as required to accomplish the intended purpose. If the Administration judges, in the Administration's sole opinion, that the revision is not a minor field adjustments of temporary ESC measures, the Administration will notify the Design-Builder and the Design-Builder must submit the revision as a redline revision per the requirements of TC 3.05.25.02.03.01.

All other revisions to ESC plans, including but not limited to, adding, deleting or changing of the control type or material, must be submitted as redline revisions per the requirements of TC 3.05.25.02.03.01.

When directed by the Administration's PE, the contractor shall be responsible to implement additional erosion and sediment control measures and modifications to the approved erosion and sediment control plan as required by the MDOT SHA QA Inspector and the Administration's Environmental Monitor or IEM to address unforeseen site conditions during design at no additional cost to the Administration.

Review times by SWM/ESC Approval Authority, MDOT SHA and/ or environmental agencies for any revision to ESC plans shall not be the basis of a claim or time extension against the Administration.

c. Protection of Existing Waterways and Highway

d. Debris or trash of any kind, either existing or generated by the project, shall not be allowed to enter Waters of the U.S or onto roadways. This includes, but is not limited to, paint splatters and spillage, wet or dry silica dust, and truck cleanout remnants. Take care to prevent damage and/or injury to personnel, vessels, and vehicles using waterways, roadways, or pedestrian ways. Provide devices and maintain as required to prevent such occurrences. Promptly remove any material or items falling in a waterway, on adjacent banks, or on roadways and immediately report to the Engineer and the jurisdictional agency.

e. Fish and Wildlife Resources

Do not alter water flows or otherwise disturb native habitat near or adjacent to the project construction area, unless otherwise stipulated in the project's permits and approved as an authorized action by the appropriate regulatory agencies.

f. Staging Areas

Do not use, in connection with this Contract, for storage, as a staging area, or as a preparation site any cultural resource facility, building, site or cleared area that is, as of the date of this Contract, on or eligible for listing on the National Register of Historic Places (16 U.S.C., paragraph 470a) without prior approval of the Engineer.

For the purpose of the preceding paragraph, the term "cultural resource" includes districts, sites, buildings, structures, and objects significant in American history, architecture, archaeology, or culture.

### **3.19.05 Engineers Office**

The Design-Build Team shall supply one (1) Engineer's Office Type D, for use by - Administration personnel, conforming to the requirements of Section 103 of the Standard Specifications.

One phone in the conference room of the Engineer's Office shall have conference call and speakerphone capabilities.

The Design-Build Team shall provide the Administration with two (2) desktop computers, and one (1) laptop computer as described in special provisions in this RFP.

The Design-Build Team shall provide the CPM schedule, as is described in the special provision in this RFP.



**TC 3.20 ENVIRONMENTAL PERFORMANCE SPECIFICATION****3.20.01 General**

The Design-Builder shall conduct its design and construction activities in accordance with these specifications such that no action or inaction on the part of the Design-Builder shall result in non-compliance with any federal, state, or local laws and regulations, MDOT SHA policy and standards, or the project environmental goals and commitments. Specifically, the Design-Builder shall obtain and adhere to any applicable requirements of Clean Water Act Section 404 and 401 authorizations/permits, MDE Nontidal Wetlands and Waterways Permit, floodplain permits, and all other necessary permits and approvals required by the Project. Additionally, the Design-Builder will be required to fulfill all commitments included in the Categorical Exclusion (CE), which has been completed by the Administration in accordance with the requirements of the National Environmental Policy Act of 1969 (NEPA).

**3.20.01.01 General Environmental Philosophy**

The I-695 Transportation System Management Operations (TSMO) design-build project vicinity is comprised primarily of urbanized residential communities with dense population and commercial centers, consistent with suburban development. Amongst the diverse community and cultural resources surrounding the project limits, there are other natural and environmental resources as well. Protection of these resources is of paramount importance. The philosophy followed by the Administration during the development of the RFP was to incorporate environmental stewardship measures to avoid and minimize impacts to the natural and forest areas, community, and cultural resources (Section 106 resources) to the greatest extent feasible and practical. The Design-Builder shall continue this environmentally sensitive approach and philosophy during the preparation of final design plans and through Project implementation.

**3.20.01.02 Guidelines and References**

The Design-Builder shall design and implement Environmental requirements in accordance with this Environmental Performance Specification and the relevant requirements of the Guidelines and References in TC 3.08.

**3.20.01.03 Owner's Environmental Roles and Responsibilities**

The Administration is coordinating with various environmental and regulatory agencies (including but not limited to the U.S. Army Corps of Engineers (USACE), Maryland Department of the Environment (MDE), Maryland Department of Natural Resources (DNR), Maryland State Historic Preservation Office (MD SHPO), U.S. Fish and Wildlife Service (USFWS), U.S. Environmental Protection Agency (EPA) and the public. Should a permit be required, the Administration would provide an Independent Environmental Monitor (IEM) on behalf of the USACE and MDE that will work with the Design-Builder to confirm that the Design-Builder's plans and construction methods are compliant and satisfy permit conditions and commitments are met. The IEM will:



- A. Review design submittals and construction activities for compliance with all conditions of applicable permits and environmental regulations;
- B. Review the Design-Builder's environmental compliance implementation;
- C. Notify the Design-Builder of deficiencies in the compliance with the commitments and permits;
- D. Report findings directly and concurrently to MDE Nontidal Wetlands and Waterway Construction Divisions, and USACE, notifying them and the Administration immediately of any reported or observed violations or non-compliance issues within the terms or conditions of the permit, the Water Quality Certification, or approved plans and specifications;
- E. Document impacts to regulated resources by developing and maintaining a detailed tracking list of impacted resources;
- F. Assist with the identification of ongoing opportunities for further avoidance and minimization of impacts to regulated environmental resources and protection of water quality; and
- G. Coordinate and attend any meetings involving resource or regulatory agencies (including the USACE, MDE, DNR, USFWS, and EPA).

All activities and issues identified during design and construction involving the USACE, MDE, DNR, USFWS, and/or EPA, will be coordinated through the Administration by the Design-Builder. The Design-Builder shall not directly contact the regulatory agencies without written approval from the Administration.

#### **3.20.01.04 Design-Builder's Responsibilities**

The Design-Builder shall be responsible for providing all information required to obtain all permit approvals listed in 3.20.01.05.A. The Design-Builder shall be responsible for compliance with any permit conditions throughout the design and construction of the Project.

The Design-Builder shall demonstrate compliance with all permits, permit requirements, approvals, and NEPA requirements by producing a Compliance Report each quarter. The Compliance Report will be made up of a memorandum and checklist, which tracks and confirms compliance with all permits, permit requirements, approvals, and NEPA requirements through design and construction. The Compliance Report shall be submitted to the Administration within one week after the end of each quarter starting on the first quarter after Notice to proceed.

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**3.20.01.05 Permits and Approvals**

No permits have been obtained by the Administration. Agency coordination will be required to secure necessary permits for any environmental impacts as part of the Design-Builder's project. Environmental impacts due to the Design-Builder's project should be avoided and minimized to the maximum extent practical. The Design-Builder shall achieve and maintain commitments and permits through a strong Environmental Compliance Plan and partnering with the Administration.

- A. The Design-Builder shall be responsible for providing all information required to obtain the following permits and/or approvals, if required by the final design, and shall submit through the Administration:
1. USACE Permit
  2. MDE Non-Tidal Wetlands and Waterways Permit
  3. MDE Dam Safety Approval
  4. SWM/ESC Approval Authority Erosion and Sediment Control Approval
  5. SWM/ESC Approval Authority Stormwater Management Permit
  6. MDE NPDES Permit
  7. MDE Water Quality Certification
  8. Maryland Department of Natural Resources (DNR) Maryland Forest Conservation Act, Maryland Reforestation Law and/or Maryland Roadside Tree Law permit
  9. All other approvals, permits and licenses, permit modifications, pay all charges, fees and taxes and give notices necessary or appropriate for the implementation of the Project beyond those obtained by the Administration. This includes but is not limited to approvals for on or off-site staging, stockpiling areas, disposal sites and borrow pits.

**3.20.02 NEPA****3.20.02.01 General**

In accordance with the requirements of NEPA, MDOT SHA has completed a CE for this project. The Design-Builder is required to fulfill all commitments included in the NEPA document.

**3.20.02.02 Environmental Summaries (ES)/Reevaluation Process**

An Environmental summary and a reevaluation are both mechanisms to determine whether or not the NEPA decision remains valid or if additional analysis and/or documentation is necessary. The improvements proposed by the Design-Builder, which occur inside or outside

of the project Right-of-way, shall be reviewed to determine if an environmental summary or reevaluation is required. Should the Design-Builder's improvements require an environmental summary or reevaluation, it will be completed by MDOT SHA post Award with the Design-Builder providing any and all data and information required. It is the responsibility of the Design-Builder to account for the time to obtain approval of an environmental summary(ies) or reevaluation(s) within their project schedule to ensure there are no delays to the project. The preparation of an environmental summary/reevaluation process is triggered by:

- A. Improvements that change the project scope;
- B. Improvements that change the NEPA evaluated limits of disturbance;
- C. Improvements that change the direct effects, indirect effects and/or cumulative impacts, and any appropriate mitigation measures as outlined in the NEPA document;
- D. Improvements that cause Federal Actions, such as Interstate Access Point Approval (IAPA);
- E. Even without improvements, there are changes in the condition of the planning area evaluated in the approved NEPA document;
- F. Change that occurs outside of the planning area evaluated in the approved NEPA document and any approved NEPA reevaluations, as applicable, such as staging areas;
- G. New information becomes available that was not known at the time the NEPA document was approved;
- H. Improvements meet the definition of a Type I Project in accordance with MDOT SHA Noise Policy and 23 CFR 772.5; and
- I. Changes in applicable laws and regulations.

The Administration will prepare the NEPA documentation based on the information provided by the Design-Builder. The Administration will coordinate approvals with the regulatory agencies and FHWA. If an environmental summary/reevaluation is needed, it must be approved by FHWA prior to construction starting.

#### 3.20.02.02.01 Design Change

If the Design Builder proposes a design change that causes an environmental summary/reevaluation to be triggered, the following is the step by step process to obtain approval of an environmental summary/reevaluation:

1. Design-Builder determines a design change is warranted;
2. Design-Builder environmental staff conducts a quick review to determine if any

environmental, social or cultural impacts will occur due to the change;

3. Design-Builder presents information to the MDOT SHA Project Engineer and MDOT SHA Environmental Manager including Environmental Summary (ES) narrative and figures;
4. MDOT SHA Project Engineer, in consultation with the MDOT SHA Environmental Manager, will deny the change with comments, or conditionally approve the change;
5. MDOT SHA Environmental Manager determines specific agency involvement;
6. If MDOT SHA conditionally approves the change, MDOT SHA Environmental Manager and/or the Environmental Management Team (EMT) prepares the Environmental Summary (ES) and sends documentation letters required to regulatory agencies (such as MD SHPO letter, permit modification, etc.):
  - a. Permit modification
  - b. MD SHPO response (additional information is included in 3.20.02.03 Cultural Resources)
  - c. Rare Threatened or Endangered (RTE) species and fisheries responses
7. Obtain all agency approvals;
8. MDOT SHA submits the ES to FHWA for formal approval.

It is the Design-Builder's responsibility to provide any and all data and information required for any environmental summary/reevaluation. The Administration will prepare the NEPA documentation based on the information provided by the Design-Builder. The Administration will coordinate approvals with the regulatory agencies and FHWA. Delays due to environmental summary/reevaluation approval for design changes, requested by the Design-Builder, shall not result in additional costs to the Administration nor be the basis of a claim or time extensions against the Administration.

Note: FHWA could request more information before they will approve an ES. Supplying the additional information is the responsibility of the Design-Builder at no additional cost to the Administration.

### **3.20.02.03 Cultural Resources**

Historic Properties, including archaeological sites and historic standing structures, are afforded protection by Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended, and the Maryland Historical Trust Act of 1985, as amended, State Finance and Procurement Article §§ 5A-325 and 5A-326 of the Annotated Code of Maryland. Pursuant to Section 106, MDOT SHA has determined the project's Area of Potential Effect (APE), to include the project LOD for archaeological resources and the geographic area within the

immediate viewshed and perceivable audible range of the project for architectural resources.

There are eleven standing structures that are listed in, or eligible for listing in the National Register of Historic Places identified within the APE: the Milford Survey District (BA-2955); the Woodholme Avenue Historic District (BA-3052); the Green Spring Valley Historic District (BA-2216); the Cloisters (BA-1186), Brooklandville House/Valley Inn (BA-218); Rockland (BA-219); Rockland Village Historic District (BA-221), the Northern Central Railroad Engineering Structures Historic District (BA-2874); the Lutherville Historic District (BA-2211); Goucher College (BA-1484); and Hampton National Historic Site (BA-103). Six unevaluated archaeological properties are along or adjacent to the MDOT SHA right of way: 18BA95, the Hampton National Historic Site; 18BA100, the Howard-McHenry Mill; 18BA177, Kulis I; 18BA606, a section of the Loch Raven Railroad; 18BA607, Stone Block; and BALTOW-QF09, Milford Mill.

A Programmatic Agreement (PA) Among the Federal Highway Administration, the Maryland Department of Transportation State Highway Administration, and The Maryland State Historic Preservation Officer pursuant to 36 CFR 800 regarding improvements to I-695: I-70 To MD 43, Transportation Systems Management And Operations Design-Build Project in Baltimore County, Maryland has been signed. A copy of this PA is provided as part of the Appendices to the CE on ProjectWise. **The Design-Builder will be held by MDOT SHA responsible for all requirements, restrictions, and provisions as described in the PA.**

All Design-Builder design plan submittals will be reviewed by the Administration's cultural resources staff to assess any effects to cultural resources. The Design-Builder is required to provide the Administration, upon request, any additional information required by the Administration to allow its cultural resources staff to make an informed assessment and coordinate with the MD SHPO. This information may include but is not limited to: narratives, displays, specifications, details, renderings, graphics and other information. This information shall be at no additional cost to the administration. **Construction on any Design-Builder Ready for Construction package shall not take place prior to the completion of review by the Administration's cultural resources staff and any necessary coordination with the MD SHPO.**

If the Administration determines that any project elements have the potential to adversely affect cultural resources, the Administration will evaluate these resources in consultation with the MD SHPO and relevant consulting parties, which may include the Hampton National Historic Site, the Baltimore County Landmarks Preservation Commission, the Preservation Alliance of Baltimore County, and the Piscataway-Conoy Tribe. Work items proposed within the viewshed of Hampton National Historic Site (PA Attachment D) require the Administration to provide information to Hampton National Historic Site (A unit of the National Park Service) and allow 30-days for Hampton National Historic Site to request consultation.

If historic properties or cultural resources listed, eligible, or found to be eligible for listing in the NRHP are adversely affected by the proposed plans, the Administration will consult with MD SHPO and other parties, as appropriate, to determine the appropriate mitigation for the

adverse effects. The evaluation and treatment of cultural resources will be carried out following the stipulations provided in the Programmatic Agreement Among FHWA, MDOT SHA, MD SHPO. Any mitigation required for adverse effects caused by the Design-Builder's improvements shall be the Design-Builder's responsibility and at no additional cost to the Administration.

### **3.20.02.03.01 Unanticipated Discovery of Archaeological Resources**

Maryland Department of Transportation State Highway Administration consultant archaeologist Dr. Lisa Kraus (410- 545-2884 or via email at [lkraus.consultant@mdot.maryland.gov](mailto:lkraus.consultant@mdot.maryland.gov)) (the MDOT SHA Archaeologist) shall act as the archaeological liaison with the MDOT SHA Construction Engineer. The MDOT SHA Archaeologist shall be available to report to the job site within 24 hours of notification to inspect any archaeological discoveries that might be encountered during construction. If MDOT SHA Construction Engineer is unable to get in touch with Dr. Kraus, they shall call down the MDOT SHA Unanticipated Discover Contact List, provided on ProjectWise, until connecting directly with an archaeologist. A MDOT SHA archaeologist will be dispatched immediately to provide guidance and ensure any work delays are eliminated or minimized.

In the event that previously unidentified archaeological resources, including human remains, are discovered during ground disturbing activities, the Design-Builder shall immediately notify the Administration's Project Engineer, heavy equipment and ground disturbing operation is required to stop in the discovery area and the Design-Builder shall establish a surrounding buffer (minimum 100 feet) to protect the find. No media, agency, or other external contacts should be made until and unless an MDOT SHA archaeologist evaluates the discovery and provides additional direction. See also MDOT SHA Standard Specifications TC-5.04 "Cultural Resources". Examples of archaeological resources include, but are not limited to, accumulations of shell, pottery, burned rocks, bone, charcoal, dark soil staining containing artifacts; stone tools or chips; evidence of building foundations; concentrations of tin cans, bottles, or ceramics appearing to be greater than 50 years old; or other unanticipated human-constructed features. The design-builder shall implement the provisions of this section in any situation where there may be reasonable suspicion of an archaeological discovery. The Administration's Project Engineer shall contact Administration Archaeologist Dr. Julie Schablitsky (410-545-8870), Assistant Division Chief of the Environmental Planning Division, who shall notify the MD SHPO and other required parties of the discovery.

The Administration, or an archaeologist approved by the Administration, shall promptly inspect the work site and determine the area and nature of the archaeological resource. Following this inspection, the Engineer may release the area to resume construction if the archaeologist determines the discovery does not require additional consultation.

Should the archaeologist determine the resource requires additional consultation, within no more than three working days of the original notification of discovery, the Administration, in consultation with MD SHPO, shall determine the National Register eligibility of the resource. If the resource is determined eligible for the National Register, the Administration

shall prepare a plan for its avoidance, protection, recovery, or destruction without recovery. Such a plan shall require approval by MD SHPO prior to implementation.

Work in the affected area shall not proceed until consultation is complete.

### **3.20.02.03.02 Human Remains**

Should any known or suspected human remains (hereafter, "Remains") be encountered during construction, all construction work in the vicinity of the Remains shall immediately be halted to prevent damage to the Remains, or to any additional Remains that might be present in the vicinity. The Design-Builder shall immediately notify the Administration's Engineer, who shall coordinate with the MDOT SHA Archaeologist, Dr. Julie Schablitsky (410-545-8870 or via email at jschablitsky@mdot.maryland.gov). If MDOT SHA Construction Engineer is unable to get in touch with Dr. Schablitsky, they shall call down the MDOT SHA Unanticipated Discover Contact List, provided on ProjectWise, until connecting directly with an archaeologist. A MDOT SHA archaeologist will be dispatched immediately to provide guidance and ensure any work delays are eliminated or minimized. The design-builder shall implement the provisions of this section in any situation where there may be reasonable suspicion of human remains.

1. The MDOT SHA archaeologist shall inform law enforcement and MD SHPO and shall perform a preliminary inspection of the Remains to confirm whether the Remains may be human and evaluate the age and cultural affiliation of the remains.
2. If determined archaeological (non-forensic) and the Remains cannot be avoided by construction, the MDOT SHA Archaeologist shall consult with MD SHPO and other parties as appropriate on a treatment plan.
3. Construction shall be temporarily suspended in the immediate vicinity of the Remains until the archaeological investigation has been completed, as provided for in the Standard Specifications for Construction and Materials under TC 5.04 (Cultural Resources) and TC 4.04 (Work Suspension). Construction can and should continue in all other parts of the project area.
4. If the Administration's Engineer determines that the Remains are located in a part of the project that will affect the critical path of construction, investigations will be limited to the minimum time required to complete necessary investigation, removal, or other treatment.
5. Upon completion of implementation of the treatment plan and concurrence from MD SHPO, the MDOT SHA archaeologist will notify the Engineer that construction may resume in the area of discovery.

Work in the affected area shall not proceed until the above procedure is complete.

### **3.20.02.04 Terrestrial Wildlife (TW)**

**3.20.02.04.01 Rare, Threatened and Endangered Species (RTE)**

The US Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) species list indicated that the threatened northern long-eared bat (*Myotis septentrionalis*) may occur within the project area. Per recent guidance from the USFWS Chesapeake Bay Field Office, there is no documented hibernacula or known maternity roosts for the northern long-eared bat within the project vicinity. No other official state or federally listed rare, threatened, or endangered species, nor any critical habitats, refuges or fish hatcheries, have been identified in the vicinity of the Project. Multiple resident cold and warm water fish species have been identified at nearby Maryland Biological Stream Survey stations and important fisheries resources are located in the project area.

Important fisheries resources in the project area include the American Eel. American Eels migrate upstream through this region to smaller streams where they grow to adult stages. Some eels may reside within the project study area long term. Their spawning runs then take them back through this area as they migrate downstream as adults to a specific region of the Atlantic Ocean to spawn. Special attention has been given to American Eel management in recent years, due to their ecological and economic importance, and their declining numbers.

Jones Falls is a designated natural trout stream, supporting reproducing populations of trout species. Trout have been documented in the project area and are a high priority species for protection and restoration because of widespread declines (e.g. water temperature, habitat degradation, competition from exotics) throughout its native range. While not federal or state listed, DNR recommends conservation measures to avoid and minimize trout impacts and may be unlikely to grant waivers to stream closures.

Gwynns Falls and Gunpowder Falls are stocked with adult trout during the spring season at or near the project location. Depending upon flow and in-stream conditions, small numbers of stocked trout may be found near the project site.

If the Design-Build proposes in-stream work, they would be required to adhere to time of year restrictions identified in 3.20.03.02.04 - Aquatic Biota. Should forest or tree removal be proposed, it is the Design-Builder's responsibility to provide all information required for coordination with USFWS regarding any requirements for time or year restrictions on forest clearing and tree removal.



DNR analysis of the project area information provided indicates that forested areas on or adjacent to the project site contains Forest Interior Dwelling Bird habitat. Populations of many Forest Interior Dwelling Bird Species (FIDS) are declining in Maryland and throughout the eastern United States. The conservation of FIDS habitat is strongly encouraged by the DNR.

### **3.20.03 Wetlands and Waterways**

Wetlands and waterways were identified, delineated and surveyed within the Project limits, except where parcels were inaccessible and property owners did not grant access for delineation. Surveyed boundaries of waterways and wetlands have been provided as part of the Environmental Features information and Natural Resources Inventory Report on ProjectWise. Should the project design result in any unavoidable impacts to wetlands and waterways, the Design-Builder shall be responsible for providing all required information to obtain all required permits for impacts to wetlands and waterways and for meeting all requirements of those permits. Should the project design involve any inaccessible properties (as noted in the Environmental Features information and the Natural Resources Inventory Report) the Design-Builder shall be responsible for conducting a wetland and waterways delineation and incorporating this information into the project plan base files and permits.

A mapped vernal pool appears to be located adjacent to the project area. Any impacts to vernal pools must be mitigated at 3:1 in kind. Since vernal pools are difficult to recreate and may take years to develop the wildlife that the habitat provides, it is highly recommended that the pool be avoided. Hydrologic and other types of impacts from features and design of the project, such as draining the pool, should be avoided.

#### **3.20.03.01 Wetlands and Waterways Permitting and Agencies Coordination**

The Design-Builder shall be responsible for providing all required information to obtain all permit approvals or modifications for permits listed in 3.20.01.05.A. Any delays while obtaining permit approvals or modifications to permits shall be at no additional cost to the Administration or be cause for any contract claims or time extensions.

If impacts to jurisdictional resources are proposed, the Design-Builder is responsible for providing all information required for permit acquisition from the USACE and MDE including coordination with the agencies following the requirements below:

1. A Pre-Permitting meeting shall be held once the notice of selection has been made, and prior to meeting with the SWM/ESC Approval Authority. This meeting will be scheduled by the Administration, upon request by the Design-Builder, and will include the Design-Builder's Project Design Manager, Construction Manager, erosion and sediment control lead, stormwater design lead, wetlands and waterways permitting lead, as well as, the Administration's Environmental Programs Division (EPD) Project Coordinator, Design Project Manager, EPD Regional Environmental Coordinator, HHD Project Coordinator and others as needed. The purposed of the meeting is to discuss the

permitting process and preview and discuss the Design Builder's approach to wetlands and waterways permitting including avoidance and minimization during design.

2. Monthly meetings with the Administration, Design-Builder, USACE and MDE shall be required to discuss design elements related to wetlands and waterways permits. This meeting will be scheduled by the Administration and attendees shall be identified by the Administration and the Design-Builder. The USFWS, DNR, and other permitting agencies shall be invited to attend as needed. Meetings can be reduced at the discretion of the USACE and MDE.
3. No discharge or indirect impacts to wetlands or waterways is permissible without required permits.
4. No work in wetlands, wetland buffers, waterways, or the 100-year floodplain shall occur without required permits.
5. The Design-Builder shall not directly contact the USACE or MDE or other wetland and waterways permitting agencies without written approval from the Administration.
6. All submittal information to obtain all required wetland and waterways permits and any modifications shall not follow the IDQM process but shall be submitted directly to the Administration's Project Manager and EPD Project Coordinator. No advanced notification is required prior to submitting to the Administration but advanced notification is encouraged. The Administration will review each submittal and provide comments within 28 calendar days beginning the day after receipt of the submittal. Electronic copies of the submission shall be provided through ProjectWise to the Administration. If the submittal is acceptable to the Administration, the Administration will notify the Design-Builder and the Design-Builder shall provide an electronic copy via ProjectWise and hard copies (if requested by USACE and/or MDE) of all information. Hard copies shall be hand delivered directly to the Administration's EPD Project Coordinator. The Administration will forward the submittal to the regulatory agencies. Review time for the USACE and MDE shall not be the basis of a claim or time extensions against the Administration.
7. Though the Administration will coordinate with the regulatory agencies, it is the Design-Builder's sole responsibility for obtaining all required permits and providing sufficient and permittable information. Delays due to the regulatory agencies' approval process shall not be the basis of a claim or time extensions against the Administration.
8. The Design-Builder shall submit to the Administration a Conceptual Avoidance and Minimization Plan as discussed in 3.20.03.02.
9. The Design-Builder shall provide Avoidance and Minimization Memos with all ESC and SWM submittal packages as described in 3.20.03.02.

10. All plan packages that follow the IDQM process outlined in TC 3.05, shall be submitted to the Administration. The Administration will review each submittal to determine if they will need to be forwarded to the USACE and MDE for review and comment. If the submittal is acceptable to the Administration and needs to be forwarded to the USACE and MDE, the Administration will notify the Design-Builder and the Design-Builder shall provide an electronic copy via ProjectWise and hard copies (if requested by USACE and/or MDE) of all information. Hard copies shall be hand delivered directly to the Administration's EPD Project Coordinator.
11. If the USACE, MDE, and/or other agencies (including EPA, USFWS, DNR, and MD SHPO) provide comments on the submitted information, the Administration will forward the comments to the Design-Builder. The Design-Builder shall address all comments to the satisfaction of the Administration and the regulatory and commenting agencies. It is the Design-Builder's responsibility to provide sufficient submittals to address regulatory agencies' comments.
12. It is at the USACE and MDE's discretion as to when the Joint Permit Application (JPA) is considered complete. Timeliness of approval from USACE and MDE will be dependent on quality of the Design-Builder's submittals. Delays due to the regulatory agencies approval process shall not be the basis of a claim or time extensions against the Administration.

#### **3.20.03.01.01 Public Notice / Hearing depending on MDE comments**

MDE's process includes a public notice period for the project and interested persons may request a public hearing during this time. If a public hearing is requested and required by MDE, the Design-Builder shall present a short presentation about the project during the hearing, provide display boards showing the project design, and shall provide any other information requested by MDE or the Administration. The Design-Builder shall prepare any required mailings information for the public notice and hearing and provide the information to the Administration. The Administration will coordinate the location of the hearing, and distribution of the mailings. The Administration shall provide a Court Reporter if required by MDE.

#### **3.20.03.01.02 Submittals**

The Design-Builder shall submit the following (but not limited to):

- A. JPA, Impact Plates and Impact Tables for USACE and MDE Permits (if applicable)
- B. Preliminary Plans
- C. Final Plans
- D. Surveyed as-built 22x34 plans of post construction conditions

**3.20.03.01.03 Modifications**

If the Design-Builder determines that changes to impacts are to be considered through design and/or construction, the Design-Builder shall be responsible for providing the Administration with all necessary information required to request and to obtain the permits, approvals or modifications from the regulatory agencies. In addition to changes in impacts, requests for waivers to conduct instream work during the time-of-year restriction require permit modifications. Changes to the scope of work within regulated resources may also require a permit modification. The Design-Builder shall obtain concurrence from the Administration for any changes in design and/or construction activities that affect any permit conditions and would require a modification and approval from the regulatory agencies. Requests for modifications to the permits shall be accompanied by documentation provided by the Design-Builder to demonstrate that there is no practical alternative. The Design-Builder shall be responsible for addressing any comments or issues the regulatory agencies and/or the Administration may have, including those pertaining to avoidance and minimization measures. Any modification shall be acceptable by the Administration prior to the modification being forward to the regulatory agencies for approval. Any revisions shall be completed in a timely fashion and shall be at no additional charge to the Administration.

Additional mitigation required with approval of modifications shall be the responsibility of the Design-Builder and at no cost to the Administration. The Design-Builder shall provide all required information to EPD for EPD to submit to the USACE and MDE in regard to permit modifications, which includes but is not limited to comment letters, phone conversations transcripts, transmittals, reports, plans, impact plates and revisions to plans.

All conditions in the permits shall be adhered to unless modifications are accepted and approved by the Administration and the regulatory agencies.

It is not the responsibility of, nor guaranteed by, the Administration that approval or authorization of the proposed permit modification will be granted by the USACE and MDE. Delays due to permit approval for permits listed in 3.20.01.05.A, requested by the Design-Builder, will not result in additional costs to the Administration nor will the Contract be extended.

Coordination with EPD for permit modification requests shall follow the process below:

1. Design-Builder determines a design change is warranted.
2. Design-Builder environmental staff determines if there are any additional impacts to wetlands, wetland buffers, waterways, or the 100-year floodplain.
3. Design-Builder presents information to the Administration's Project Engineer and EPD Project Coordinator including design plans, a narrative, and a modification package.

4. Administration's Project Engineer and EPD Project Coordinator will review the information. EPD may provide comments or request additional information as needed for submission to the USACE and MDE. The Administration's EPD Project Coordinator may require corrective action to the submittals prior to final concurrence in order to ensure the modification process is implemented correctly. Any and all corrections shall be completed in a timely fashion for review and concurrence and shall be at no additional charge to the Administration.
5. The Administration's EPD Project Coordinator determines specific agency involvement.
6. The Administration's EPD Project Coordinator sends documentation prepared by the Design-Builder to the regulatory agencies (such as revised plates, permit modification, etc.)
7. Permit modifications must be approved by the USACE and MDE prior to initiation of construction for the affected Design Unit/submittal package. USACE and MDE could request more information before potential approval of the Permit Modification. Supplying the additional information is the responsibility of the Design-Builder and shall be at no additional cost to the Administration.

### **3.20.03.02 Wetland and Waterway Design Requirements**

If impacts to wetlands and/or waterways are proposed, the Design-Builder shall implement avoidance and minimization techniques to reduce impacts to regulated wetlands and waterways.

Until the acceptance of the Design-Builder's Conceptual Avoidance and Minimization Plan and permit issuance, there are no permitted wetland and waterway impacts for this project.

The Design-Builder shall focus its efforts to minimize impacts to wetlands, wetland buffers, waterways, and floodplains in all areas of the project, especially sensitive areas as noted in this specification. No stormwater management facilities shall be placed in wetlands or waterways. Additionally, preference shall be placed on minimizing impacts to wetland buffers due to stormwater management. Engineering designs shall emphasize avoidance and minimization of impacts to regulated resources including evaluating the feasibility and effectiveness of using measures such as retaining walls, steeper embankment slopes (2:1 or steeper where appropriate), reduced culvert lengths, use of lower impact erosion and sediment control measures, elimination of stormwater management facilities, increased headwall heights, reduced roadway sections and any other feasible minimization efforts.

#### **3.20.03.02.01 Stream Relocations**

Any stream relocations shall be designed to the geomorphic characteristics of stable local streams to avoid downstream scour, channel degradation, and fish blockages. Concrete channels shall not be utilized for this project. For any stormwater management pond

constructed in the vicinity of a stream, the pond shall be located a sufficient distance from the stream to maintain a 15-foot-wide cleared area beyond the toe of any berms surrounding the pond, plus an additional 30-foot-wide, or larger, vegetated buffer along the stream. All stream relocation designs shall be reviewed by the Administration and approved by the USACE and MDE prior to implementation.

#### **3.20.03.02.02 Groundwater**

The Design-Builder shall maintain hydrology within wetlands and waterways.

The Design-Builder shall be responsible for design measures that maintain and discharge natural groundwater flows and seeps associated with waters of the U.S. and wetlands.

The Design-Builder shall provide protective measures at cut slopes, ditching, and other activities adjacent to non-impacted or temporarily impacted wetlands, to ensure that the source of hydrology to that wetland is preserved. If it is determined that the wetland has been altered hydrologically, it will be considered an additional impact, for which the Design-Builder shall be responsible for providing permit modification documentation as well as mitigation at the designated ratios, per COMAR Section 26.23.04, for the impacts.

#### **3.20.03.02.03 Surface Water**

The hydrology of roadside ditches, should they need to be replaced, shall be replaced in-kind and in the same or better condition after construction based on the pre-construction survey. The agencies may require additional mitigation if these systems are not maintained and additional mitigation shall be at the cost of the Design-Builder.

For details on ESC and SWM, see the Drainage, Stormwater Management, and Erosion & Sediment Control Performance Specification, TC 3.17.

The Design-Builder shall not discharge or allow the release of any sediment laden construction water unless properly treated by an MDE approved device. The Design-Builder shall obtain Administration approval of all dewatering operations prior to pumping and discharge. Water to be pumped and discharged shall be in conformance with the COMAR Standards (Section 26.08.02).

To minimize potential for untreated discharge, the Design-Builder shall designate, design construct, utilize, maintain, and upon conclusion of operations, properly close concrete wash-out pits for all concrete production, transport and placement operations. The location of concrete wash-out pits shall be approved by the Administration prior to use. The pits shall be managed such that no concrete waste or wash water is discharged into wetlands or waters of the U.S. This may include the implementation of drying beds with proper sediment controls and treatment of excess wash water on-site or proper off-site disposal.

If construction discharges exceed water quality standards identified in COMAR, the Design-Builder shall immediately notify the Administration and resolve any Project-related deficiencies within 24 hours.

The Design-Builder shall not degrade water quality downstream of the project site. Water quality shall be greater than or equal to current water quality baseline data provided as part of the additional information on ProjectWise.

The Administration can request spot-check inspections by the IEM at any time to verify compliance.

#### **3.20.03.02.04 Aquatic Biota**

The Design-Builder shall:

- A. Conduct all work to avoid/minimize fish mortality from both construction-related water quality impairment and in-stream activities. The Design-Builder shall notify the Administration 48 hours prior to the commencement of any stream dewatering or other in-stream activities.
- B. Comply with all water quality standards stated in the COMAR for the protection of aquatic biota.
- C. Minimize culvert length to the greatest extent practicable. New culverts shall be appropriately sized and depressed per COMAR requirements for passage of aquatic life. Where existing culverts are being extended, appropriate measures to promote/restore passage of aquatic life may be required.
- D. Conduct all in-stream work in compliance with the Maryland mandated stream closure period for the appropriate stream closure period. The project area contains Use I (typically March 1 through June 15, inclusive in any year), Use III (typically October 1 through April 30, inclusive any year), and Use IV (typically March 1 through May 31, inclusive in any year) streams (time of year restrictions may be extended or modified based on the existing of species found within the project area). The Design-Builder is responsible for ensuring all stream restriction periods are adhered to and appropriate stream use restriction periods are shown on applicable plans.
- E. Any riprap placed shall be constructed so as not to obstruct the movement of aquatic species, unless the purpose of the activity is to temporarily impound water. Existing riparian vegetation in the area of the stream channel should be preserved as much as possible to maintain aquatic habitat and shading to the stream. Per DNR guidance, utmost caution would be given when using grout, mortar, or concrete in or near stream channels, as uncured concrete could cause pH spikes onsite and downstream.

- F. For all perennial streams the Design-Builder shall relocate fish and other aquatic organisms downstream of the sandbag diversion or work area in a timely manner to minimize mortality to the extent practicable. All aquatic biota relocations will be performed in accordance with regulatory agency permits and regulations.

#### **3.20.03.02.05 Construction Practices**

Prior to performing any work on the Project, the Design-Builder shall install temporary orange safety fence along the limits of disturbance (LOD) and fabricate and install prohibitive signage in English and Spanish adjacent to non-impacted areas of wetlands and their buffers along the LOD and/or ROW. The signage dimensions and text shall be per the "Wetland Prohibitive Signage Detail" provided as part of the Additional Information on ProjectWise. The orange safety fence shall be installed at a maximum of 25 feet from the proposed toe of cut/fill adjacent to wetlands, and the Administration, USACE, and MDE shall concur/approve of the locations. The wetland fencing locations should be staked prior to the pre-construction meeting. All personnel of the Design-Builder or subcontractors shall be alerted to these designated protection areas.

#### **3.20.03.02.06 Occupying Wetlands/Waterways and Best Management Practices for Work in Nontidal Wetlands, Wetland Buffers, Waterways, and 100-Year Floodplains**

See Contract Provisions CP – Occupying Wetlands.

#### **3.20.03.02.07 Best Management Practices for Work in Nontidal Wetlands, Wetland Buffers, Waterways, and 100-Year Floodplains**

The Design-Builder shall follow the Best Management Practices for work in nontidal wetlands, wetland buffers, waterways, and 100-year floodplains:

- A. The Design-Builder shall not stockpile or store excess fill, construction material, equipment nor debris in un-permitted nontidal wetlands, nontidal wetland buffers, waterways, or the 100-year floodplain.
- B. The Design-Builder shall not place materials in a location and manner, which adversely impacts surface or subsurface water flow into or out of nontidal wetlands, nontidal wetland buffers, waterways, or the 100-year floodplain.
- C. The Design-Builder shall not use excavated material as backfill if it contains waste metal products, unsightly debris, toxic material, or any other deleterious substance. If additional backfill is required, the Design-Builder shall use clean materials that are free of waste metal products, debris, toxic material, asphalt, or any other deleterious substance.
- D. The Design-Builder shall not operate heavy equipment in a manner that will damage un-permitted nontidal wetlands, nontidal wetland buffers, waterways, or the 100-year floodplain.



- E. The Design-Builder shall repair and maintain any serviceable structure or fill so there is no permanent loss of nontidal wetlands, nontidal wetland buffers, or waterways, or permanent modification of the 100-year floodplain in excess of that lost under the originally permitted structure or fill.
- F. The Design-Builder shall restore any nontidal wetlands, wetland buffers, waterways, or 100-year floodplain temporarily impacted by any construction to the full satisfaction of the Administration, regulatory agencies, and in accordance with the requirements of the USACE and MDE permits.
- G. The Design-Builder shall use the following species for all stabilization in the nontidal wetland and nontidal wetland buffer: annual ryegrass (*Lolium multiflorum*), millet (*Setaria italica*), barley (*Hordeum* sp.), and/or oats (*Uniola* sp.). Other non-persistent vegetation may be acceptable but must be approved by the Administration and MDE Nontidal Wetlands and Waterways Division. Kentucky 31 fescue shall not be utilized in wetland or buffer areas. Areas shall be seeded and mulched to control erosion after construction activities have been completed.
- H. The Design-Builder shall make post construction grades and elevations the same as original grades and elevations in temporarily impacted areas after construction has been completed.
- I. The Design-Builder shall protect aquatic species. In-stream work is determined by the classification of the stream and the time of year restrictions specified in the MDE Water Quality Certification.
- J. The Design-Builder shall control stormwater runoff from impervious surfaces to prevent washing of debris into the waterway
- K. The Design-Builder shall construct culverts and place any riprap so as not to obstruct the movement of aquatic species.
- L. The Design Builder shall use disposal areas for excess excavation that do not impact wetlands or waterways. The Design-Builder shall track the disposal of all excess excavation to ensure that there is no unauthorized discharge of fill in regulated wetlands or waterways and shall notify the Administration of the intended disposal site location for excess excavation or rubble waste removed from the project.

### **3.20.03.02.08 Conversion from Forested and Scrub-Shrub Wetlands to Emergent Wetlands**

Vegetation in converted wetlands may be cleared but shall not be grubbed. The topography and hydrology connections shall remain the same or be restored to pre-construction conditions. The Design-Builder shall replace damaged vegetation and shall present a proposed planting list to the Administration for review and written comment prior to implementation of replacement vegetation.

**3.20.03.02.09 Temporary Impacts-Stream, Wetland and Floodplain Restoration Efforts**

Temporary impacts are defined as waterways and wetlands that are temporarily altered during construction but are restored to pre-construction conditions after construction is completed. Stream stabilization measures may be required to insure stability of the restored section and could be considered as permanent impacts. USACE and MDE will determine, at their sole discretion, whether or not any stream stabilization measures considered a permanent impact will count against avoidance and minimization. Impacts shall be avoided and/or minimized to the greatest extent possible.

Construction details for any temporary stream crossings, temporary stream diversions, temporary stream relocations, and utility installations across waterways shall be prepared for Administration review and for MDE and USACE authorization prior to proceeding with construction. Earthen materials will not be permitted in the construction of temporary stream diversions; stream crossings; or cofferdams, due to the potential for washout during storm events.

The restoration plan for temporary impacts shall include but are not limited to the following elements:

- A. Removal of all construction and temporary fill material;
- B. De-consolidation and/or scarification of compacted soils;
- C. Replacement of topsoil and/or organic matter lost to erosion and sediment control measures;
- D. Re-establishment of grades to preconstruction conditions;
- E. Removal of temporary stream crossings;
- F. Restoration of stream banks with woody vegetation as specified in TC.3.13 Landscaping Performance Requirements and TC.3.17 Drainage, Stormwater Management, and Erosion & Sediment Control Performance Requirements;
- G. Avoid disturbance to riparian vegetation, particularly within 30 feet of stream banks;
- H. With the exception of underground utility corridors, areas within 30 feet of stream banks shall be replanted with native vegetation that is similar to that of the pre-construction species composition. Underground utility corridors shall be seeded within herbaceous species only; and
- I. Re-establishment of hydrology connections

### **3.20.03.02.10 Pre-Construction and Post-Construction Survey of Proposed Wetland and Waterways Impacts**

For any Wetlands and Waterways that the Design-Builder will impact temporarily, the Design-Builder shall confirm the pre-construction elevation of the wetland or waterway, and ensure the final elevation is appropriate to maintain existing hydrology to the satisfaction of the Administration, the USACE, and MDE. Results of the survey shall be documented in the Pre- and Post- Construction Wetland and Waterways Condition Report.

### **3.20.03.02.11 Loss of Wetland Hydrology**

Within one year of the completion of the construction project, an inspection will be conducted by the Administration and the regulatory agencies to determine whether any temporarily wetlands have altered their hydrology. If it is determined that temporarily impacted wetlands are no longer functioning as a regulated wetland, the Design- Builder shall be responsible for costs associated with the additional mitigation required. This additional mitigation shall not be applied to the proposed wetland mitigation site. Mitigation ratios for the lost wetlands shall be in accordance with COMAR 26.23.04.03.



### **3.20.03.02.12 Closeout of Wetlands and Waterways Permitting**

Once any Wetlands and Waterways As-built plans have been approved by the Administration and all punch-list items that would affect any wetlands and waterways Joint State/Federal Nontidal Wetlands and Waterways Permit have been resolved to the satisfaction of the Administration, the Design-Builder shall provide revised impact tables and plates in the same format as the Joint State/Federal Nontidal Wetlands and Waterways Permit application that show final impacts to wetlands, wetland buffers, streams, and the 100-year floodplain. The plates shall callout the temporary and permanent impacts and shall be accompanied by the Pre- and Post-Construction Wetland and Waterways Condition Report that details the activities that took place within the resources and any efforts that were taken to restore the area. This information shall be provided to the Administration's EPD Project Coordinator. The Administration may provide comments or request additional information to suffice as necessary for submission to the USACE and MDE for final acceptance. The Administration's EPD Project Coordinator may require corrective action to the submittals prior to final acceptance in order to ensure the permitting process is implemented correctly. Any and all corrections shall be completed in a timely fashion for review and concurrence and shall be at no additional charge to the Administration. The Design-Builder shall also submit any required closeout form to the USACE in accordance with the Permit. The Design-Builder shall submit electronic copies of all materials.

### **3.20.04 Forest and Plantings**

Reforestation work shall include the performance of all required and applicable Maryland Reforestation Law associated with the Project.

**3.20.04.01 Forest Avoidance and Minimization**

Boundaries of forests are depicted in the Environmental Features information on ProjectWise. Prior to performing any Work, the Design-Builder shall be responsible for performing all tree preservation measures in accordance with Section 120-Tree Preservation of the Standard Specifications for Construction and Materials.

Specimen trees (trees greater than 30” in diameter measured at 4.5’ from the ground) were identified and are depicted in the Environmental Features information. The Design- Builder shall avoid as many specimen trees as possible without affecting resources with equal or greater regulatory protection. As the design advances, it may be found that specimen trees are located near the outer edge of the required LOD or just outside the LOD. If this condition exists, the Design-Builder shall coordinate with the Administration to mark and provide a buffer for any such tree to avoid its removal during clearing and grubbing activities. An adequate buffer is defined as the critical root zone (drip line). Critical Root Zones for individual significant or specimen trees, as defined by DNR: Measured from the center of the tree’s trunk; 1.5 foot of radius per inch of DBH (Diameter at Breast Height).

Before reforestation is approved by DNR, every reasonable effort shall be made by the Design-Builder to minimize the cutting or clearing of trees. Only the minimum number of trees may be cut, and sound design practices shall be utilized.

The DNR has analyzed the forested area adjacent to the project site. The analysis suggests that this forested area contains Forest Interior Dwelling Bird Species (FIDS) habitat. The conservation of this habitat is strongly encouraged by DNR. The Design-Builder shall adhere to the following guidelines to minimize the project’s impacts on FIDS habitat and other native forest plants and wildlife:

- a. Avoid placement of new roads or related construction in the forest interior. If forest loss or disturbance is unavoidable, restrict development to the perimeter of the forest (i.e., within 300 feet of the existing forest edge), and avoid road placement in areas of high quality FIDS habitat (e.g., old-growth forest). Maximize the amount of remaining contiguous forested habitat.
- b. Do not remove or disturb forest habitat during April-August, the breeding season for most FIDS. This seasonal restriction may be expanded to February- August if certain early nesting FIDS (e.g., Barred Owl) are present.
- c. Maintain forest habitat as close as possible to the road and maintain canopy closure where possible.
- d. Maintain grass height at least 10” during the breeding season (April-August).

**3.20.04.02 Forest Mitigation**

Land disturbed by construction activities shall be revegetated as soon as practical after construction is completed in accordance with the TC.3.13 Landscaping Performance Requirements and TC.3.17 Drainage, Stormwater Management, and Erosion & Sediment Control Performance Requirements. The Design Builder shall maximize all potential on-site reforestation opportunities to minimize off-site plantings by the Administration.

Mitigation shall be the responsibility of the Design-Builder, and may include a site search, agency reviews and approvals, design, and obtaining right of way and construction.

**3.20.05 Hazardous Materials**

- A. The Design-Builder shall prepare and implement a plan for management and disposal of controlled hazardous materials and contaminated soil and groundwater that may be encountered during structure demolition, land clearing, or excavation activities.
- B. The plan shall address worker safety and health in accordance with applicable federal, state, and local regulations.
- C. The plan shall provide procedures for management, handling, transportation, and disposal of demolition debris and contaminated soils and groundwater that contain controlled hazardous substances in accordance with applicable federal, state, and local regulations.

**3.20.06 Tracking of Sediment**

The Design-Builder shall implement means to reduce tracking of sediment such as:

- A. Elongated and widened stabilized construction entrances;
- B. Use of wash racks;
- C. Use of street cleaning equipment;
- D. Increased maintenance of entrances; and
- E. On-site concrete wash-out pits in proximity to all major pour sites

**TC 3.21 INTELLIGENT TRANSPORTATION SYSTEMS PERFORMANCE SPECIFICATION**

**3.21.01 General**

1. It is the Administration’s intent to implement Intelligent Transportation Systems (ITS) devices on this project. The Design-Builder shall determine the exact systems and their limits in accordance with the Design-Builder’s proposal to address the Project Goals. The Design-Builder shall design, construct, and implement the elements of the ITS in accordance with the requirements of this specification, including performance requirements, standards and references, design and construction criteria, and required submittals.
2. The Design-Builder shall furnish, install, test and integrate all equipment, software, and materials necessary to provide a fully functional and acceptable ITS to facilitate static-dynamic median part-time shoulder use, vehicle throughput, safety, active traffic management, traffic monitoring and surveillance, motorist information, data collection, incident management, or other transportation system management and operational strategies along the project limits, as determined by the Design-Builder’s ITS proposal. All equipment, hardware, and software supplied must be fully compatible with the Administration’s Coordinated Highway Action Response Team (CHART) system. The ITS shall minimize MDOT SHA operations and/or maintenance activities while being adaptable to future transportation technological advancements. The sub-systems may include:
  - a. Closed Circuit Television (CCTV) Cameras
  - b. Lane Use Control Signals (LUCS)
  - c. Dynamic Message Signs (DMS)
  - d. Automated Incident Detection (AID)
  - e. Active Traffic Management (ATM) Systems
  - f. Advanced Transportation Management Systems (ATMS)
  - g. Communications Systems
  - h. Electrical Systems
  - i. Uninterruptible Power Supplies (UPS) / Battery Back-up Systems
  - j. Other systems or sub-systems as determined and proposed by the Design-Builder
3. All ITS equipment designed and installed by the Design-Builder will be owned, maintained, and operated by the Administration and shall be integrated with an Active Traffic Management (ATM) software package to be provided by the Design-Builder or the CHART system, as described herein.
4. Determination of maximum extent practical is in the Administrations sole judgments and shall not result in additional costs to the Administration nor be the basis of a claim or time extensions against the Administration.

**3.21.02 Qualifications**

1. In addition to the Project’s Key Staff requirements, the Design-Builder shall retain the services

of a Systems Engineer with a minimum of ten (10) years of proven experience in systems engineering for Intelligent Transportation System projects. The Systems Engineer shall have experience in system concept development, architecture development, design, construction, and implementation of ITS projects of a similar nature to the ITS required by this project and being proposed by the Design-Builder. The Administration reserves the right to request a resume to verify qualifications. Duties include but are not limited to:

- a. Work in conjunction with the Design-Builder's Intelligent Transportation Systems Specialist Key Staff Member and be responsible for the system engineering aspects of the Design-Builder's proposed ITS.
- b. Be responsible for the system concept development, architecture development, design, and implementation of the Design-Builder's proposed ITS.
- c. Be responsible for coordination and management of the Design-Builder's responsibilities related to system software development.

### **3.21.03 Guidelines, Standards & References**

The Design-Builder shall design and construct the ITS in accordance with this TC 3.21 – Intelligent Transportation Systems (ITS) Performance Specification and the relevant requirements of the Guidelines and References in TC 3.08. All ITS Work shall be based on a systems engineering analysis meeting the requirements in Title 23 - Code of Federal Regulations, Subchapter K - Intelligent Transportation Systems (Federal Rule 940).

Since this project promotes the Design-Builder to develop innovative ITS solutions, the Design-Builder is encouraged, and may be required, to submit ITS Proposed Technical Concepts (PTC) in accordance with TC Section 2.08.02.8 through 2.08.02.13.

### **3.21.04 Performance Requirements**

The Design-Builder shall design and construct the ITS using the criteria specified within this Section to:

1. Design and specify all ITS equipment, components, systems, software, and infrastructure.
2. Provide a fully functional and operational ITS system.
3. Provide ITS equipment that is fully compatible with the existing CHART system or the Design-Builder's proposed ATM software package.
4. Provide ITS system fully in compliance with all MDOT security policies, protocols and procedures
5. Maintain the operation of all existing ITS equipment within the Project limits throughout the duration of construction, except as otherwise stated herein.

6. Provide a final product that facilitates and accommodates routine maintenance of ITS equipment without impacting normal traffic operations. ITS equipment shall be compatible with and shall comply with the Administration's existing maintenance abilities and requirements to the maximum extent practical.
7. Integrate the project's ITS equipment with the regional and statewide CHART network to provide continuous and uninterrupted service of the ITS equipment and associated communications throughout the project area.
8. Test all equipment installed to ensure it functions properly and as required, and provide the results of those tests to CHART.
9. Provide documentation and training to Administration personnel on the administration, maintenance, and operation of all Design-Builder supplied equipment and software.
10. Provide an ITS that improves safety and mobility during periods of recurring and non-recurring congestion and provides for improved incident management and response.
11. Provide static-dynamic median part-time shoulder use through the greatest portion of the project limits as possible to maximize vehicle throughput and minimize vehicle travel times and delay along the inner and outer loops of I-695 from I-70 to MD 43.
  - a. The part-time shoulder use lane(s) shall operate open or closed at pre-determined times of the day on pre-determined days of the week as determined by the Design-Builder's traffic analysis to address recurring congestion.
  - b. The Design-Builder shall determine the limits that the part-time shoulder use lane(s) will be open during the pre-determined times through traffic analysis.
  - c. The part-time shoulder use lane(s) shall have the ability to be opened during times of emergency (traffic, weather, or atypical traffic conditions) to address non-recurring congestion.
  - d. The part-time shoulder use lane(s) system shall have the ability to become fully dynamic in the future.
12. Provide a lane use control signal system for operation of the static-dynamic part-time shoulder use lanes.
13. Provide enhanced CCTV coverage through the project limits for surveillance, operation, and incident management.
14. Provide an Automated Incident Detection (AID) System using ITS devices and software components for the operational safety of the part-time shoulder use lane(s).
15. Provide a Vehicle Detection System (VDS) for operation of the static-dynamic part-time shoulder use lanes.
  - a. The VDS shall provide traffic data on the real-time conditions of the roadway(s)



- b. The vehicle detection system shall support the conversion of the part-time shoulder use lane(s) to fully dynamic operation in the future.
16. Provide ITS that offers improved incident management and response by:
- a. Having the ability to automate incident management operations through automated event management response plans.
  - b. Providing anomaly detection algorithms to analyze anomalies affecting roadway traffic.
  - c. Reducing the overall incident response timeline, including detection, verification, response, roadway clearance, incident clearance, and return to normal flow.
  - d. Providing event logging, reporting, and archiving to enable performance measures-based oversight of incident management operations.
  - e. Providing improved incident management and response capabilities for the part-time shoulder use lane(s) as well as regular travel lanes.
  - f. Providing overall efficiency and benefit to the MDOT SHA through savings in expenditure of resources.
17. Provide a new Active Traffic Management (ATM) software package to facilitate operation of the new system(s) proposed by the Design-Builder able to interface with and integrate with MDOT SHA CHART's existing ATMS software
18. The ITS design must be coordinated with the traffic control device design and ensure it seamlessly functions, operates, and provides a fully functional ITS.




19. The ITS proposed by the Design-Builder shall not utilize any artificial intelligence, learning, and/or problem solving logic, software, or other in their operation, including decision making for operational statuses or incident response. All parameters/variables and values of each parameter/variable used in the operation of all systems shall be configurable and adjustable.

**3.21.05 Design and Construction Requirements**

**3.21.05.01 General**

- 1. The Design-Build Contractor shall understand that any work not specifically mentioned in this Specification, but which is necessary, either directly or indirectly, for the proper performance of the Improvements shall be in conformance with the requirements of this contract or as approved by the Administration. This shall include software or firmware upgrades needed at any time prior to project completion to guarantee the proper performance or compliance of the equipment with the CHART system, and any hardware changes or additions associated with those upgrades.
- 2. The Administration will operate and control messages for all electronic displays that are potentially in the public view. The Design-Builder shall not activate any display or ITS equipment without prior coordination with the Administration.

3. Any ITS device that is governed by or displays and provides information to vehicular traffic must be designed to meet the requirements of the 2011 MD MUTCD and additional requirements as listed in TC 3.12 – Traffic Performance Specification.
4. The Design-Builder shall design, provide, install, and assist with the integration and testing of all constructed and interconnected system elements, in accordance with procedures approved by the Administration. The Improvements shall satisfy contract requirements and demonstrate compatibility and interoperability with the existing systems and communication networks. Design, construction, installation, and integration activities shall include equipment installation, functional integration, and testing at multiple levels. Configuration changes required to the CHART system will be completed by the Administration.
5. The Design-Builder shall construct and integrate ITS equipment at the earliest practical time to minimize impacts to traffic and maximize the ability to use ITS equipment during construction.
6. The ITS shall be implemented using a construction sequencing approach maximizing the ability to use temporary or permanent ITS field equipment to actively monitor and manage recurring and non-recurring Project traffic congestion, as well as to detect and confirm incidents during construction and post construction activities.
7. No part or attachment of any equipment shall be substituted or applied contrary to the manufacturers' recommendations and standard practices.
8. The Design-Builder shall provide the Engineer with detailed descriptions and data sheets of all equipment, components, software, and services proposed on the Project. All submittals shall be in accordance with TC-4.01 Working Drawings. The Design-Builder shall provide the Engineer with detailed setup/configuration and software documentation. The Design-Builder shall also provide to the Engineer all licenses required for equipment, services, hardware and software supplied.
9. The Design-Builder shall identify and provide all permits, government fees and licenses required to execute the Contract if required. The Design-Builder shall provide copies of these executed documents to the Engineer.
10. The Design-Builder shall be responsible for all site installation, insurance, interim storage, labor, and transportation costs associated with equipment pickup and transportation between the Design-Builder provided storage and field sites.
-  11. The Design-Builder shall prepare the Administration's Office of Traffic and Safety's Traffic Control Device Request Design Request Form for all proposed ITS Infrastructure and Equipment Placement plan in accordance with Section 3.12.04.02. The Design-Builder shall obtain ITS Infrastructure and Equipment Placement plan approval signatures from the Administration's Office of Traffic and Safety in accordance with Section 3.12.

**3.21.05.02 Plan Requirements**

1. The Design-Builder shall prepare an ITS roll plan to be submitted to the Administration for review, comment, and concurrence prior to preparing the ITS plan cut sheets. The ITS roll plan shall show all of the proposed ITS equipment and the location of all existing ITS equipment to be retained. The ITS design shown on the ITS roll plans shall be coordinated with the traffic control device (TCD) design (signal, lighting, and signing designs) and shall also depict all existing and proposed TCDs within the project limits, and/or affected by the project.
2. The Design-Builder shall prepare and present ITS plans with a scale appropriate for the Project. The ITS plans shall include existing and proposed geometry, existing and proposed utilities, right-of-way, landscape features, applicable drainage features, applicable structural facilities, and other information required for coordination of utilities. Plans shall show the location of new ITS equipment, removal and relocation of existing ITS equipment if necessary, conduit, cable types and installation method, manholes/handholes/junction boxes, ground rod locations, electrical service locations, telecommunications service locations, and any other details pertinent to the construction.

**3.21.05.03 Existing ITS Equipment**

1. The Design-Builder shall perform a survey and inventory to verify existing ITS field equipment and locations.
2. The Design-Builder shall perform design, construction, installation, relocation, integration assistance, and testing of existing ITS equipment that is impacted by the Design-Builder's improvements to ensure continued functionality. Existing equipment impacted shall be relocated or replaced, as approved by the Administration.
3. If existing ITS equipment is impacted by this project, the maximum outage time shall be 24 hours unless otherwise approved by the Administration. All existing ITS equipment within the Project shall be working upon completion of the Project. Any existing ITS equipment that is impacted by the construction of this Project shall be disconnected, reconnected, and made fully operational by the Design-Builder as part of this Project. All abandoned cables shall be made safe.

**3.21.05.04 Location of ITS Equipment**

1. All ITS equipment shall be installed within the Project right-of-way.
2. All ITS equipment shall be located in an area where access to equipment will not affect traffic operations or require temporary traffic control unless otherwise identified.

3. All roadside ITS equipment shall be located in accordance with the AASHTO Roadside Design Guide. Barrier protection shall be provided for all non-breakaway equipment within the clear zone. The Design-Builder may install barrier wall, guardrail, or crash protection devices to protect equipment that is temporarily in the clear zone due to maintenance of traffic or construction staging.
4. Maintenance access to all ITS equipment, including cabinets, shall be provided by an all-weather maintenance pull-off, or by a widened shoulder with a minimum width of 12 feet, and a minimum length of 100 feet, unless otherwise specified. This maintenance pull-off or widened shoulder must allow room for maintenance vehicles such as a bucket truck vehicle to operate. Where provided, an all-weather maintenance pull-off shall be sufficient to accommodate access and egress of a single unit maintenance vehicle load in all weather conditions. The pull-off roadway surface shall consist of a permanent pavement suitable for access vehicle loading conditions. The pull-off shall be located behind guardrail or other roadside barrier suitable for protection of maintenance personnel and shall be located downstream of the ITS equipment.
5. The Design-Builder shall locate all existing underground and aerial facilities and design all ITS equipment, including cabinets, to avoid or minimize conflicts with these existing facilities and any proposed facilities. The Design-Builder shall locate the bases/foundations of all ITS equipment poles to avoid existing or proposed underground and overhead utilities.
6. The Design-Builder shall locate all ITS equipment bases/foundations, including cabinets, on a site that is flatly graded so the equipment and associated cabinet are installed level with finished grade in an area that can be safely accessed by maintenance personnel. Where sites cannot be graded flat because of the overall site grading, treated timber cribbing shall be provided to level the area around the equipment or infrastructure for safe access. Stairs and handrails shall be provided as necessary to provide fall protection following Maryland Occupational Safety and Health (MOSH) requirements, or the requirements of the jurisdiction having authority.
7. It is anticipated that a substantial amount of ITS equipment will be required to be located in the median of I-695 in order to provide the static-dynamic median part-time shoulder use desired for the project. The following shall apply:
  - a. ITS equipment cabinets for ITS equipment located in the median shall not be located in the median and shall be located on either of the outside shoulders.
8. ITS equipment may be mounted on existing structures provided the structure is verified for the proposed loading conditions. Refer to TC 3.12 – Traffic Performance Specification for details of the structure verification process. ITS equipment shall not be installed on roadway lighting structures.
9. ITS equipment, aside from conduits and junction boxes, shall not be attached to or mounted to bridges, retaining walls, or culvert structures.

**3.21.06 ITS Subsystems, Equipment, and Devices**

1. The ITS subsystems, equipment, and devices included in the following sections are subsystems, equipment, and devices at the Design-Builder's disposal to include in their proposed ITS. If the Design-Builder chooses to include any of the subsystems, equipment, or devices included in the following sections, the Design-Builder shall follow the requirements as established in the following sections for each subsystems, equipment, or device. Other subsystems, equipment, and devices not included in the following sections or deviations from the requirements included in the following sections may also be proposed by the Design Builder following the ATC or ITS PTC process. It shall be the Design-Builder's responsibility to design, specify, and construct any ATC or ITS PTCs approved by the Administration that the Design-Builder elects to include in their proposal.
2. MDOT SHA may require the Design-Builder to provide equipment test units or software so that MDOT SHA may demo, review, test, and validate equipment or software and confirm that the equipment or software operates with MDOT SHA systems, as applicable.

**3.21.07 Closed Circuit Television (CCTV) Cameras****3.21.07.01 Design Requirements**

1. CCTV sites shall be selected to yield the optimum unobstructed camera view of the roadway. In situations where a camera is to be located at the intersection of two roadways, the pole location may be selected so that both roadways may be viewed, unless the Design-Builder is directed otherwise by CHART. All sightline views for CCTV sites must be provided to the Administration for approval. The Design-Builder shall provide any information required by the Administration to make this determination. Approval that a sightline view is the optimum unobstructed camera view is at the sole discretion of the Administration.
2. Each of the CCTV cameras shall be capable of local control (PTZ and all remotely-controllable functions) from their respective controller cabinets. All CCTV functions (camera video and control) shall be transmitted to The Administration's CHART System and the Statewide Operations Center. The Administration's CHART System/SOC shall have complete control of all camera functions at all times.
3. The CCTV system in support of static-dynamic part-time shoulder use shall provide full (100%) coverage of the shoulder area in use and allow viewing of incidents or obstructions that would prevent the switch or continued operation of the part-time shoulder use lanes from happening.
4. CCTV cameras shall utilize camera lowering systems mounted on poles when the camera mounting height exceeds 40 feet or if the camera is not easily accessible for maintenance from a standard bucket truck.

**3.21.07.02                    Material Requirements**

1. All materials shall be provided in accordance with the requirements of this specification. CCTV cameras and encoders shall meet current MDOT SHA and/or CHART standards and system requirements.

**3.21.07.03                    Construction Requirements**

1. The Design-Builder shall install foundations, concrete technician pads, poles, cabinets, lowering systems, and cameras following MDOT SHA standards.
2. The Design-Builder shall install two 3-inch diameter conduits in each CCTV pole foundation, with one oriented toward the intended camera cabinet location, as shown in the MDOT SHA standard CCTV details.

**3.21.08                        LED Dynamic Message Signs (DMS)**

**3.21.08.01                    Design Requirements**

1. The Design-Builder shall design, install, and test all materials and equipment required to provide a complete and accepted DMS.
2. The Design-Builder shall meet the MD MUTCD standards for all existing and proposed fixed sign placement in determining the precise DMS locations.
3. All overhead mounted DMS and housing shall be installed such that they are perpendicular to and centered over the lanes of travel that are to view the message. The Design-Builder shall perform a DMS site survey to identify optimum location that meets Administration and MD MUTCD sign spacing, visibility, and orientation requirements.
4. A local DMS control access point (defined as the local DMS controller cabinet) must be provided at the ground level. The local access point shall be placed at a location from which the full face of the sign is legible and a minimum of 100 feet upstream of the sign. The DMS Controller cabinet shall be oriented with the front door of the cabinet and the face of the sign pointing in the same direction (i.e. both face North and face South, etc.) to allow maintenance personnel facing the front door of the cabinet to also face the front of the sign.
5. The DMS controller cabinet shall be located to minimize the need for maintenance personnel to traverse the roadway mainline, connector ramps, or surface streets to walk between the DMS controller cabinet and the DMS. The DMS controller cabinet shall be located in accordance with the AASHTO Roadside Design Guide and in areas where access to equipment shall not require traffic control.
6. The Design-Builder shall design the DMS installations to minimize glare on the sign face from vehicle headlights and maximize sign visibility.
7. Each DMS shall be viewable by at least one CCTV camera such that the message displayed on the DMS can be visually confirmed by an operator in the SOC.



8. All DMS control functions shall be transmitted to The Administration's CHART System and the Statewide Operations Center. The Administration's CHART System/SOC shall ultimately have complete control of all DMS functions at all times.
9. The DMS support structure shall be designed to be compatible with vertical Z-bars that are attached to the back of the DMS. The Design-Builder shall design and fabricate and install sign mounting hardware that connects the DMS to the Design-Builder furnished DMS support structure.
10. Neither the DMS nor its supporting structure shall be mounted to bridges. DMS shall not be installed on cantilever structures. Full overhead span or butterfly structures are acceptable. The vertical supports for the DMS support structure and foundations shall be located in accordance with the AASHTO Roadside Design Guide.
11. For any DMS that is located over the travelled portion of a roadway (including shoulders), a walk-in DMS shall be provided and the DMS structure shall have a maintenance platform (catwalk), including railing and any other safety appurtenances necessary to create a safe working environment as required by OSHA, on both sides of the sign to prevent entrapment of maintenance personnel. The DMS and its support structure shall be located such that the maintenance platform shall be capable of being accessed and the sign maintained without traffic control.

**3.21.08.02 Material Requirements**

1. All materials shall be provided in accordance with the requirements of this specification. LED Dynamic Message Signs shall meet current MDOT SHA and/or CHART standards and system requirements.
2. All materials furnished and or installed shall be new, corrosion resistant, and approved by the MDOT SHA.
3. The DMS shall include LED DMS assemblies, DMS controllers, DMS control cabling and connectors (as specified by the DMS vendor), DMS support structures and foundations, DMS mounting hardware, DMS maintenance platform, DMS equipment cabinet and base, conduit, cabling, connectors, junction boxes, and power service disconnects. All materials shall be provided in accordance with the requirements of this specification.
4. All anchor bolts and erection bolts, as required in accordance with the Design-Builder supplied designs, shall be furnished with each DMS support structure.
5. All DMS equipment components, modular assemblies, and other materials located in the DMS housing shall be removable, transportable, and capable of being installed by a single technician utilizing front access doors on the DMS. Structural members and components, except the beams that connect DMS with the overhead structure, thereof are not included in this requirement.
6. All DMS and equipment cabinets shall be 100% solid-state, except for the DMS cabinet's environmental control fans and thermostat. The entire DMS Site, including all DMS units, and wiring that make up a completely operational site shall be UL listed. All electrical components exceeding 24 VDC used in the DMS equipment cabinet and the DMS controller shall be UL listed and shall meet all local codes and NEC, as applicable to DMS

applications. DMS wiring shall use the following color coding: Green for ground, White for neutral, Black for Line 1, and Red for Line 2.

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

**3.21.08.03 Construction Requirements**

1. The Design-Builder shall furnish, deliver, install, commission, and test the Dynamic Message Signs (DMS)
2. The Design-Builder shall make all power connections to the DMS controller cabinet assembly in accordance with the requirements of the manufacturer.
3. The Design-Builder shall furnish and install all conduits, cabling, and connectors required to make all data connections between the DMS and its controller assembly to provide a fully operational DMS. The data connection between the DMS and the controller cabinet shall be 12 strand, 50 micron, armored fiber optic cable with ST style connectors on each end.
4. The DMS shall be energized from a 2-pole, 100 amp, 120/240V circuit. The DMS controller cabinet shall be energized from a separate 1-pole, 60 amp, 120V circuit.
5. All power service points for DMS shall utilize a NEMA-4X rated safety switch box containing a service disconnect. In addition, a second service disconnect pedestal shall be placed not more than 15 ft from the DMS cabinet assembly.
6. Where 120/240 VAC service is not available from the local power utility for the DMS, a pad-mounted step down transformer shall be installed in a suitable location near the DMS cabinet assembly.
7. The Design-Builder shall furnish and install all wiring harnesses, cables, connectors, fittings, panels, cable management devices, and other materials required to provide a complete and accepted DMS assembly that is fully functional.

**3.21.09 Lane Use Control Signals (LUCS)**

**3.21.09.01 Design Requirements**

1. The LUCS messages shall meet the minimum requirements of Chapter 4M of the MD MUTCD with respect to:
  - a. Sign character/message
  - b. Signal face size and shape
  - c. Background



- d. Visibility
  - e. Location
  - f. Operation
2. LUCS shall be accessible and mounted in such a manner that a single unit can be removed and replaced in under 20 minutes by a qualified technician.
  3. Each LUCS shall be capable of displaying a MD MUTCD compliant lane control indication, including a green down arrow, red “X”, and yellow “X”.
  4. Each LUCS shall have an individual controller and circuit breaker that shall be installed on the ground in the equipment cabinet and not overhead within the LUCS assembly. Local control of all LUCS messages on each LUCS shall be capable from their respective controller cabinets.
  5. Each individual LUCS shall transmit a status confirmation for each possible message so that the central software knows the message status and so that the signs can be monitored for errors and faults. The LUCS system shall be integrated with the ATM software package to be provided by the Design-Builder. CHART shall ultimately have complete control of all LUCS functions at all times via the ATM software package to be provided by the Design-Builder and its integration MDOT SHA CHART’s existing ATMS.

**3.21.09.02                      Material Requirements**

1. All materials shall be provided in accordance with the requirements of this specification. Lane Use Control Signals shall meet current MDOT SHA and/or CHART standards and system requirements.

**3.21.09.03                      Construction Requirements**

1. LUCS shall be installed on new or existing overhead or cantilever sign structures or signal pole and mast arm structures for shoulder lane control. Structures arm/span lengths shall accommodate future shifting of signal heads for reconfiguration of roadway travel lanes in a temporary or permanent condition. A shift of up to one full lane width shall be accommodated.
2. The LUCS shall be centered over the shoulder lane and shall be installed following MD MUTCD requirements so that two LUCS are visible to a vehicle traveling in the shoulder lane at all times with a minimum of 500-foot spacing.
3. Each LUCS support shall have a unique number displayed on a static sign strapped to the

upright post; the font height used for the gantry number shall be 10 inch minimum. The Design-Builder shall coordinate the nomenclature with CHART.

4. Each LUCS shall be viewable by at least one CCTV camera such that the message displayed on the LUCS can be visually confirmed by an operator in the SOC.

### **3.21.10 Automated Incident Detection (AID) System**

#### **3.21.10.01 Design Requirements**

1. The AID system shall provide automated detection to support the static-dynamic part-time shoulder use system.
2. The Design-Builder shall implement AID at locations where shoulder use lanes are proposed including:
  - a. The entire limits of the static-dynamic part-time shoulder use lanes plus an additional distance for the entry and exit transition of the static-dynamic part-time shoulder use lane.
  - b. The risk of traffic incidents is expected to be higher than average.
  - c. Rapid detection of incidents is required for special reasons, such as near critical infrastructure.
3. The AID system shall function under all lighting conditions, all times of day, and all weather conditions.
4. The AID system shall be integrated with the ATM software package to be provided by the Design-Builder and shall be capable of:
  - a. Detecting anomalies in traffic flow such as stopped vehicles, slow vehicles, and other obstructions that are within the AID coverage area.
  - b. A false alarm rate of less than one false alarm per 10 true alarms; and
  - c. Detecting incidents and providing an alarm to the ATM software and/or ATMS in less than 30 seconds.
5. The AID system shall be supplied with Application Programming Interface (API) and/or Software Development Kit (SDK).
6. The AID system alarms shall utilize Simple Network Management Protocol (SNMP) traps that are transmitted over the Ethernet network.

#### **3.21.10.02 Material Requirements**

1. Due to the fact that materials used will be determined based on the Design-Builder's proposed AID system, material requirements shall be developed by the Design-Builder and provided to the Administration for review and approval. The Design-Builder shall provide

any information required by the Administration to make this determination. Approval of material requirements for the Design-Builder's AID system is at the sole discretion of the Administration.

**3.21.10.03 Construction Requirements**

1. The Design-Builder shall furnish, install, test, integrate and perform all calibration and fine-tuning of components to enable proper monitoring and alarming functionality of the AID system.
2. The equipment units that support the AID system may be mounted on existing structures or structures furnished and installed under the Project with approval from MDOT SHA depending on mounting method, structure capacity, access, clearance and other related factors.
3. The equipment units that support the AID system shall be terminated and/or installed in equipment cabinets furnished under this project.
4. Furnish and install all mounting brackets and hardware necessary to install the equipment units that support the AID system.
5. Furnish and install all power supplies, cables, etc. required to properly power on the AID system monitoring station at each location. All conductors shall run continuously from the equipment units to the cabinet, with no splicing or connections along the way. Cables shall be installed in junction boxes with a nominal slack length of 15 feet.
6. Furnish and install all communications cabling, such as coaxial jumpers, Cat5e cables, etc. required for communication from the AID system monitoring station to Ethernet switches, equipment units, etc. in the field or Administration network hub.
7. The AID system testing shall at a minimum include the following:
  - a. Develop a test plan and procedures that tests every AID system function. Test plans shall include all tests recommended by the manufacturer of all equipment that supports the AID system. When the plan is satisfactory to the Administration, conduct the testing in accordance with the plan and prepare a test report. The tests shall be conducted at the field equipment cabinets and shall include the following:
    - i. All diagnostic tests recommended by the manufacturer and all self-tests of which the equipment is capable.
    - ii. Visual inspection for manufacturing and installation defects.
    - iii. Local operation of all equipment.

**3.21.11 Vehicle Detection System (VDS)**

**3.21.11.01 Design Requirements**

1. Traffic sensors may be installed to monitor and report real-time traffic volume, lane occupancy, speed data, and vehicle classification along the limits of the project corridor where the Design-Builder proposes ITS to manage traffic flow along the corridor (e.g. traffic monitoring shall be provided through the limits of proposed static-dynamic median part-time shoulder use).
2. The traffic monitoring sensors shall provide all traffic data for all lanes and shoulders of the roadway in both directions and for all entrance and exit ramps.
3. The traffic data shall be used to monitor the performance on the corridor and to provide active traffic management systems with traffic data.
4. Each vehicle detection zone shall be shown on the plans as a part of the design documentation.
5. Defining, configuring, adjusting, and programming detections parameters, zones, size, placement, and sensitivity shall be achievable by laptop computer both in the field and remotely.
6. Once programmed the traffic monitoring sensor shall not require periodic adjustments to the detection zones unless physical roadway conditions change, such as lane shifts or closures.
7. The Design-Builder shall furnish software for integration and configuration of the VDS. The software application for the VDS shall provide the ability to view the detection zones and control of any traffic monitoring sensors connected to the network to conduct system setup, calibration, diagnosis, and data retrieval operations. The vehicle detection system shall offer an open API and software development kit available at no cost for integration with the ATM software package to be provided by the Design-Builder and/or MDOT SHA CHART's existing ATMS.

**3.21.11.02 Material Requirements**

1. Due to the fact that materials used will be determined based on the Design-Builder's proposed VDS, material requirements shall be developed by the Design-Builder and provided to the Administration for review and approval. The Design-Builder shall provide any information required by the Administration to make this determination. Approval of material requirements for the Design-Builder's VDS is at the sole discretion of the Administration.

**3.21.11.03 Construction Requirements**

1. Install, calibrate, and test the traffic sensors following the manufacturer's recommendations.
2. Traffic monitoring sensors shall be installed on structures based on the manufacturer's recommendations.
3. Traffic monitoring sensors shall be installed by the Design-Builder approximately every 1/3 mile on the corridor. Under unusual circumstances or in specific situations, longer spacing may be used as long as data collection and operational requirements are met. Additionally, traffic monitoring sensors shall cover hard shoulder lane's entry and exit points.
4. The Design-Builder shall relocate existing traffic monitoring sensors that are impacted by construction. Relocation shall include constructing new foundation(s) and relocating the existing device, cabinet, pole and other supporting equipment to the proposed location. New communications and power shall be brought to the new location. If any or all equipment becomes damaged during the relocation, then the Design Builder shall furnish and install a new traffic monitoring sensors meeting the requirements listed in this performance specification.

**3.21.12 Ramp Metering System**

**3.21.12.01 Design Requirements**

1. Ramp metering may be provided at the Design-Builder's discretion to dynamically control the rate in which vehicles enter the corridor.
2. The ramp metering system equipment shall be identical to other ramp metering systems that the Administration is currently implementing in the State with regards to the Concept of Operations and equipment. The equipment includes, but is not limited to, the following:
  - a. Modify existing MDOT SHA Intelight MaxView Central software or provide new as applicable.
  - b. Econolite ASC/3 or Econolit Cobalt controllers.
  - c. Wavetronix SmartSensorHD radar detectors.
  - d. Terra or Encore video detection cameras.
  - e. Moxa or Patton ethernet switches.
  - f. Sierra Wireless GX450 (Ethernet Model) Cellular modems operating on Sprint cellular network.
  - g. Patton CL1314MDE Ethernet Extenders.
  - h. MDOT SHA Standard Size 'S' Cabinet with UPS Battery Back-up.



All ramp metering system signal cabinets, controllers, and rack mounted modules shall be supplied by the Design-Builder.

3. Real-time and anticipated traffic volume data (volume, occupancy, and speed) shall be used to control the vehicle release rate. The Ramp Meter software shall utilize queue, demand, passage, and mainline detectors to determine the release rate.
4. Traffic responsive algorithm(s) shall be used to optimize local or system-wide traffic conditions. The system must have the functionality to operate with pre-timed (fixed) rates, however this mode of operation will be the exception, and the ramp meters shall typically operate in adaptive / traffic responsive mode.
5. Ramp meter location(s) may be controlled by a local mainline traffic detector location installed in the vicinity of the ramp, or multiple ramp meter locations may be controlled by a single mainline detector location installed near a bottleneck.
6. The Ramp Metering System shall use traffic signal displays on each of the ramps to release vehicles at a rate of 120 to 1,800 vehicles per hour.
7. Each location shall be equipped with queue detection. When the ramp queue detector reaches specific thresholds (count or occupancy), the ramp metering system shall increase the release rate to prevent queues from backing onto and therefore impacting operations on the arterial roadways.
8. Stop lines shall be placed to allow adequate acceleration distance from a stopped condition to five miles per hour less than the posted speed limit.
9. An Advanced Hazard Identification Beacon (HIB) assembly, consisting of pedestal pole mounted HIB and signs, shall be installed to ensure all motorist visibility of the HIB(s) in advance of the ramp meters stop line, to warn motorists when ramp metering is in progress. The advanced HIB shall consist of two 1-section circular yellow LED traffic signal heads which will flash in an alternating pattern when ramp metering is in progress. The advance HIB shall be pedestal mounted unless overhead mounting is necessary based on sight distance or geometry.
10. A controller with ramp metering software shall be installed at each ramp metering location to control the ramp metering system at each location. The cabinet with controller will be located near ramp meter stop line and shall be positioned so that the ramp signal heads are visible when facing the front door of the cabinet
11. Ramp metering systems shall all be designed and constructed in accordance with the additional requirements included in TC 3.12 – Traffic Performance Specification.

**3.21.12.02                      Material Requirements**

1. The ramp metering system shall consist of traffic signal assemblies, vehicle detectors, signs and ramp meter software and all applicable equipment as noted above.
2. The traffic signal assembly shall consist of mast arm poles mounted downstream of the proposed stop line, three section (circular-red, circular-yellow, circular-green) LED traffic signal heads mounted to the mast arm pole, and overhead signs mounted between the traffic signal heads.
3. A traffic signal control cabinet with ramp metering software shall be installed at each metered ramp. The cabinet with controller shall be located near ramp meter stop line and shall be positioned such that the ramp signal heads are visible when facing the front door of the cabinet.

**3.21.12.03 Construction Requirements**

1. Refer to TC 3.12 – Traffic Performance Specification for traffic signal construction requirements that shall be applicable to the Ramp Metering System.

**3.21.13 ITS Cabinets**

Unless otherwise noted elsewhere, all ITS cabinets shall meet the following:

1. This work shall consist of design and construction of ITS equipment cabinets, bases, electrical power work, junction boxes, conduit, grading, cables and conductors.
2. ITS cabinets shall be provided for each new ITS equipment location and shall be utilized as the equipment control and communications connection point.
3. Front and rear concrete pads shall be furnished and installed at all cabinet sites to provide level and dry surfaces for a maintenance technician to stand on while servicing the cabinets. This work includes excavation, gravel base, backfilling, and treated timber cribbing. Concrete pads shall be provided for all doors on all ITS cabinets.

**3.21.13.01 Design Requirements**

1. All Type 332/334 cabinets provided for ITS equipment shall have heating, ventilation, and LED lighting systems, and shall have a pull-out “laptop” drawer/shelf situated in an appropriate rack position below the device controller to allow ease of maintenance by MDOT SHA technicians.
2. The Design-Builder shall provide a cabinet heater/thermostat in the cabinet to reduce condensation and enhance the performance of the electronics installed in the cabinet. The cabinets shall not be insulated for heat retention.



**3.21.13.02 Material Requirements**

1. ITS cabinets shall at a minimum be Type 332/334 NEMA-3X rated and be constructed to meet or exceed the requirements of the Caltrans Transportation Equipment Specifications (TEES) and/or the latest version of the Advanced Transportation Controller (ATC) standards jointly published by the American Association of State Highway and Transportation Officials (AASHTO), the Institute of Transportation Engineers (ITE), and the National Electrical Manufacturers Association (NEMA).


**3.21.13.03 Construction Requirements**

1. The Design-Builder shall install two 3-inch diameter conduits for fiber optic communication drop cable from the fiber distribution handhole to the cabinet.
2. The Design-Builder shall provide two (2) empty 3-inch diameter conduit stub-outs in all pad-mounted ITS cabinet foundations. The conduit stubs from the cabinet shall terminate in the ground for future power and communication usage.
3. Cabinets shall be configured for their specific application (e.g., DMS, etc.) and site location.
4. Each cabinet shall be identified by a specific cabinet ID derived using an approved naming convention.

**3.21.14 Electrical Power System****3.21.14.01 Design Requirements**

1. The Design-Builder shall be responsible for the design and construction of all power service connections and electrical infrastructure necessary to provide electric power to the ITS equipment in this project. This work shall include all conduits, manholes / hand holes / junction boxes, conductor cables, disconnect switches, base-mounted metered or un-metered service pedestals, dry transformers, and any other necessary work.
2. The Design-Builder shall determine the appropriate load required for each cabinet, perform voltage drop calculations, and size the conductor cables for each ITS equipment installation. Each cabinet shall include an additional load allowance of 12 Amps for powering convenience outlets. These calculations shall be part of the design review information. The voltage drop, as measured between the power service point (at the meter) and the device(s) it is serving, shall not exceed 5%. Conductors shall be sized appropriately to satisfy this requirement.
3. A NEMA 4X rated stainless-steel safety switch shall be installed on the controller cabinet or separate disconnect assembly as a service disconnect if the controller cabinet is located



 more than 50 feet from the metered service pedestal, or the metered service pedestal is in a location that makes it inaccessible, such as across a roadway or behind a retaining or noise wall.

4. Some ITS devices may require electrical services that are located at great distances from the equipment sites. As a result, dry transformers and low gauge cables for power services may be needed. Transformers shall be installed at the electric service or “step-up” location and the equipment or “step down” location to provide the required 120/240 VAC electric.
5. The Design-Builder shall design and install a grounding system and transient surge protection devices that are suitable for the specific installation and equipment being supplied for each type of ITS equipment.
6. Utility Company Power Service Connections:
  - a. The Design-Builder shall be solely responsible for all Work, coordination, materials, and costs, including utility company service connection charges, associated with obtaining power and maintaining power throughout construction for all proposed ITS equipment or existing ITS equipment that requires modified power service connections.
  - b. The Design-Builder shall be responsible for completing all electrical service application materials necessary for obtaining service from the appropriate utility company. All materials shall be submitted to the power company.
  - c. Power service arrangements shall be reviewed and approved by the power service provider and by the Administration.
  - d. The Administration shall be copied on all correspondence with the utility company regarding power service connections.
  - e. The Design-Builder shall be responsible for all ongoing monthly electricity costs for any new ITS equipment installed under this Project until Partial Acceptance for Maintenance of the ITS equipment.
  - f. All electric service connections to the utility company’s distribution equipment shall be metered. All ITS power service points shall utilize a 120/240 VAC base-mounted metered service pedestal whose design has been approved by the appropriate utility company.

**3.21.14.02 Material Requirements**

1. 120/240 VAC electric shall be utilized and provided to all ITS equipment.

2. All CCTV, AID, VDS, and LUCS sites shall have an Uninterruptible Power Supply (UPS) system in a separate cabinet with sufficient capacity to allow the operation of the system for 24-28 hours. The Design-Builder shall use shared foundations with a base mounted Type 332 ITS equipment control cabinet and base mounted NEMA 5 UPS cabinet. Foundation details for ITS cabinets can be found in the Administration’s OOTS Shelf Typical.
3. All above ground electrical enclosures, service disconnects, transformers, and any other required electrical equipment shall be rated NEMA 4X at a minimum.

**3.21.14.03 Construction Requirements**

1. The Design-Builder shall comply with the National Electric Code (NEC) for all power work.
2. The electric power to existing ITS equipment shall be maintained throughout the duration of construction without interruption of existing service. Any impacts to existing service shall be repaired or replaced by the Design-Builder following the same requirements as proposed permanent electric power. Any temporary electric power required shall be the responsibility of the Design-Builder and shall also follow the same requirements as proposed permanent electric power.
3. The Design-Builder shall ensure that all equipment, devices, interconnect wiring, communication devices, communication lines, power supplies, antennas, operator controls, and power service are protected from external and internal electrical transient surges and line noise sources, including power surges, lightning, induced voltages, and static discharge.

**3.21.15 Communications System**



1. The Design-Builder shall design, furnish, and install a reliable communications system capable of transmitting data between ITS field equipment and the Administrations systems to update, poll, monitor, and control traffic management elements. The communications system shall use dedicated fiber optics to establish network communications to all critical proposed and existing ITS equipment/cabinets within the project limits. Other communications methods (e.g. T1 or wireless) may be used for non-critical devices/systems. The usage of T1 services shall be reserved for situations where other communications methods are not available and shall only be used with written approval by MDOT SHA in letter form. Approval of any T1 services is at the sole discretion of MDOT SHA and approval or disapproval of a T1 services shall not be basis for any additional cost to the Administration nor be cause for any contract claims or time extensions. It shall be the Design-Builder’s responsibility to explain the critical or non-critical nature of the Design-Builder’s proposed ITS devices and selected communications methods as it relates to the performance and reliability of the Design-Builder’s overall ITS.

2. Critical devices/systems are defined as:
  - a. Devices/systems that provide regulatory or warning messages to the traveling public.
  - b. Devices/systems that are used for incident management and response.
  - c. Devices/systems that are not redundant or able to be supplemented with alternate data/feedback.



3. The Administration currently has existing fiber optic communications along I-695 from I-70 to I-83 within the project limits. Refer to Section 3.15.01.07 for additional information on MDOT SHA's existing fiber optic cable and for additional requirements regarding the design and construction of MDOT SHA fiber optic cable.
4. The Design-Builder shall be responsible for constructing fiber optic communications and/or drop lines to link critical devices/systems.
5. The Administration's communications HUB points in the vicinity of the project limits include the MDOT Glen Burnie Data Center, MDOT SHA District 4 on Warren Road, MDOT State Operations Center in Hanover, MD, and the MDOT SHA Communications Division (Radio Shop) in Catonsville, MD.

#### **3.21.15.01 Design Requirements**



1. The Design-Builder shall coordinate with the CHART Intelligent Transportation System (ITS) Division (CHART ITS Division) to develop an appropriate IP/Network Plan.
2. The Design-Builder shall ensure compatibility with the existing fiber used by the Administration, and shall make connections with existing/previously installed fiber as required.
3. Some ITS equipment may require communications services that are located at great distances from the equipment control cabinet. As a result, fiber-optic based communications services may be needed. This is particularly true of equipment that has a limited transmission distance over copper lines. At these sites, setups using two ITS equipment cabinets will be required: one adjacent to the Verizon communications source and one at the CCTV site. Each of these ITS equipment cabinets will contain a fiber optic patch panel and a fiber-optic transceiver unit with 50-micron, 12-strand single-mode, non-dispersion shifted, armored, fiber optic cable with a rodent resistant outer jacket in a SHA-approved conduit system between them. The Design-Builder will be responsible for all communications service infrastructure, including conduits, 6-pair jelly-filled copper cable or fiber cable, and manholes/hand holes/junction boxes.

#### **3.21.15.02 Material Requirements**

1. Proposed fiber optic communications cable used as the trunk line shall be minimum 96

- count, armored, single-mode fiber optic.
2. Proposed fiber optic communications cable used as a drop line to an equipment location shall be minimum 24 count, armored, single-mode fiber optic. The Design-Builder shall use pre-terminated drop cables and splice to the trunk line in the communications vault closest to the equipment location.
  3. Network switches shall be Cisco products.

**3.21.15.03 Construction Requirements**

1. Network switches, routers, and specialized communications equipment will be furnished and installed by the Design-Builder and configured and commissioned in coordination with the MDOT SHA. MDOT SHA will also enter the equipment into the State inventory. The Design-Builder shall furnish to the Administration any required communications equipment at least 16 weeks prior to needing the equipment in the field so that the Administration can configure the equipment and return to the Design-Builder for installation. After installation and energization of the equipment by the Design-Builder, the Administration will visit the equipment field site to commission the communications equipment so that testing by the Design-Builder or the Administration, as applicable, can be performed.
2. The Design-Builder shall coordinate the communications system related work in this contract with the Administration, provide access to Administration personnel to the project work area as required, perform testing, and deliver a fully functional system.
-  3. The Design-Builder shall be solely responsible for all Work, coordination, materials, and costs, including utility company service connection charges, associated with obtaining communications and maintaining communications throughout construction for all proposed ITS equipment or existing ITS equipment that requires modified communication service connections. The Design-Builder shall be responsible for all ongoing monthly communications service costs for any new ITS equipment installed under this Project until Partial Acceptance for Maintenance of the ITS equipment.
4. The Design-Builder shall coordinate with SHA to start new services in MDOT SHA's name in lieu of transferring services at a later date.
-  5. Refer to Section TC 3.15.01.07 for additional construction requirements.

The Design-Builder shall develop a fiber optic testing plan to ensure the viability of all existing and new fiber optic post construction. The Design-Builder shall submit the test plan to MDOT SHA for approval, and perform fiber optic testing according to the approved plan. The final fiber optic testing plan shall formally be submitted to the Administration and approved by the Administration in writing in letter form. Approval of the fiber optic

testing plan is at the sole discretion of MDOT SHA and approval or disapproval of the fiber optic testing plan shall not be basis for any additional cost to the Administration nor be cause for any contract claims or time extensions. 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; TIA/EIA-526 Standard Test Procedures for Fiber Optic Systems.
- b. 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, and/or termination of the cable. OTDR measurements shall be made once in each direction on each fiber, including fibers designated for use and spare fibers that remain dark. OTDR graphs, raw data, event tables shall be stored on disk and submitted to the MDOT SHA.
- c. The fiber testing plan shall include existing MDOT SHA fibers that MDOT SHA has allocated for the Design-Builder's use. Where OTDR results indicate excessive loss, or other problems, in existing fibers, terminations, or splices, the Contractor shall submit those findings to MDOT SHA for resolution.
- d. 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-568C (or later) 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.
- e. Insertion loss testing shall be performed and recorded. The acceptable loss on each fiber segment accounting for segment length, splices, and terminations shall be calculated and compared to the total measured loss. A cable segment shall be deemed a failure if the total loss exceeds the calculated loss for that segment. Documentation of all testing and results shall be submitted to MDOT SHA for their approval.

#### **3.21.15.04 Verizon Coordination**

1. It is the Design-Builder's responsibilities to contact Verizon to verify that T1 data line service can be obtained at or within reasonable distance of the proposed equipment. A number of variables can affect the availability of T1 service which may force the Design-Builder to change the intended location of an equipment site. Substantial site design work should not be completed until this verification has been obtained, and a written and signed commitment has been received from Verizon. Failure to do this may result in substantial re-design and/or device relocation costs which shall be borne by the Design-Builder. The Administration will not be liable for any of the costs incurred resulting from ambiguities in the T1 data line source location(s).
2. It is anticipated that Verizon will need to do work to finalize the connection to their system. The Design-Builder shall be made aware that Verizon is a third party and it is the

responsibility of the DBT to coordinate any Verizon work with the DBT's design, schedule and sequence of construction so that there are no delays to the utility or the DBT's schedule. It may be necessary the DBT to modify their design after this verification is obtained due to a lack of T1 data service availability. The Administration will not be liable for any of the costs incurred resulting from scheduling difficulties with Verizon.

3. The Design-Builder shall be solely responsible for all Work, coordination, materials, and costs, including Verizon service connection charges, associated with obtaining communications and maintaining communications throughout construction for all proposed ITS equipment or existing ITS equipment that requires modified communications service connections.

### **3.21.16 Cabling and Conductors**

1. The Design-Builder shall furnish and install conductors and cables in accordance with the design standards listed in TC 3.08 – Guidelines and References. The minimum gauge for all electrical conductors shall be #12 AWG. The maximum conduit fill ratio shall be 25%

### **3.21.17 ITS Vaults, Manholes, Handholes, and Junction Boxes**

#### **3.21.17.01 Design Requirements**

1. Design of manholes/handholes below finish grade shall conform to Administration standards. The Design-Builder shall prepare all necessary drawings and instructions and submit them per the requirements of TC 3.05.18 for any manholes and handholes, and any pull boxes that are to be installed above ground, in barriers or walls, or any other unique application not covered by Administration standards.
2. All handholes, manholes, and vaults shall be located on a site that is flatly graded so the handholes, manholes, or vault are installed level with the finished grade in an area that can be safely accessed by maintenance personnel.
3. Junction Boxes shall be provided in the concrete median barrier or foundation for ITS equipment mounted on structures located in the median. Vaults, manholes, handholes, and junction boxes shall not be located within the roadway pavement.
4. Communication vaults may be required at certain field locations if there is a need for additional space for splices, coiling or other communication related features. Communication vaults shall not be located within ditches.

#### **3.21.17.02 Construction Requirements**

1. Communication vaults that connect with fiber optic conduit and cable runs shall be spaced



no more than 600 ft. apart. Handholes used for all other conduit and cable runs shall be spaced no more than 300 ft. apart. Handholes along fiber optic lines may be placed as needed to facilitate the installation of fiber optic cable. All vaults, manholes, handholes and pull boxes shall be installed with underdrain in accordance with Standard No. MD 811.04. The stone surrounding these structures shall not be considered a suitable outfall. Underdrain shall be connected to a suitable outlet such as underdrain outlet pipe to a slope or drainage structure.

**3.21.18 ITS Conduits****3.21.18.01 Design Requirements**

1. The Design-Builder shall design and construct all conduits, including all necessary hardware, fasteners, and accessories, in accordance with the requirements of this document. Longitudinal conduits for T1 communications networks shall not be installed under the paved surfaces.
2. The Design-Builder shall provide a "locator wire" or tape that allows for future non-destructive identification and locating from the surface grade. The locator wire shall be installed in all independent conduit runs and at least one conduit when conduits are installed in a conduit duct bank.

**3.21.18.02 Material Requirements**

1. All vertical run conduit located above ground shall be galvanized rigid steel. PVC coated rigid galvanized steel conduit shall be used from the nearest manholes/handhole below grade to a minimum of 2' above grade.
2. All materials used in the installation of conduit, such as bends, adapters, couplings, and fittings, shall meet or exceed all of the recommendations of the conduit manufacturer for suitable installation.
3. The Design-Builder shall use complete conduit sections in 20 feet (nominal) sections when PVC conduit is used and include mid-body gasket to provide watertight integrity. The Design-Builder shall use complete conduit rigid bend sections complete with bell and spigot. When used, PVC shall be Schedule 80. HDPE shall be Schedule 80 equivalent (SDR 13.5)
4. The Design-Builder shall provide flat profile, low stretch polyester, sequential footage marked, 2500 lb. tensile strength Mule Tape or approved equivalent in each empty conduit or cell. The Design- Builder shall leave 2 ft. of Mule Tape outside of the end cap and fasten it securely.
5. The mounting rail for the locator wire connection device shall be zinc dichromate plated

steel.

**3.21.18.03 Construction Requirements**

1. When crossing finished curbs and gutters, sidewalks, concrete flatwork, and textured or decorated surfaces, conduit shall be installed so as not to damage these sections. Any section damaged by the operations of the Design-Builder shall be replaced entirely at no additional cost to the Administration.
2. The Design-Builder shall place all conduits in the same trench before surfacing. Galvanized rigid steel shall be used in all above ground conduit installations, unless otherwise specified; and PVC or high density polyethylene (HDPE) shall be used in all underground conduit installations. PVC coated rigid galvanized steel conduit shall be used from the nearest manholes/handhole below grade to a minimum of 2' above grade. The Design-Builder shall install plugs on all empty conduits inside all handholes.
3. Any installation of buried conduit shall be located away from potential guardrail installations.
4. Conduits shall be installed in a manner that allows the backfill to completely surround all exterior surfaces of the conduit. Multi-duct conduits shall be separated by use of a commercially available conduit spacer or Administration-approved equivalent.
5. Non-metallic conduit that contains a conductor shall conform to the abrasion requirements per Section 346-8 of the NEC. Grounded bushings shall be installed on the ends of metal conduits per Section 347-12 of the NEC.
6. The Design-Builder shall construct all conduits into structures. Installation of multi-duct conduit on structures shall require additional Design-Builder prepared details specific to each particular structure and situation. The Design-Builder shall prepare any necessary details and instructions for multi-duct conduit on structures, including all materials, location of assembly relative to other structural features, expansion/contraction fittings, and the method used for passing conduit through diaphragms and abutments.
7. Conduit expansion fittings shall be installed at locations where the conduit crosses structural expansion joints.
8. The Design-Builder shall install the following cables and conductors in separate conduit runs and junction boxes:
  - a. Power service conductors (120 V and above);
  - b. Communication cables;
  - c. CCTV coaxial and control cables.
9. The Design-Builder shall not install any combination of the above categories of cables and



conductors in a common conduit or junction box, unless within the junction box that is installed immediately adjacent to the cabinet, which can accommodate any cables or conductors that are less than 120 V. Power service conductors shall enter the cabinet through a separate junction box with no other cables or conductors. Only fiber optic cable shall be installed in multi-duct conduit.

**3.21.19 Concept of Operations**

1. The Design-Builder shall be responsible for developing a Concept(s) of Operations (ConOps) for the Design-Builder’s proposed ITS. High level functions and operational requirements for the Static-Dynamic Median Part-Time Shoulder Use are provided in the following subsection. The Design-Builder’s ConOps shall address these Static-Dynamic Median Part-Time Shoulder Use requirements as well as all other ITS systems or TSMO strategies proposed by the Design-Builder and the overall TC 3.21 – Intelligent Transportation Systems (ITS) Performance Specification.



2. All proposed ITS deployments should be a part of a ConOps developed for the project. The ConOps shall be continuously coordinated with the Administration. The final ConOps shall formally be submitted to the Administration and approved by the Administration in writing in letter form. Approval of the ConOps is at the sole discretion of MDOT SHA and approval or disapproval of the ConOps shall not be basis for any additional cost to the Administration nor be cause for any contract claims or time extensions.

**3.21.19.01 General**

The ConOps shall be developed in accordance with Title 23 - Code of Federal Regulations, Subchapter K - Intelligent Transportation Systems (Federal Rule 940) following FHWA’s report Developing and Using a Concept of Operations in Transportation Management Systems and shall address the following at a minimum:

1. A ConOps is a user-oriented document that describes system characteristics for a proposed system from the user’s viewpoint. Accordingly, the ConOps shall provide a stakeholder view of the operations of the ITS being developed, presenting each of the multiple views of the system corresponding to the various stakeholders. These stakeholders include operators, users, owners, developers, maintenance, and management. The ConOps shall lay the foundation for early agreement among the stakeholders on all system aspects and provide detailed system requirements. The ConOps shall identify the roles and responsibilities delegated to each stakeholder in the operation and implementation of the proposed ITS.
2. The ConOps shall identify the geographical limits and physical location of the proposed ITS, include a description of the current conditions, needs and problems, the goals and objectives of the proposed ITS, and the proposed operational approach to the ITS for attaining these objectives, with clear justification for the implementation of the proposed ITS.

3. The ConOps shall describe the full range of factors that are needed to support the ITS goals and objectives, including but not limited to:
  - a. Equipment
  - b. Integration with other planned and existing systems and subsystems
  - c. Facilities
  - d. Personnel
  - e. Training
  - f. Public outreach and education
  - g. Maintenance
  - h. Performance measures
4. The ConOps shall provide a physical and functional overview of the ITS to be deployed.
5. The ConOps shall include scenarios that describe how the system will operate from the stakeholders perspective.
6. The ConOps shall identify the time-sequence of activities that will be performed to bring the ITS to a fully functional state of completion.
7. The ConOps shall identify policies, and constraints affecting the ITS.
8. The Design-Builder shall develop incident response plans, in coordination with the Administration, for the Design-Builder’s proposed improvements and location of those improvements.

**3.21.19.02                      Static-Dynamic Median Part-time Shoulder Use and Concept of Operations**

Static-Dynamic Median Part-time Shoulder Use shall meet the criteria as follows:

1. The system shall be operated and controlled by MDOT SHA CHART.
2. The open/closed status of the shoulder lane(s) and the limits that the shoulders are open/closed shall be determined by the Design-Builder’s traffic analysis and ITS proposal.
3. The system shall utilize and monitor the real-time data collected from the VDS.
4. The system shall utilize and monitor the real-time data collected from the AID system.
5. The system shall prompt the operator of changes in the real-time data being monitored, signifying events that may warrant a change in the current system operation.
6. The system shall not utilize data from 3<sup>rd</sup> party sources for operation. The system shall operate “standalone”, based on data from the Design-Builder’s proposed ITS that is to be owned, operated and maintained by MDOT SHA.
7. The system shall provide the system operators with data and tools that can be used as a basis for making decisions about the opening, continued operation, or closing of the shoulder lane(s). The variables and values of each variable from each subsystem that the system provides shall be configurable and adjustable.
8. The system shall provide automated segment or corridor sweeps of the static-dynamic median part-time shoulder use lane(s) limits with system operator approved measures to advance

changes in the current system operation (opening or closing) through a step-by-step process.

9. The system shall provide automated detection of incidents or other anomalies affecting the operation of the roadway. The system shall prompt the operator when these conditions are detected.

The Design-Builder shall develop and provide a ConOps for the Design-Builder’s Static-Dynamic Median Part-time Shoulder Use system.

**3.21.20 Active Traffic Management (ATM) Software and CHART Advanced Transportation Management Systems (ATMS)**

1. The Administration will operate all ITS equipment and systems proposed by the Design-Builder. Operation of multiple subsystems under separate controls is not an acceptable approach. All new ITS equipment and systems proposed by the Design-Builder shall be integrated into and controlled by an ATM software package that shall be provided by the Design-Builder or the existing CHART ATMS. The ATM software package provided by the Design-Builder shall interface with the CHART ATMS.
2. Some systems and devices are already operated by CHART within the existing CHART ATMS (i.e. CCTV, DMS, etc.). When integrating devices or systems within the existing CHART ATMS, the Design-Builder shall use proposed equipment that is consistent and fully compatible with the existing CHART systems to facilitate and ease system integration (i.e. the Design-Builder’s proposed CCTV equipment shall be compatible with CHART’s existing CCTV system).
3. When providing equipment for Design-Builder proposed systems that are not part of the existing systems already in use in the Administration’s CHART system, the Design-Builder shall provide equipment that can seamlessly be integrated into the ATM software package to be provided by the Design-Builder.



4. MDOT SHA CHART has determined that use of Southwest Research Institute’s (SwRI) ActiveITS software meets security and operational requirements, capability and functionality as outlined below. The Design-Builder shall furnish, develop, integrate, and test SwRI ActiveITS software on this project as required to implement and operate the ITS proposed by the Design-Builder on this project and as well as address the requirements of MDOT SHA CHART as the operator of the system. The Design-Builder is permitted to propose alternate ATM software packages for operation of the Design-Builder’s proposed ITS; however, any alternate software package must meet or exceed all requirements, capabilities, and functionality of SwRI ActiveITS as noted herein and subject to approval by MDOT SHA via ATC. The SwRI ActiveITS software is found to meet security and operational requirements by MDOT SHA CHART based on the following capabilities and functionality:
  - a. Scalability – ActiveITS is scalable for number of field devices (type and quantity) and subsystems that are able to be integrated and controlled.
  - b. Interoperability
    - i. Active ITS supports over 30 functional modules for various devices and

- subsystems.
- ii. ActiveITS supports more than 60 protocols including NTCIP.
- iii. ActiveITS can integrate with other software packages such as traffic detection and analysis software.
- c. Ability to interface with and integrate with MDOT SHA CHART’s existing ATMS software:
  - i. Utilizes existing CHART ATMS interfaces to achieve this functionality.
  - ii. Allows, through the integration with CHARTS ATMS, CHART operators to view the existence, status, configuration, messages, feedback, etc. of devices within the CHART ATMS GUI.
  - iii. Allows for pushing or polling of various device or system data and controls to or from the CHART ATMS.
- d. Eliminates the need for separate operator workstations running ActiveITS
- e. Automated incident/event management response plans.
- f. Archiving and reporting for performance based oversight of field equipment, operations, system/subsystem performance, and incident/event management.
- g. Open platform non-proprietary software that can be freely customized to integrate new technologies and equipment based MDOT SHA CHART’s specific requirements and needs.
- h. Ability to interconnect with other centers or ATMS for data sharing and aggregation, remote management, and monitoring.
- i. Integrated user interface that allows for management of devices, events, and subsystems in a browser, map-based, or application-based interface operating in a Windows environment.



5. ATM Software/System Development Requirements:

- a. The Design-Builder’s ATM software package and system development shall include, but not be limited to, the following as determined by the Design-Builder’s proposed ITS for the Project:
  - i. Develop/select device drivers and control modules for ITS equipment proposed by the Design-Builder that is not integrated into CHART ATMS.
  - ii. Develop an interface with the existing CHART ATMS.
  - iii. Provide Graphic User Interfaces (GUI) for all system functions, controls, and statuses as necessary to operate the system consistent with the Design-Builder’s proposal, MDOT SHA CHART’s requirements as the operator of the system, and this technical requirement. The Design-Builder shall coordinate and work with MDOT SHA CHART to develop, review, and revise the GUI so that it operates in accordance with CHART’s work-flow and operator expectations.
  - iv. Provide event logging for system records and so that future changes to the operations of the system can be evaluated.
  - v. Develop a comprehensive software requirements document tied to the functional requirements of the system and concept of operations.
  - vi. Develop and implement a list of software enhancements over the base SwRI ActiveITS software based on the Design-Builder’s proposed ITS. Software enhancements may include:

1. Procurement of development of additional device or system software modules for operation of the Design-Builder’s proposed ITS.
2. Linking between devices and subsystems.
3. Development of system logic.
4. Adding configuration variables and determining minimum or maximum thresholds.
5. Development of system health monitoring, including monitoring data quality.
6. Development of templates or dashboards for device configuration, management, monitoring, and control.
7. Development of additional system performance monitoring metrics and reports.
8. Development a system of alerts for device or system functions or failures.
9. Development of interfaces such as xml feeds for center to center interfaces.



6. Testing Requirements:

- a. Develop and perform a test program and testing plans to be used during system acceptance. The test program and testing plans shall be coordinated and approved by the Administration. Each of the software requirements shall be cross referenced to a testing step to be used during the acceptance testing. Testing plans shall include device level testing, subsystem testing, and system level operational testing.
- b. Develop and perform proof of concept testing with the ActiveITS software working as designed with real hardware and devices that are proposed for use in the project
- c. Center to center testing between ActiveITS software and CHART ATMS or other system as applicable.
- d. Develop and perform a burn-in plan to test and monitor the system under operational conditions.



7. Deployment Requirements:

As part of Deployment, the following actives shall be performed by the Design-Builder:

- a. Installation, configuration, and device integration of software within the ActiveITS software.
- b. Integration of ActiveITS with CHART ATMS, and other system as applicable.
- c. Testing in accordance with the testing program.



8. Training Requirements:

- a. Develop operator and administrator level training materials and provide on-site training to MDOT SHA staff.



9. Documentation Requirements:

- a. Modify existing documentation to match the developments specific for this project,

including software enhancements. Documentation shall include at a minimum:

- i. Setup and configuration settings.
- ii. Software User’s Manual (SUM)
- iii. Administrative Reference Guide (ARG)
- iv. Training Materials
- v. Interface Control Document (ICD)
- vi. Testing Plans and Reports



**10. Burn-In Requirements:**

- a. Perform a minimum 90-Day burn-in period of the system under operational conditions.
  - i. Provide one (1) engineer for a minimum 30 days of on-site support.
  - ii. Provide remote support throughout the duration of the burn-in.
    - 1. Provide personnel on-site within 24 hours of notice from MDOT SHA during the burn-in period.



**11. Warranty Requirements:**

- a. Provide a minimum 18-month warranty on the software modules developed or modified as part of the project, beginning after Final Acceptance. If the root cause of a defect is determined to be a defect of the software, then provide all necessary labor, hardware, software or other to fix the defect to the satisfaction of MDOT SHA.
- b. Provide all necessary maintenance updates, security patches, or other for the base ActiveITS software or any software modules developed or modified as part of the project. The Design-Builder shall coordinate the above with the Administration to ensure compatibility with CHART ATMS and systems. Be aware MDOT SHA may need to test any maintenance updates, security patches, or other to ensure no conflict with their CHART ATMS and systems prior to deployment.

**3.21.20.01**

**CHART’s ATMS Software Developer**

- 1. The Design-Builder shall be responsible for coordinating and scheduling with CHART’s existing ATMS System Software Developer to determine and identify all required system software development and modifications to CHART’s existing ATMS required for the implementation of the Design-Builder’s proposed ITS. CHART’s existing ATMS System Architecture is included as an attachment to the RFP for use with these efforts. The Design-Builder shall use the existing CHART ATMS Architecture to the maximum extent practical to minimize modification. The Design-Builder shall be aware that changes to the CHART ATMS system can take up to one year to implement and must be coordinated with other CHART ATMS work. The one year timeframe shall not start until the Interface Control Document (ICD) required in bullet 2 of this Section 3.21.20.01 is finalized by the Design-Builder, formally submitted to the Administration and approved by the Administration in writing in letter form. It is the responsibility of the DBT to coordinate this approval and the one year timeframe for changes to the CHART ATMS system into their schedule so that there are no delays to the MDOT SHA’s project. Delays to the DBT’s schedule associated with the anticipated time to obtain approval and for the one year timeframe shall not be basis for any additional cost to the Administration nor be cause for any contract claims or time extensions





2. The Design-Builder shall be responsible for developing an Interface Control Document (ICD) in coordination with the Administration. That document shall describe the interface between the Design-Builder's proposed ITS and the CHART ATMS. The ICD shall include:
  - a. Identify the electronic information exchange between the Design-Builder's proposed devices, systems, and software and the CHART ATMS.
  - b. Identify all hardware, software, and licenses required.
  - c. Define the management and configuration off all devices and systems and whether that resides within the Design-Builder's system or the CHART ATMS.
  - d. Define priority or arbitration, as required.

**3.21.21 Integration and Testing**

1. The Design-Builder shall perform the integration of equipment proposed to be integrated and controlled through the Design-Builder's proposed ATM software. Additionally, the Design-Builder shall assist with the integration of existing and proposed ITS field equipment, within the Project limits that is to be integrated into the CHART ATMS. The equipment for integration in the Design-Builder's proposed ATM software and/or CHART ATMS may include, but is not be limited to:
  - a. CCTV
  - b. DMS
  - c. Vehicle Detection System
  - d. AID
  - e. LUCS
  - f. Communications system
  - g. Ramp Metering Signals
  - h. Any other ITS equipment proposed by the Design-Builder
2. For all equipment connected to the existing fiber optic cable system, proposed fiber optic cable system installed under this Project, or equipment that utilizes another method of communications, integration shall include field site and subsystem/system integration and testing. The Design-Builder shall develop a test plan for conducting all required tests. This test plan shall be submitted to the Administration for review and written comment. The Design-Builder shall not be allowed to conduct any testing until the Administration has approved the test plan. The Design-Builder shall permit the Administration to adjust the proposed schedule of the test by up to seven days, at no cost to the Administration, to allow for availability of personnel. Administration personnel or an authorized Administration representative will witness and sign off on all tests. This person is the only person who can sign off that each test is successfully completed.

**3.21.21.01 Tests Applicable to All Devices**

1. The Design-Builder shall conduct, pass, and document a subsystem/system communication throughput test over the entire communications network path between each field device and the Ethernet over Fiber (EOF). The Design-Builder shall document that the bit error rate (BER) over the path, for each cabinet, is zero over a five-minute period. The Design-Builder shall supply the bit error rate test equipment. The test shall occur after all communication installation for a particular site has been completed, the communication paths between the device and the EOF have been functional for at least 48 hours, and all fiber tests have been successfully passed. The Design-Builder shall notify the Administration a minimum of 72 hours prior to the commencement of testing.
2. After successful completion of all subsystem test procedures, each site shall be tested under normal operating conditions for proper operation for 30 consecutive days. During the testing period, all Design-Builder provided, installed or relocated equipment at the site shall operate without failures of any type. If any component malfunctions or fails to provide the capabilities specified herein during the 30-day test period, the Design-Builder shall troubleshoot to find the exact cause of the failure. If the failed equipment was provided by the Design-Builder the equipment shall be removed and replaced by the Design-Builder. If the failed equipment is Administration-furnished, the equipment shall be removed and replaced by the Design-Builder with replacement equipment from the Administration. This troubleshooting shall occur within 48 hours of notification by the Administration.
3. After the component malfunction has been corrected to the satisfaction of the Administration, the Design-Builder may be required to restart the 30-day test period. In the event of a failure in equipment furnished by the Administration, the 30-day test will be suspended until failures with the Administration provided hardware are corrected, at which time the test will resume.

**3.21.21.02 Cable Conductor Test, Field Operation Test, and 30 Day Burn-In Tests**

1. The Design-Builder shall conduct, pass, and document a local field operations test for all ITS equipment to demonstrate that all hardware, cables, and connections furnished and installed by the Design-Builder operate correctly and that all functions are in conformance with the requirements described herein. The Design-Builder shall verify the power supply voltages and the functionality of the cabinet fans and heaters. A five (5) day pretest notification shall be required and a completion notice shall also be required.
2. A 30-Day Device Burn-in test is also required.
3. The Design-Builder shall submit documentation indicating successful passing of each test to the Administration for approval prior to final acceptance. The Design-Builder shall not perform any testing until the Administration has approved the testing Plans prepared by the Design-Builder.

**3.21.22 Maintenance During Construction**



1. The Design-Builder shall be responsible for the maintenance of all installed proposed ITS and any existing ITS that is modified permanently or temporarily by the Project until the ITS equipment is Accepted for Maintenance by MDOT SHA. This includes maintaining power and communications to the ITS equipment.

**3.21.23 Temporary ITS**

1. The Design-Builder shall be responsible for determining all temporary ITS measures necessary to maintain the operation of existing ITS equipment throughout construction. This includes maintaining power and communications to the ITS equipment. The Design-Builder shall be responsible to design, furnish, install, configure, integrate, test, and operate all temporary ITS measures. The Design-Builder shall be responsible for all costs associated with providing temporary ITS measures, including 3<sup>rd</sup> party electrical and communications service costs.

**3.21.24 Spare Equipment**

1. The Design-Builder shall provide to MDOT SHA spare parts and equipment necessary for SHA's future maintenance of the Design-Builders proposed ITS.
2. The Design-Builder shall coordinate with MDOT SHA to fully refine the spare equipment list and quantities during the design process. For the purposes of bidding, the Contractor shall assume the following quantities of spare equipment shall be provided:
3. 10% of the total number of devices installed shall be provided as spare equipment, including, but not limited to:
  - a. CCTV Cameras
  - b. Automated Incident Detection Equipment
  - c. Microwave Vehicle Detectors
  - d. Lane Use Control Signals
  - e. Lane Use Control Signal Controllers.
  - f. Network switches
  - g. Network routers
4. 5% of the total number of ITS equipment cabinets installed shall be provided as spare ITS equipment cabinets.
5. The spare equipment shall include the device, controller, encoders, power supplies, and other equipment directly associated with the device necessary for a complete (100%) repair installation of the device.
6. The Design-Builder shall deliver the spare equipment to a location selected by MDOT SHA within the State of Maryland. The Contractor shall be aware that not all equipment may be delivered to the same location.
7. The spare equipment shall be delivered to MDOT SHA prior to, and as a condition of, any of

the installed equipment being accepted for maintenance by MDOT SHA.

8. The spare equipment shall be delivered in its original packaging with all manuals, etc. A detailed transmittal of the exact spare equipment inventory shall be provided.



**3.21.25**

**Training and Documentation**

**3.21.25.01**

**Training**

1. The Design-Builder shall provide operational and maintenance training to MDOT SHA personnel for all ITS equipment and systems prior to, and as a condition of, any of the installed equipment or systems being accepted for maintenance by MDOT SHA.
2. The contractor shall coordinate with MDOT SHA to determine the most effective format and breakdown of training sessions and materials. The Contractor shall be aware that multiple training sessions will be required to cover all materials and all personnel. The Contractor shall provide separate classes for operator training and maintenance training.
3. The training shall include how to configure, program, operate, maintain, replace, test, and troubleshoot the system. A training submittal shall be submitted to MDOT SHA for approval 30 days prior to performing any training. MDOT SHA must approve the training materials in advance of the training.
4. Copies of all approved training materials shall be provided by the Design-Builder to all trainees. All information shall be bound in a 3-ring binder with an outside label on the binder cover and spine. In addition to each trainee receiving a copy of this binder, 5 additional full copies of the binder shall be provided to MDOT SHA.
5. All training materials shall provide detailed step-by-step instructions for trainees. Standard off-the-shelf reference manuals may be used, but tailored step-by-step procedures and exercises must be provided during training to place emphasis on those features that will be utilized by MDOT SHA. Under no circumstances shall generic training be provided. The training must be specific to the equipment, configuration, and operation of the ITS proposed and constructed in this project.
6. The Contractor shall supply copies of a maintenance manual complete with catalog cuts of all parts and components utilized within the system, including user manuals, and installation and configuration guides.
7. Detailed procedures providing step-by-step instructions for configuring and maintaining the system shall be provided along with the training materials.
8. Exercises shall be provided for all operations and maintenance functions.

**3.21.25.02                    Documentation**

The Design-Builder shall provide documentation for ITS equipment and systems proposed by the Design-Builder and furnished and installed in the project. The documentation shall include the following at a minimum:

1. All fiber work performed on this Project, including but not limited to, cable designations, splices, terminations, patches, etc.
2. Shop Drawings.
3. Training Materials.
4. As-built plans.
5. As-built wiring diagrams and schematics for all components of all systems.
6. ITS equipment cabinet rack elevation drawings and wiring diagrams.
7. Configuration and settings documentation.
8. All manufacturer documentation (user/operator manual, maintenance manual, specifications) as part of the training submittal. Deliver two (2) hard copies and 2 electronic copies on CD-ROMs.
9. Architecture document for new systems.
10. ATM control system/software documentation.
11. Interface Control Documents.
12. Testing Plans.
13. Databases.

The Design-Builder shall coordinate and provide requested data to the Administration and CHART for modifications and updates of existing databases to add new ITS field equipment. Updated data shall include equipment identification, interfaces for fiber optic communications network, and updates to graphical user interfaces. All software and database modifications, and associated modules, files, and documentation necessary to compile updates to the system shall become the sole property of the Administration, and shall be delivered to the Administration as a condition of Acceptance for Maintenance.

Any materials listed above that are produced through the execution of the project (i.e. shop drawings) shall be organized by the Design-Builder and provided to MDOT SHA.

**3.21.26                    ITS Coordination Meetings**

A regular ITS Coordination shall be established between the Administration and the Design-Build Team. A ITS Coordination initiation meeting shall be held once the notice of selection has been made. This meeting will be scheduled by the Administration upon request by the Design-Build Team and will include the Design-Build Project Manager, applicable members of the Design-Build Team, the MDOT SHA Project Design Manager, applicable members of OOTS, applicable members of CHART and other personnel as needed. The purpose of this meeting is to:

- Preview and discuss the Design Build team's proposed improvements;
- Discuss the Design Build Team's proposed ITS;

- Discuss the Design-Builders tentative design and construction schedule;
- Discuss the Design Build Team's proposed ITS Software, and development plan and schedule;
- Schedule the date and time for the regular ITS Coordination meetings;
- Discuss additional focused meetings that may be needed;
- And additional agenda items as coordinated between the Design-Build Project Manager and MDOT SHA Project Design Manager

The Design-Build Team shall prepare all meeting minutes and distribute them to attendees and team members for review and comment within one week of each meeting. The Design-Builder shall also create document for each ITS Improvement that memorializes the developmental process and decisions reached on those ITS Improvements. This shall be a living document for the life of the project continuously updated and distribute to attendees and team members for review and comment at each meeting. A final copy of each document will be provided to the Administration at the completion of the project.

**TC 3.22 PUBLIC OUTREACH PERFORMANCE SPECIFICATION**

**3.22.01 General**

This Performance Specification outlines the requirements for Public Outreach (PO) and defines the roles and responsibilities for this effort.

The PO program includes Administration and Design-Builder activities, including the following:

- A. Public Outreach;
- B. Community involvement and meetings;
- C. Communications with the public;
- D. Public notices;
- E. Media relations; and
- F. Maintenance of Traffic (MOT) plan.

The residents, businesses, elected officials, communities, motorists, and other interest groups within the project area have been kept informed and their engagement in the construction process is critical to the successful completion of the Project. In support of the Administration, the Design-Builder shall commit to significant assistance of the Administration regarding community participation and interaction activities during the development of the design and throughout the construction of the Project.

The Design-Builder shall provide a Public Outreach Coordinator who is responsible for assisting the MDOT SHA and Design-Build Team (DBT) in developing integrated communication plans, including planning, research, implementation and evaluation. The Coordinator must have strong writing skills, excellent communication skills, community outreach skills and experience handling sensitive and/or controversial issues. The Administration reserves the right to request a resume to verify qualifications. Duties include but are not limited to:

- Research, write and edit draft news releases, fact sheets, traffic alerts, briefing memos, advertising copy, speeches, web content, social media content, newsletters and brochures that will be submitted for approval to MDOT SHA.
- Collects and provides clips of media coverage of the project for inclusion in MDOT SHA's daily report.
- Gathers information on construction updates and project timelines and works with MDOT SHA to input and distribute the data through all applicable communication channels such as mainstream, social media, and website postings.
- Drafts responses to correspondence, emails, and other inquiries, including Customer Care Management System (CCMS) assignments.
- Assists with website content management and development, including writing, editing and potentially uploading content on multiple websites; as well as photographs and video of the project progress.
- Facilitates and coordinates obtaining any aerial or digital photography, graphical maps of traffic patterns and project design, art or other materials needed for public outreach

- Coordinates and participates in a variety of community/stakeholder events and meetings. Coordinates with MDOT SHA on the DBT's development of graphics, presentations, videos, power point, slide shows or other visual presentations for those events and meetings.
- Helps implement/coordinate special events on the project and/or VIP and media events, including materials preparation and logistics.
- Develops and writes copy for public outreach materials such as, but not limited to, e-blasts, inserts, newsletters, brochures, fliers, fact sheets, calendars and maps. Manages distribution including zip code mailings, door hanger posting, etc.
- Researches inquiries from the public, elected officials and/or media and develops response to be provided by the Coordinator or other designed project or SHA official.

**3.22.02 Guidelines and References**

The Work shall be in accordance with this Public Outreach Specification.

**3.22.03 Requirements**

The community involvement element is intended to carry forward the dialogue with residents, landowners, community groups, local officials, and other similar groups. This effort shall include activities such as, but not limited to, the Design-Builder supporting the Administration in meetings with individual land owners, local officials, and community groups and public meetings to keep the public involved in design and construction activities.

Public Outreach is intended to keep the public informed of major activities and decisions through design and construction. This element will involve the preparation and distribution of Project information to the assigned Administration representative for further dissemination to the public and media.

The Design-Builder shall make a good faith effort to address any concerns the public may have and consider any suggestions or wishes they express if those suggestions are reasonable in regard to cost, time, and construction effort. Documentation shall be in the form of meeting minutes and correspondence, including e-mails. The Design-Builder shall direct requests it receives to the Administration and shall assist in preparing responses. All design or construction modifications are subject to written acceptance by the Administration.

**3.22.03.01 Administration Public Outreach Responsibilities**

The Administration and the Design-Builder have shared responsibility for the PO Program. The Administration will be the lead on Public Outreach activities, with active support provided by the Design-Builder, to include project research, adequate support staff, graphic design, materials, and printing.

The Design-Builder shall have primary responsibility for performing the activities specified in this Public Outreach Specification as was well as in the Contract Documents.

The Administration's responsibilities include the following activities:

- A. Maintain Questions & Answers/Frequently Asked Questions of any approved communication efforts by the Design-Builder; and

- B. Liaising with and monitoring the Design-Builder's performance for compliance with the Contract's public outreach requirements.

**3.22.03.02 Design-Builder Responsibilities and Requirements**

**3.22.03.02.01 Design-Builder's Response to Inquiries and Comments**

- A. Questions or comments from residents, businesses, or other member of the public shall be referred to the Administration within 4 hours. The Design-Builder shall take necessary steps to facilitate such contact.
- B. If Design-Builder receives a complaint regarding its conduct of work on the Project, the Design-Builder shall notify the Administration within 4 hours. The Design-Builder shall provide necessary information, staff support, and representation to assist in resolving the issue.
- C. If Design-Builder receives a complaint regarding flooding, erosion, water quality, or any other drainage or environmental concern, the Design-Builder shall notify the Administration's Highway Hydraulics Division within 4 hours. The Design-Builder shall provide necessary information, staff support, and representation to assist in resolving the issue.
- D. On occasions specified by the Administration, the Design-Builder shall commit its Project Manager to serve as a spokesperson for the Project for technical and safety issues with certain audiences.

**3.22.03.02.02 Public Notifications**

- A. The Design-Builder shall facilitate the Administration's notification of the public and community in general and specifically affected businesses and residents along the Project. As directed by the Administration, this may include personal contact to affected parties of construction progress and upcoming events.
- B. The Design-Builder shall provide the specific notifications listed in Table 1.
- C. Utility shut-off/diversion announcements shall be coordinated in advance with the Administration and the utility company. The Design-Builder shall prepare a written notice to the affected parties.

**Table 1: Notifications**

Notice	Requirement
Lane Closure	Written notices posted at least 7 days in advance of planned closures at start and end of Project and at intermediate intersections/junction with United States (US), state, or county highways and roads. Notice provided to Refer to Maintenance of Traffic Performance Specifications.
Critical Utility Shut-off/ Diversion	Written notice at least 72 hours in advance of, but not more than 96 hours before, shut-off and/or diversions. Copy of notice to the Administration and Utility Company.
Business/Commercial Utility Shutdown	Written notification of Utility shutdown or diversion for businesses and commercial property at least 72 hours in advance of shut-down. Notice shall be coordinated in advance with the Administration and Utility Company.
Residential Utility Shutdown	Written notification of Utility shutdown or diversion for residential property 72 hours in advance of shut-down. Notice shall be coordinated in advance with the Administration and Utility Company.
Weekly Construction Updates	Construction updates shall be provided weekly and shall identify all Planned traffic shifts, lane closures and utility shut-downs and activities.
Road and Driveway Closures	Written notice and personal contact at least 72-hours in advance of closure. Copy of notice to the Administration. Refer to Maintenance of Traffic Performance Specifications

**3.22.03.02.03 Public Contact Records**

The Design-Builder shall maintain a consistent system for documenting all contact with business owners, residents, media and property owners. Unless otherwise directed, the Design-Builder should not act as spokesman for the Project. The Design-Builder shall provide the Administration an electronic copy of all public contact records. File should be received by the 1<sup>st</sup> of each month and should include all contacts made prior to the 25<sup>th</sup> of the previous month.

**3.22.03.02.04 Construction Schedule/Maintenance of Traffic and Access**

Information regarding Project design and construction shall be readily available in a form that can be quickly disseminated to the public. Information provided to the public shall be consistent with information contained in the Baseline Progress Schedule, schedule updates, and the applicable Maintenance of Traffic Plan.

**3.22.03.02.05 Signage**

The Design-Builder shall install signs throughout the Project to be placed at the start and end of the Project, at intersections and interchanges with County and State highways, at



Design-Builder's main office (if along the Project alignment), and at all field offices. The signs shall identify the Administration by its MDOT SHA official logo and show the name of the Project, the Project hotline number, and the Project Website address if applicable. Signs and lettering shall be sized appropriate for the speed limit in the area using MUTCD size guidelines.

#### **3.22.03.02.06 Telephone Trees**

The Design-Builder shall establish and manage an emergency response telephone tree. All appropriate emergency response agencies shall be included on this telephone tree for immediate response in the event of an emergency. The telephone tree shall be divided into areas of expertise, so the proper people are called for specific emergency situations.

#### **3.22.03.02.07 Public Forums**

At the specific request of the Administration, the Design-Builder shall participate in Administration organized public forums to give the public the opportunity to discuss the Project. The Design-Builder, in coordination with the Administration, shall hold a public meeting to advise the public of the construction prior to beginning construction activities.

Additionally, the Design-Builder, in coordination with the Administration, shall hold a series of public meetings explaining to the public the traffic operation of the system. Topics of discussion should include: How will traveling public know if the shoulder is open or closed? Are special signs or messages incorporated into the system? What should drivers do in the event of breakdown, crash or police pull-over? These meetings shall be held prior to the implementation of any or all segments of the proposed system. A video explaining the traffic operation of the system shall be developed and presented at the public meetings.

The Design-Builder shall provide all graphics and printed materials for these forums and work with the Administration in developing all materials.

All outreach materials, including meeting displays, mailings and videos, shall be posted on the project website to maximize public access.

#### **3.22.03.02.08 Construction Progress Photographs**

The Design-Builder shall provide to the Administration high-resolution construction progress photographs in electronic format at least monthly or at any time that a new significant activity commences. Monthly submission should include at a minimum of 10 (ten) new progress photos. In addition, the Design-Builder will facilitate requests and make arrangements for the Administration to take additional photos on an as-requested basis. Distinct from progress documentation photos, the purpose of photos identified in this section is to facilitate public information via the Project Website, newsletters and other such materials.

#### **3.22.03.02.09 Media and Public Outreach for ITS**

There are many ITS systems that may be apart of the Design-Builder's project that Maryland roadway users are not familiar with. As such, the Design-Builder shall assist the Administration in providing the public with information on these ITS systems and educate them on their use. This includes but is not limited to the following:

- The Design-Builder shall assist with ITS informational and educational website content including but not limited to: writing, editing and potentially uploading content on multiple websites; and providing website compatible renderings, graphics, animations and ITS related photographs.
- Develop and write copy for ITS informational and educational public outreach materials such as, but not limited to, e-blasts, inserts, newsletters, brochures, pamphlets, fliers, fact sheets, and maps. The Design-Builder shall provide all graphics and printed materials for these efforts and work with the Administration in developing all materials. Facilitate distribution including zip code mailings, door hanger posting, etc.

### **3.22.03.03 Other Design-Builder Activities**

The Design-Builder is encouraged to provide additional, cost-effective services to enhance the overall Public Outreach Community Relations Program. Additional services should adhere to the standards indicated in the Public Outreach Plan and be a supplement to the services outlined in this Performance Specification. Any such enhancements may be implemented at any time during the Project and subject to the Administration's written acceptance.

These activities may include part of the Federal Transportation Management Plan guidelines to draft a Public Information & Outreach plan for the project, which shall include:

- Standard language for constituent response (i.e. correspondence, phone inquiries, memos, etc.) in accordance with the Administration's guidelines.
- Creation/printing of overall project brochure and supporting materials
- Creation/printing of community updates for distribution
- Development of community contacts list
- Educating the public on work zone safety

### **3.22.03.04 Media Relations**

An ongoing media relations effort will be handled by the Administration. The Design-Builder shall assist in providing timely information to the Administration regarding construction activities for use in media events.

**NEITHER THE DESIGN-BUILDER NOR ANY SUBCONTRACTOR NOR THEIR EMPLOYEES SHALL INTERFACE WITH THE MEDIA WITHOUT THE EXPRESSED CONSENT OF THE ADMINISTRATION, EXCEPT AS SPECIFICALLY DIRECTED BY THE ADMINISTRATION. IN EMERGENCY SITUATIONS, THE DESIGN-BUILDER SHALL IMMEDIATELY NOTIFY THE ADMINISTRATION OF ANY SITUATIONS THAT MAY INVOLVE THE MEDIA.**

**TC 3.23 TOPOGRAPHIC SURVEY PERFORMANCE SPECIFICATION**

**3.23.01 General**

The Design-Builder shall obtain all necessary material from Maryland Department of Transportation State Highway Administration's (MDOT SHA) prior to starting work on the project. This includes, but is not limited to published MDOT SHA CADD standards, publications, guidelines, procedures, formats, data collection codes, attributes, Microstation seed files, resource files, preference files, etc. Appropriate MDOT SHA project account numbers and ProjectWise access (for appropriate projects) also will be provided for the projects assigned to the Design Builder. The Design-Builder shall adhere to the current MDOT SHA Plats and Surveys Division *Field Procedures Manual – 2018 for Consultants* and any revisions thereto for all field surveying.

**3.23.02 Guidelines and References**

All work shall be performed in accordance with the current laws, ordinances, and all policies of Federal, State and local governments. All work shall conform to specifications set forth in the "Plats and Surveys Field Procedures Manual – 2018 Consultant Version" and the "Minimum Standards of Practice" COMAR 09.13.06, and any revisions thereto. The Design-Build Team shall adhere to all MDOT SHA's overall safety guidelines provided by the Office of Traffic and Safety (OOTS) to include applicable guideline manuals and enacted laws. In addition, the MDOT SHA has developed certain note taking formats that shall be adhered to for all surveys performed on this project. Samples of the various types of survey notes will be provided to the Design-Builder upon the award of the contract.

**3.23.02.01 Survey Datum**

A. Horizontal Datum

Unless otherwise directed by the Administration, the North American Datum of 1983, 2011 Adjustment (NAD83/2011) shall be utilized for this project.

B. Vertical Datum

Unless otherwise directed by the Administration, North American Vertical Datum of 1988 (NAVD88) shall be utilized for this project.

**3.23.03 Requirements**

- A. Traverse adjustment – All traverse set by the Design-Builder shall be properly adjusted by least squares and must adhere to the "Minimum Standards of Practice" as dictated by the Annotated code of Maryland (COMAR 09.13.06) Elevations shall be obtained by differential leveling from valid bench marks and must be applied to each traverse point used in the collection of survey data.

- B. Editing – Copies of all field observation files may be compiled for editing or edited on a daily basis as directed by the Design-Builder’s surveyor in responsible charge, pertinent field personnel and/or processing technician(s). However, no original observation files may be edited. These must remain as observed by the survey field crew.

NOTE: Final editing does not have to be made here. Final editing may be made interactively and reflected in the final fieldbook (.fwd) file

- C. Processing and map production - The Design-Builder shall complete the processing of the edited field observation data using Bentley’s Power InRoads for Microstation V8i Select Series 2 creating the various mapping design (.dgn) files and the digital terrain modeling (.dtm) file(s)

- D. File naming – The Design-Builder shall adhere to the MDOT SHA CADD standard file name convention for all electronically delivered files.

- E. Deliverables-The Design-Builder shall deliver the following to MDOT SHA Plats and Survey Division (PSD) upon completion of the topographic survey. Once these items have been received by MDOT SHA PSD the Design-Builder Team shall continue with the design of the project:

- i. Any/all survey field books used for and/or depicting new work pertaining to the subject project.
- ii. Any/all (originals or copies) plan sheets, sketches, documentation, etc. supplied to the Design-Builder by PSD to assist in the collection or processing of the survey task.
- iii. Original (or copies of the original) daily collection survey field “Set-up” sheets, notes, sketches or any hard copy means of recording set-up data.  
NOTE: Some form of this data is required.
- iv. Electronic copy of the 3D Bentley’s Power InRoads for Microstation V8i Select Series 2 design (.dgn) file(s) of all planimetric features (filename – mTO-S000\_RTE#.dgn). Separate file(s) must be created for bridge deck(s) and appurtenances (filename – mTO-B000\_RTE#.dgn). NOTE: No annotation labeling is to be placed in this file (see v below).
- v. Electronic copy of the 3D Bentley’s Power InRoads for Microstation V8i Select Series 2 design (.dgn) file(s) of all annotation labeling of the planimetric features (filename – mTX-0000\_RTE#.dgn). This file is to be used as a reference file relative to the planimetric file. Separate file(s) must be created for bridge deck(s) and appurtenance annotation labeling (filename – mTX-B000\_RTE#.dgn).

- vi. Electronic copy of the 3D Bentley's Power InRoads for Microstation V8i Select Series 2 design (.dgn) file(s) of all contour lines depicting minor contours at intervals of 1 foot, and major contours with labels at intervals of 5 feet (filename – mGR-E000\_RTE#.dgn).
- vii. Electronic copy of the 3D Bentley's Power InRoads for Microstation V8i Select Series 2 design (.dgn) file(s) of all plane surface network triangles (filename – mTR-E000\_RTE#.dgn).
- viii. Electronic copy of the Bentley's Power InRoads for Microstation V8i Select Series 2 generated digital terrain model (.dtm) file(s) generated during processing (filename – 01RTE#.dtm)
- ix. Electronic copy of the Bentley's Power InRoads for Microstation V8i Select Series 2 generated fieldbook (.fwd) file. This should be the final completely edited version of the mapping data (filename – 01RTE#.fwd).
- x. Electronic file in MDOT SHA CADD standard format of the coordinate dump (.dmp) file(s) of all data collection surveyed points (filename – 01RTE#.dmp).
- xi. Electronic file in the appropriate data collection software format of the traverse observation file (filename – 01RTE#.software extension).
- xii. Electronic copy of the traverse least squares adjustment report file (filename – book#ppg#.### EX: 23456p78.###).
- xiii. Electronic file of the adjusted traverse coordinate dump file with the leveled orthometric elevations included.  
NOTE: This file is to be a separate file from the above mentioned coordinate dump (.dmp) file and is to have an extension of '.dat'(filename – book#ppg#.dat EX: 23456p78.dat) or is to be in TDS .rw5 format and file name ending '\*dat.rw5' (filename – book#ppg#dat.rw5 EX: 23456p78dat.rw5)'
- xiv. Electronic files in the appropriate data collection software format of all field observation files (filename – Trte#date.software extention for topo files and Brte#date.software extention for bridge files).

EX: A topo data collection task utilizing Carlson Surv CE or TDS Survey Pro software on MD348 with a date of survey being January 22 would appear thus TM3480122.rw5. A data collection of a bridge deck on the same project and same day would appear BM3480122.rw5

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- xv. Wetland delineation location (if applicable) will require an electronic copy of 3D Bentley's Power InRoads for Microstation V8i Select Series 2 design (.dgn) file(s) of the designated wetland boundary and/or the designated Waters of the United States boundary (filename – mEF-C000\_RTE#.dgn).

**TC 3.24      RIGHT-OF-WAY ACQUISITION PERFORMANCE SPECIFICATION**

**3.24.01      General**

All construction must be contained within the Right-of-Way. No Additional Right-of-Way will be obtained by the Administration for this project.

The Design-Builder will be responsible for acquiring, at its expense, all other rights in land needed for construction staging, yarding, construction, or otherwise.

**TC 3.25 PLATS PERFORMANCE SPECIFICATION**

**3.25.01 General**

Preparation of Plats is not anticipated on this project. All construction must be contained within the Right-of-Way. No Additional Right-of-Way will be obtained by the Administration for this project.



**TERMS AND CONDITIONS**

**TC SECTION 4**  
**CONTROL OF WORK FOR DESIGN-BUILD**

**TC-4.01 WORKING DRAWINGS.**

**DELETE:** This entire section.

**INSERT:** The following:

**(a) General.** The Plans shall be supplemented by working drawings as necessary to adequately control the work. All authorized alterations affecting the requirements and information given on the working drawings shall be in writing to the Design-Build Team's Lead Design Firm. When reference is made to the working drawings, the interpretation shall be the working drawings as affected by all authorized alterations then in effect.

Working drawings shall show details of all structures, lines, grades, typical cross section of roadway, general cross sections, location, and designation of all units and elements.

The Design-Build Team shall prepare working drawings as described in the Standard Specifications, with the exception that the drawings shall not be submitted to the Maryland Department of Transportation State Highway Administration (MDOT SHA) but shall be submitted to the Design-Build Team's Lead Design Firm for review and approval. Following approval by the Lead Design Firm, two copies of the approved drawings shall be forwarded to the Administration, unless noted elsewhere in this specification. The Administration shall review the drawings and will either concur that they meet or exceed the performance specifications and Ready for Construction plans or provide comments noting areas of non-compliance. Concurrence of the drawings shall not relieve the Design-Builder of any responsibility in connection therewith and the Administration assumes no responsibility for the accuracy of the drawings. A two-week period will be permitted for MDOT SHA review of the working drawings, unless noted elsewhere in this specification. The approved working drawings shall be stamped and signed by the Design-Build Team's Lead Design Firm and forwarded to:

Maryland Department of Transportation  
State Highway Administration  
Director  
Office of Highway Development  
Attn: MDOT SHA Design Project Manager  
707 North Calvert Street  
Baltimore, Maryland 21202

All working drawings shall be on sheets measuring 22 in. by 34 in. or 24 in. by 36 in. , unless noted elsewhere in this specification, and shall have a standard title block at the lower right corner approximately 4 in. by 8 in. (2 in. for the revision column on the left side and the remaining 6 in. for the title) indicating the following information in the order named:

Name of Contractor (and subcontractor, if applicable)  
Address of Contractor (and subcontractor, if applicable)  
Sheet Title (Reinforcement Details, etc.)  
Name of Structure  
Crossing  
For (MDOT State Highway Administration)  
By (Indicate name of Contractor's official or engineer, or other parties authorized to sign official documents.)

List all Administration Contract numbers, complete Federal Aid number, if any, and the date the drawing was completed. The left portion of the title block shall be headed "Revisions" and the space used as needed.

Working drawings for standard scuppers are not required. A sketch or statement specifying the type and number of standard scuppers required and the length of the downspout is acceptable.

**(b) Working Drawings for Falsework Systems.** Falsework systems (design, plans, and construction) shall be the responsibility of the Contractor, including submitting and obtaining written acceptance of the design and plans by the Design-Build Lead Design Firm Engineer before erection.

The Contractor shall utilize the Design-Build Lead Design Firm Engineer, a Professional Engineer (P.E.) registered in the State of Maryland, who has at least five years of experience in falsework design for bridge construction and repair. The falsework design calculations and plans shall be signed by the P.E. and bear the seal of the P.E. The submittal of the design and falsework plans shall include the P.E.'s resume showing evidence of the required experience.

Erection engineering calculations to substantiate the structural adequacy and stability of the bridge system for each step of the steel erection shall be performed to substantiate the erection plans and procedures. The Contractor shall be responsible for developing the girder erection plan and calculations based on their selected means and methods for erecting the steel members, including crane picks and handling stresses in the girder during the erection process.

At a minimum, erection engineering calculations shall conform to the latest edition (including interims) of the following or as stated in the General Notes of the Structural Plans:

- LRFD Bridge Construction Specifications, AASHTO
- LRFD Bridge Design Specification, AASHTO
- Guide Design Specifications for Bridge Temporary Works, AASHTO
- Guide Specifications for Wind Loads on Bridges During Construction, AASHTO
- Steel Bridge Erection Guide Specification, AASHTO, S 10.1 - 2014

The P.E.'s plans and design calculations shall evaluate and qualify all products and components including manufactured products and proprietary items for their intended service. Acceptance by the Design-Build Lead Design Firm Engineer of falsework systems shall not in any way relieve the Contractor of the responsibility for the safety and adequacy of the design and construction for the falsework systems and operations, including all components.

Every structure in the construction Contract will require a separate falsework design analysis, separate plans, and design submittal as set forth above. This applies even though structures may appear to be identical.

Each falsework system shall be designed to support all vertical and horizontal loading with enough redundancy to prevent progressive failure. Vertical loading, differential settlement forces, live load where applicable, and all horizontal, lateral, and longitudinal forces shall be taken into account. Unbalanced temporary loading caused by placement sequence shall also be provided for in the design. Adequate diagonal bracing in all planes shall be employed.

All falsework systems (designs, plans, and construction) shall provide for adequate foundations with bearings below the frost line or on rock or on piling, and for possible settlement. If additional subsurface data is necessary, it shall be obtained and analyzed for proper design of the plans and performance of construction.

Falsework designs and plans shall include protection against impact from uncontrolled highway vehicles, accidental collision of a crane boom or other construction equipment and vehicles, traffic vibration, flood waters, high winds, and any other envisioned contingent situations.

**(c) Structural Working Drawings and Catalog Cuts.** The Design-Build Team shall check all shop drawings for hydraulic structures, non-standard drainage structures and all other designed structures prior to manufacture and/or placement of such structures. The Lead Design Firm shall check all such shop drawings and stamp their acceptance prior to sending accepted shop drawings to the Administration. The accepted shop drawings for

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hydraulic structures, non-standard drainage structures (including stormwater management) along with the necessary structural computations shall be submitted to:

Maryland Department of Transportation  
State Highway Administration  
Director  
Office of Highway Development  
Attn: MDOT SHA Design Project Manager  
707 North Calvert Street  
Baltimore, Maryland 21202

All shop drawings relating to the temporary and permanent structures (bridges, retaining walls, and culverts) shall be reviewed. The primary review shall be undertaken by the Lead Design Firm with a secondary review undertaken by the MDOT SHA OOS designated review representative. Once reviewed and accepted by the Lead Design Firm, they shall be stamped as accepted and submitted to the MDOT SHA. The Administration shall review the drawings and will either concur that they meet or exceed the performance specifications and Ready for Construction plans or provide comments noting areas of non-compliance. Concurrence of the drawings shall not relieve the Design-Builder of any responsibility in connection therewith and the Administration assumes no responsibility for the accuracy of the drawings. The Design-Build Team shall correct any errors or omissions found by the Administration at no additional cost to the Administration. Each shop drawing shall bear the official stamp of the Design-Build Lead Design Firm Engineer, attesting to their review and approval by the Lead Design Firm. This work is to be done under the supervision of and shall be the responsibility of a Maryland Registered Professional Engineer. All prints of shop drawings shall be printed by the Design-Build Team, full size, in color and distributed to the Administration (Office of Structures, District, and Field).

**(d) Traffic and ITS Catalog Cuts and Working Drawings.** Prepare and transmit submittals to demonstrate the performance of the work 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, traffic signals, and ITS. Submit stakeouts of device locations for ground mounted signs, overhead/cantilever sign structures, and ITS device locations.

The Design-Builder shall be responsible for their schedule and coordinate submittals with that schedule to ensure there is no delay to the project. Arrange the schedule for submission of submittals so that related equipment items are submitted concurrently. Submit shop drawings for closely related items such as a sign and ITS support structures together.

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Provide drawings neat in appearance, legible and explicit to enable proper review. D size plans shall still be legible when reduced to one half size. 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. 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. 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 drawings deviate from the Contract Documents, the Design-Build Team's Engineer shall state the reason for the deviation in writing with the submittal.

Provide manufacturer's catalog, product and equipment data that includes 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.

Provide catalog cuts for sign luminaires with 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.

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

In case of fixed mechanical and electrical equipment, submit layout drawings drawn to scale, to show required clearances for operation, maintenance and replacement of parts. Provide manufacturers certified performance curves, catalog cuts, pamphlets, descriptive literature, installation and application recommendations, 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.

**SPECIAL PROVISIONS**  
**CONTROL OF WORK FOR DESIGN-BUILD**

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Submit working drawings as required for changes, substitutions, contractor design items, and contractor designed methods of construction. Review and approval of such drawings by the Design-Builder and concurrence of the drawings by the Administration shall not relieve the Design-Builder of any responsibility in connection therewith and the Administration assumes no responsibility for the accuracy of the drawings.

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

Each drawing submitted 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."

The Design-Build Team submittals having catalog descriptions, shop drawings, working drawings, photometric data, manufacturer's certifications, method of construction and manufacturer's installation recommendations shall be submitted to the Design-Build Team's Lead Design Firm for review and approval. Following approval by the Lead Design Firm, two copies of the approved drawings shall be forwarded to the Administration. The Administration shall review the drawings and will either concur that they meet or exceed the performance specifications and Ready for Construction plans or provide comments noting areas of non-compliance. Concurrence of the drawings shall not relieve the Design-Builder of any responsibility in connection therewith and the Administration assumes no responsibility for the accuracy of the drawings. The approved working drawings shall be stamped and signed by the Design-Build Team's Lead Design Firm and forwarded to:

Chief, Traffic Operations Division  
Maryland Department of Transportation  
State Highway Administration  
Office of Traffic and Safety  
7491 Connelley Drive  
Hanover, Maryland 21076

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 transmittal only on the exterior of each package. For original submittals, and each subsequent resubmittal that may be required, 9 copies will be submitted for projects administered by the District, and 6 copies will be submitted for projects administered by Office of Traffic and Safety.

**SPECIAL PROVISIONS**  
**CONTROL OF WORK FOR DESIGN-BUILD**

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

- (a) Drawing title, drawing number, TIMS number, TOD 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 following. All pertinent Contract Document information shall be filled in the spaces provided.

MARYLAND STATE HIGHWAY ADMINISTRATION	
SUBMITTAL PACKAGE # _____ DATED _____	
CONTRACT # _____ LOCATION _____	
PROJECT DESC. _____	
ITEM # _____ THIS ITEM CONTAINS _____ PAGES	
ITEM DESCRIPTION _____	
<input type="checkbox"/> ACCEPTED	
<input type="checkbox"/> ACCEPTED AS NOTED	
<input type="checkbox"/> REJECTED - REVISE & RESUBMIT	
REVIEWERS NAME _____	DATE _____

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.

**SPECIAL PROVISIONS**  
**CONTROL OF WORK FOR DESIGN-BUILD**

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Each submittal shall be in accordance with the submission schedule. Allow thirty days for checking and appropriate action by the Administration.

Contractors 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 days for checking and appropriate action by the Engineer.



**TERMS AND CONDITIONS**

**TC SECTION 4**  
**CONTROL OF WORK**

**TC-4.02 FAILURE TO MAINTAIN PROJECT**

**ADD:** As a third 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 prorata 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 \$1,000 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 7  
PAYMENT FOR DESIGN-BUILD**

**TC-7.01 MEASUREMENT OF QUANTITIES**

**DELETE:** This section in its entirety.

**INSERT:** The following:



Unless specifically noted herein, payment for all work within the Scope of Work shall be included in the Lump Sum Prices for “DESIGN-BUILD A” and “DESIGN-BUILD B” shown on the Proposal Form. The Design-Build Team shall disregard all references in the Standard Specifications to actual quantities, Contract items, Contract unit prices, and any measurement or payment method other than inclusion in the Lump Sum Prices.

Payments to the Design-Build Team shall be full compensation for furnishing all materials and for performing all work under the contract in a complete and acceptable manner and for all risk, loss, damage, or expense of whatever character arising out of the nature of the work or the prosecution thereof.

**TC-7.02 PAYMENT ALLOWANCES FOR STORED MATERIALS**

**DELETE:** The opening statement:

**INSERT:** The following statement:

When the Contractor requests payment allowance for stored materials, those materials must be identified as an Item within the Progress Payment Breakdown described in TC-7.11. The following terms and conditions shall apply:

**TC-7.05 PROGRESS PAYMENTS**

**(a) Current Estimate.**

127 **DELETE:** (2) **Variable Retainage** in its entirety.

**INSERT:** The following:

- (3) Variable Retainage.** The Contract will be subject to a variable retainage based upon the Administration’s performance evaluations of the successful proposer and a minimum retainage for the landscaping items of work. Those qualifying may have retainage reduced upon request of the Contractor with consent of surety. This request shall be processed through the District Engineer. Landscaping items of work are not eligible to have a reduction in retainage below the minimum percentage outlined below. If at any time during the performance of the work, the evaluation of the Contractor changes, retainage reduction may be reconsidered.

**Minimum Qualifications are as follows:** After 50 percent project completion and upon request, Contractors with 'A' evaluations for the last two years may be reduced from 5 percent to 1 percent. Project completion percentage will be based upon actual work completed (excluding monies paid for stored materials). An interim evaluation of the current project would need to be completed and would need to be an 'A'.

At 50 percent project completion and upon request, 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, 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 would need to be completed and would need to be an 'A' or 'B'.

Contractors with 'C' evaluations or any combination of 'C' and 'D' evaluation for the past two years will begin and remain at 5 percent for the life of the project.

Contractors with a 'D' evaluation for the last two years will begin at 5 percent. Project performance will be evaluated monthly with the retainage being raised to 10 percent for continued 'D' performance.

**New Proposer.** Contractors who have not been previously rated by the Administration 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 Administration forms. Contractors who do not fit into the above criteria would require a 5 percent retainage throughout the life of the Contract.

**(b) Semi-Final Estimate Payments.**

129 **DELETE:** Delete the entirety of subsections (1), (2), and (3).

**INSERT:** The following:

- (1) Upon completion of the project and the acceptance by the Administration for maintenance, the Administration, at the Contractor's request and with the consent of surety, will initiate a Memorandum of Action by the Director, Office of Construction, State Highway Administration, authorizing semi-final payment. Such a semi-final estimate payment will be based upon: (a) quantities the Administration has computed and set up as proposed final quantities, and (b) a reasonably accurate estimate for those quantities for which the Administration has not yet completed computations. The quantities that the Administration sets forth as proposed final quantities shall be so designated. To arrive at the amount of the semi-final estimate, the following will be deducted from the apparent estimated value of the Contract: (a) total of all amounts previously paid to the Contractor as current estimates, (b) the retainage for landscaping items of work, (c) sums deemed chargeable against the Contractor including penalties and liquidated damages, and (d) as an additional retainage, a sum not less than 1 percent of the total value of the Contract, excluding landscaping items of work.

- (2) In cases where there has been substantial completion of the project and there are remaining only inconsequential or minor work items such as painting, seeding, mulching, or planting to be completed and such items cannot be completed for an extended period of time because of seasonal or weather conditions, a semi-final inspection will be made. If the work completed is found to be satisfactory, then there is deemed to be a partial acceptance on the entire project except for the uncompleted work items. Upon the above referred to partial acceptance, the Administration, within 30 days from such partial acceptance, upon request of the Contractor and with consent of surety, shall pay to the Contractor, what is hereby known as a partial semi-final estimate payment. Such a semi-final estimate will be based upon: (a) quantities the Administration has computed and set up as proposed final quantities, and (b) a reasonably accurate estimate for those quantities for which the Administration has not yet completed computations. The quantities that the Administration sets forth as proposed final quantities shall be so designated. To arrive at the amount of the semi-final payment, the following will be deducted from the apparent estimated value of the Contract: (a) total of all amounts previously paid to the Contractor as current estimates, (b) the retainage for landscaping items of work, (c) sums deemed chargeable against the Contractor including penalties and liquidated damages, and (d) as an additional retainage, a sum not less than 1 percent of the total value of the Contract, excluding landscaping items of work.
- (3) If all retained funds have not been paid to an escrow agent, as provided for in (a)(4), the Administration shall, upon payment of the semi-final estimate, place the remaining retainage in a interest-bearing escrow account, as designated and on such terms and conditions as specified by the procurement officer. At the time of the final payment, any retainage due, and any interest accrued on the retainage due from the time of payment of the semi-final estimate, shall be paid to the Contractor.

130 **ADD:** The following at the end of Section TC-7.05:

**(c) Application for Progress Payment.**

In order to receive payment, the Design-Build Team shall submit a written Application for Progress payment to the Administration on a monthly basis. Receipts, invoices, and other vouchers, including invoices from subcontractors shall be included. Invoices shall be based on the proportionate quantities of the various classes of work satisfactorily designed, checked, and completed or incorporated in the work in accordance with the Schedule of Work and the value thereof determined from the Contract Progress Payment Breakdown as described in TC-7.11. If the Application for Progress Payment is inconsistent with the Payment Breakdown, the Projected Schedule of Payments, or the actual progress of work, the Application must include a written explanation for such inconsistencies and the Administration reserves the right to withhold the applicable payment in whole or in part.

**(d) Payment of Invoices.**

All invoice payments shall be subject to correction in subsequent invoices and payments and upon final acceptance and payment. No payment shall be made when, in the judgment of the Administration, the work is not proceeding in accordance with

the provisions of the Contract or when the total value of the work done since the last estimate amounts to less than \$500.00. Portions of the progress payment may be withheld in accordance with the Contract provisions.

**(e) Payment for Mobilization.**

The total of payments for Mobilization will not exceed 10% of the Contract Price (less price adjustments and incentives).

**(f) Payment for Changes.**

Differing site conditions, changes, and extra work meeting the requirements of this Contract will be paid using the following methods as appropriate:

- a. Unit prices agreed upon in the order authorizing the work.
- b. An agreed upon lump sum amount.
- c. On a Force Account basis, if agreement cannot be reached and if directed by the Administration. Refer to TC-7.03

**TC-7.10 COST BREAKDOWN AND SCHEDULE OF PAYMENTS**

.01 Submittal of Cost Breakdown

Concurrent with the submission of the Price Proposal, the Design-Build Team shall submit to the Administration an itemized Cost Breakdown and supporting documentation to be used to evaluate Price Proposals and as a basis of payment. This breakdown shall present a realistic and documentable presentation of the costs for the major elements of work that comprise the Total Lump Sum Price for the Work. At a minimum, the following Lump Sum Items shall be included:



- Clearing & Grubbing
- Mobilization (refer to TC-7.05e)
- Design Engineering (Including Software, Software Development and Integration)
- As-Built Drawings
- Engineer's Office
- Maintenance of Traffic
- Construction Stakeout
- Earthwork - Excavation & Embankment
- Drainage
- Erosion & Sediment Control
- Bridge Structures
- Culverts
- Retaining Walls
- Noise Abatement
- Paving Items – hot mix asphalt, concrete pavement, and graded aggregate base
- Concrete

W-beam and concrete barrier  
Topsoil, Seed & Mulch  
Landscaping Plantings  
Lighting & Electrical  
Pavement Markings  
Permanent Signing  
Signals and Beacons  
Intelligent Transportation Systems Components (Including Testing and Warranties)

The Design-Build Team shall also submit to the Administration a Cost Breakdown of the Design Engineering item. This cost breakdown shall include the name and fee for each consultant and subconsultant firm that is included in this item.

The Administration may require additional items to be identified and included prior to approval

Note that to enable the Administration to make effective progress payments, the successful Design-Build Team will be required to submit for approval the more detailed Progress Payment Breakdown described in TC-7.11. All progress payments will be based on an approved Progress Payment Breakdown.



All costs associated with the preparation, submission, or revision of any Cost Breakdown will not be considered as an item for payment but shall be included in the Design-Build Team's Total Lump Sum Price.

**The successful Design-Build Team will be required to submit an Initial Critical Path Method Project Schedule Design-Build Activities Chart within thirty (30) working days after notification of Award.** This is in addition to the requirements outlined in Section 109- Critical Path Method Project Schedule Design-Build.

### **TC-7.11 CONSTRUCTION PROGRESS PAYMENT BREAKDOWN**

#### **.01 Submittal of Progress Payment Breakdown**



The successful Design-Build Team shall submit to the Administration an itemized Progress Payment Breakdown and supporting documentation to be used as a basis for payment. This breakdown shall be a realistic and documentable presentation of the costs for the major elements that comprise the Contract Total Lump Sum Price for the Work. The breakdown shall be sent to the District Engineer. No progress payment will be made until such time that this breakdown has been accepted by the Administration. The Administration reserves the right to request additional items and/or detail from the Design-Build Team in order to process progress payments. The Design-Build Team shall submit additional updates to the Payment Breakdown as the design and construction progresses and as directed by the Administration.

The breakdown shall be in MS Excel format and shall include but not be limited to the costs for: Mobilization, Design Engineering (Including Software Development and Integration), As-Built Drawings, Engineer's Office, Maintenance of Traffic,



Intelligent Transportation Systems Components, Intelligent Transportation Systems Components Spare Equipment and Construction Stakeout.

The breakdown shall also contain the Design-Build Team unit prices for Superpave Asphalt Mix, Superpave Asphalt Mix for Pavement Patching, each type of concrete mix to be used on the project, and each type of pavement marking. These prices will be used to determine a reduction in payment if necessary due to materials not meeting required specifications such as PCC compressive strength, AC content, asphalt density, pavement marking thickness, and reflectivity. Additionally, the breakdown shall include the hourly rate, including overhead, for each Design Key Staff member. This price will be used by the Administration to set a baseline cost associated with any work determined to be out of scope and agreed to by the Administration prior to the work being performed.



The Design-Build Team shall use the Progress Payment Breakdown format in preparing and documenting its Applications for Payment. The Administration will use the Cost Breakdown to assist in evaluating requests for payment. All costs associated with preparation, submission, or revision of the Progress Payment Breakdown will not be considered as an item for payment but shall be included in the Design-Build Team's Total Lump Sum Price.

.02 Review and Approval

Within 14 working days after the successful Design-Build Team submits to the Administration an itemized Progress Payment Breakdown and supporting documentation, the Administration shall approve the Progress Payment Breakdown or return it to the Design-Build Team with issues, comments and deficiencies noted. The Administration will not approve a Progress Payment Breakdown that is unbalanced. The Design-Build Team shall then resubmit the Progress Payment Breakdown until an acceptable Progress Payment Breakdown is approved. The Design-Build Team is responsible for incorporating time for submission and approval of the Progress Payment Breakdown in its Schedule of Work.

.03 Projected Schedule of Payments

Within 7 working days after approval of the Progress Payment Breakdown, the Design-Build Team shall provide the Administration with a Projected Schedule of Payments for the Project. This schedule will provide the Administration with an estimate of monthly cash flow requirements by forecasting the Design-Build Team's monthly Applications for Progress Payments for the duration of the Project. The Projected Schedule of Payments must be in accordance with the Contract, the approved Cost Breakdown.

.04 Justification of Cost Breakdown or Projected Schedule of Payments

The Administration may require the Design-Build Team to provide explanations and supporting documentation if the Progress Payment Breakdown or Projected Schedule

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of Payments indicate unbalancing or do not reasonably reflect the actual cost of performing the work or the value of work received by the Administration.



**TC SECTION 7**  
**PAYMENT**

**TC-7.09 PRICE ADJUSTMENT FOR DIESEL FUEL**

**(a) General.** A Price Adjustment (PA) will be made to provide additional compensation to the Contractor or a credit to the Administration for the fluctuation in the cost of diesel fuel.

The monthly index price used for calculating the PA will be the On-Highway Diesel Fuel Price for the Central Atlantic Region published by the U.S. Department of Energy, Energy Information Administration, at [www.eia.doe.gov](http://www.eia.doe.gov). The monthly index price will be the average of the weekly prices posted for the month.

The prevailing base index price will be the price specified for Diesel Fuel currently posted at [www.roads.maryland.gov](http://www.roads.maryland.gov) (Business Center /Contracts, Bids, and Proposals) prior to bid opening. A historical database will be maintained by the Administration.

The adjustment factors for specific categories of the work are included in Table TC-7.09. Category D will apply to this Contract.

The PA will be calculated when the index for the current month increases or decreases more than 5 percent of the base index. The total dollar amount of fuel adjustment will be limited to 5 percent of the Contract Total Amount as bid. If an increase or decrease in costs exceeds 5 percent of the Contract Total Amount as bid, no further adjustment will be made.

Computations for adjustment will be as follows:

$$\text{Percent Change} = [(E - B)/B] \times 100$$

$$\text{PA} = [E - (B \times D)] \times F \times Q$$

Where:

- PA = Amount of the price adjustment
- E = Current monthly index price
- B = Prevailing base index price
- D = 1.05 when increase is over 5%; 0.95 when decrease is over 5%
- F = Applicable fuel adjustment factor from Table TC-7.09
- Q = Quantity of individual units of work

**TABLE TC-7.09**

<b>COST ADJUSTMENT FACTORS FOR DIESEL FUEL</b>			
<b>CATEGORY</b>	<b>DESCRIPTION</b>	<b>UNITS</b>	<b>FACTOR</b>
A	Sum of Cubic Yards of Excavation in Category 200	Gallons/Cubic Yard	0.29
B	Sum of Structure Concrete in Category 400	Gallons/Cubic Yard	1.892
C	Sum of Aggregate Base in Category 500	Gallons per ton	0.60
D	Sum of Asphalt in Category 500	Gallons per ton	3.50
E	Sum of Rigid Concrete Pavement in Category 500	Gallons/Cubic Yard	0.95

Any difference between the checked final quantity and the sum of quantities shown on the monthly estimates for any item will be adjusted by the following formula:

$$FPA = [(FCQ \div PRQ) - 1] \times EA$$

Where:

- FPA = Final PA for the item that increased or decreased
- FCQ = Final Checked Quantity of the item
- PRQ = Total Quantity of the item reported on the most recent estimate
- EA = Total PA of the item shown on most recent estimate

**(b) Price Adjustment Criteria and Conditions.** The following criteria and conditions will be considered in determining the PA.

**(1) Payment.** The PA will be computed on a monthly basis. PA resulting in increased payment to the contractor will be paid under the item Price Adjustment for Diesel Fuel. The item amount will be established by the Administration, and shall not be revised by the Contractor. PA resulting in a decreased payment will be deducted from monies owed the Contractor.

The monthly base price for determining a PA for all work performed after the Contract completion date, as revised by an approved time extensions, will be the monthly base price at the time of the Contract completion date (as extended) or at the time the work was performed, whichever is less.

- (2) **Expiration of Contract Time.** When eligible items of work are performed after the expiration of Contract time with assessable liquidated damages, no PA will be made.
- (3) **Final Quantities.** Upon completion of the work and determination of final pay quantities, an adjusting Change Order will be prepared to reconcile any difference between estimated quantities previously paid and the final quantities.
- (4) **Inspection of Records.** The Administration reserves the right to inspect the records of the Contractor to ascertain actual pricing and cost information for the diesel fuel used in the performance of the applicable items of work.
- (5) **Additional Work.** When applicable items of work, as specified herein, are added to the Contract as additional work, in accordance with the Contract provisions, no PA will be made for the fluctuations in the cost of diesel fuel unless otherwise approved by the Engineer. The Contractor shall use current fuel costs when preparing required backup data for work to be performed at a negotiated price.
- (6) **Force Account.** Additional work performed on a force account basis, reimbursement for material, equipment, and man-hours as well as overhead and profit markups will be considered to include full compensation for the current cost of diesel fuel.

**CATEGORY 100**  
**PRELIMINARY**

**SECTION 103 – ENGINEERS OFFICE**

**103.03 CONSTRUCTION.**

**ADD:** The following after the fourth paragraph.

Progress payments for professional services may be made prior to the commencement of construction work.

**SPECIAL PROVISIONS INSERT**  
103 — ENGINEERS OFFICE

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**CATEGORY 100**  
**PRELIMINARY**

**SECTION 103 — ENGINEERS OFFICE**

**103.03.06 Engineers Office Equipment and Services.**

**(2) Computer Software**

**DELETE:** The table in its entirety.

**INSERT:** The following.

<b>Type</b>	<b>Software Package</b>
<b>Operating System</b>	Microsoft Windows 10 or newer
<b>Productivity Tools</b>	<b>32-bit</b> Microsoft Office Professional 2016 or newer
<b>PDF File Reader</b>	Adobe Acrobat Reader - current version
<b>Note: Include all current software updates and service packs.</b>	

**CATEGORY 100**  
**PRELIMINARY**



**SECTION 103 – ENGINEERS OFFICE**

**103.03.07 Specific Field Office Requirements.**

**DELETE:** Table 103.03.07B – Office Equipment Quantity Requirements in its entirety.

**INSERT:** The following.

**Table 103.03.07B - Office Equipment Quantity Requirements**

	<b>ITEM</b>	<b>SECTION</b>	<b>QUANTITY</b>
	Type A - Desktop Computer	103.03.06(a)(1)	2
	Type B - Laptop Computer	103.03.06(a)(1)	1
	High-Capacity Multi-function B&W Laser Copier/Scanner/Printer	103.03.06(c)	
	Low-Capacity Multi-function Color Ink Jet Printer/Scanner/Copier/FAX	103.03.06(d)	
	Paper shredder	103.03.06(e)	
	Digital camera	103.03.06(f)	
	Additional Monitor 24” Widescreen HD LED with integrated webcam and microphone that is compatible with project assigned devices	N/A	

**CATEGORY 100**  
**PRELIMINARY**

**SECTION 104 — MAINTENANCE OF TRAFFIC**

**104.01 TRAFFIC CONTROL PLAN (TCP)**

**104.01.01 DESCRIPTION.**

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

**INSERT:** The following.

**Work Restrictions.**

Work is not permitted on the following holidays indicated below with an “X”, nor is work permitted on the day immediately preceding and immediately following the 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
- Veterans Day, November 11
- Thanksgiving Day, the fourth Thursday in November
- Christmas Day, December 25

Work is not permitted on the following weekend days indicated below with an “X”.

- Saturdays, unless prior written approval is given by the Engineer
- Sundays, unless prior written approval is given by the Engineer

<b>TEMPORARY LANE OR SHOULDER CLOSURE SCHEDULE</b>			
<b>ROADWAY</b>	<b># LANE(S) / SHOULDER CAN BE CLOSED</b>	<b>DAY OF THE WEEK</b>	<b>CLOSURE PERIOD (TIME OF DAY)</b>
<b>I-695</b> from I-70 to MD 43	0/1 1/1 2/1	MON-FRI SUN-THUR SUN-THURS	9 AM to 3 PM 8 PM to 5 AM next day 10 PM to 5 AM next day

**All lane closure permits are required to be submitted to the office of Assistant District Engineer for Traffic District 4, (2) working days in advance of work.**

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

When closing, or opening a lane or shoulder on freeways, expressways, and roadways with posted speed  $\geq 55$  mph, ensure a work vehicle is 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, either a truck-mounted attenuator (TMA) with support structure designed for attaching the system to the work vehicle or a trailer truck-mounted attenuator (TTMA) designed for attaching the system to the work vehicle by a Pintle hook and an arrow panel (arrow mode for multilane roadways and caution mode on two-lane, two-way roadways).

Temporary Traffic Control for shoulder work along freeways, expressways, and roadways with posted speed  $\geq 55$  mph shall include the use of a PV. The PV shall be outfitted with a TMA or TTMA as noted above and be positioned on the shoulder to protect the work area throughout the duration of the shoulder work operation.

The work vehicle size and method of attachment shall be as specified in the TMA/TTMA manufacturer’s specification as tested under NCHRP and/or MASH Test Level 3.

When a temporary lane or shoulder closure is in effect, begin work within one hour after the lane is closed. For any delay, greater than one hour and no work in progress, remove the lane/shoulder closure. Ensure the Traffic Manager attends the Pre-Construction, Pre-Structural Steel Erection, Pre-Concrete Placement, Pre-MOT Shift, and Pre-Paving Meetings and is prepared to competently discuss traffic control, the Traffic Control Plan (TCP), and the procedures to be implemented for lane closures.

All closures shall be in conformance with the approved TCP and at the direction of the Traffic Manager and the Engineer.



## SPECIAL PROVISIONS

### 104.01 — TRAFFIC CONTROL PLAN

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Workers and equipment, including temporary traffic control devices needed for setting up a lane closure or restriction, are prohibited in the lane/shoulder to be closed or restricted before the time permitted in the Contract Documents unless otherwise 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 30 minutes prior to the actual time lane/shoulder closure or restriction is permitted. When temporary traffic control devices are being installed, ensure that all work vehicles involved in the installation display flashing lights that provide a 360-degree visibility of the vehicles. These lights shall remain on until the full installation of TTC devices is complete. Temporary traffic signs may be displayed to traffic at this time.

Workers shall not enter any lane open to traffic. Workers may be present on shoulders to prepare for lane closure setup no earlier than 30 minutes prior to the actual time lane/shoulder closures or restrictions are permitted. During preparation for the lane closure, ensure that all work vehicles at the site and involved in the installation of the lane closure or restriction display flashing lights that provide 360-degree visibility of the vehicles, as required by MD 104.01-18B. These lights shall remain on while the vehicle remains in the work zone and until the full implementation of the road closure or restriction is complete.

Restore all temporary lane or shoulder closures at the end of the closure period and ensure that no travel lane has been reduced to less than 11 ft on expressways, freeways and 10 ft on other roadways. Prior to opening the closed lane or shoulder, 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 assessed in conformance with the following.

This is in addition to the requirements specified in TC-4.02.

To modify the work restrictions, submit a request to the Engineer in writing with at least 72 hours notice. Do not implement any changes until written approval from the Engineer is received. Include a copy of the original work restrictions with the written request. The Engineer also reserves the right to modify or expand the methods of traffic control or working hours as specified in the Contract Documents

**CATEGORY 100**  
**PRELIMINARY**

184 **DELETE:** SECTION 107 — CONSTRUCTION STAKEOUT in the Standard Specifications in its entirety.

**INSERT:** The following.

**SECTION 107 — CONSTRUCTION STAKEOUT FOR DESIGN-BUILD PROJECTS**

**107.01 DESCRIPTION.** This work shall consist of furnishing, placing and maintaining construction layout stakes as specified in the Contract Documents or as directed by the Engineer.

The Design-Builder shall, as part of the construction stakeout operation, before any clearing operation commences, demarcate any wetlands and the limit of clearing throughout the entire project as shown in the Contract Documents and labeled as Limit of Clearing or Wetlands to the satisfaction of the Engineer.

Where limits of clearing are not shown in the Contract Documents, the limit of clearing will be the top of cut, toe of slope or limit of ditch excavation.

**107.02 MATERIALS.** The material for flagging the clearing limits shall be a 3 in. international orange vinyl material with “CLEARING LIMIT” printed on it with 2 in. letters. The material for flagging wetlands shall be the Administration's standard 1-1/2 in. pink and white striped vinyl flagging with “SHA WETLAND” printed on it with blue letters.

**107.03 CONSTRUCTION.**

**107.03.01 Line and Grade.**

The Design-Build Engineer will provide the Design-Builder with the following:

**(a) Control Points.**

**(1)** Control Points for horizontal and vertical control shall be as shown on the Preliminary Plans.

**(b) Structure Stakeout.**

- (1) A staked out center line or working line, whichever applies, with stations not over 100 ft apart and extending at least 100 ft beyond ends of the structure.
- (2) When the structure is on a curve, the Design-Build Engineer will furnish a staked out center line or working line, whichever applies, consisting of stations not over 100 ft apart and including the P.C., P.T., and at least one point on the tangents beyond each end of the curve.
- (3) At least two bench marks, one on each end of the structure, will be established by the Design-Build Engineer.

The Design-Builder will provide the following:

**(a) Roadway Stakeout.**

- (1) A staked center line of the roadway with the maximum spacing of stations (stakes, nails, crosses, etc.) of 100 ft.
- (2) Establish appropriately spaced bench marks and the necessary references including all points of curvature (P.C.), and points of tangency (P.T.) for the preservation and control of the center line.

**Horizontal Referencing:**

- The Design-Builder will establish references to all Base Line of Construction Controls. This will include all Points of Curvature (P.C.s) and Points of Tangency (P.T.s).
- Reference points shall be positioned in pairs with the closest point placed Twenty (20) feet outside the limit of construction. Should these points fall beyond the Right of Way Line, approval from the property owner or tenant must be obtained prior to setting. Right angle and radial ties to Baselines are preferred but not required.
- Reference points, typically, shall be Number #5 (five) 5/8" Rebar two (2) feet long with a State Highway Administration (SHA) Yellow Cap affixed to the top. SHA Caps will be supplied by the SHA Plans and Surveys Division. In areas unsuitable for Rebars, markers of a stable, permanent nature shall be used, (crosses in concrete, PK nails, Railroad spikes, etc.) NOTE: Wooden hubs are not to be used for any referencing purpose.
- References, when positioned, shall be hand referenced to local points of permanency (trees, structure corners, utility poles, etc.) measured to a 100<sup>th</sup> of a foot.

**Vertical Referencing:**

- The Design-Builder will place and establish permanent Bench Marks on structures along the project Baseline. These marks will be pre-stamped Brass Discs supplied by the S.H.A. Plats and Surveys Division and are to be placed in a suitable surface at time of pour and finish. In non-structure areas, permanent points in stable positions (Square cuts in existing concrete, Boat spikes in Power poles / large trees etc.) are acceptable.
- Benches shall be referenced to the Base Line of Construction by Station plus and offset distance.
- Spacing of Vertical Control shall be a minimum of Five (5) per mile.
- Elevations on all Benches shall be established by differential leveling and return Loop check.

**NOTE:** In the Horizontal and Vertical Referencing process, all work shall be shown and documented in SHA Field Survey book/s supplied by the S.H.A. Plats and Surveys Division. Upon project completion, all books shall be returned to the S.H.A. Plats and Surveys Division for archiving.

For questions regarding the S.H.A.'s specifications for Baseline Referencing or examples of S.H.A. Construction Stakeout bookwork, contact the S.H.A.s Plats and Surveys Division in Baltimore, Maryland at 410-545-8940.

**107.03.02 Equipment and Personnel.** The Design-Builder shall engage a Registered Professional Land Surveyor, licensed in the State of Maryland, to determine all lines and elevations for various parts of the Work. The Surveyor shall have 3 to 5 years experience as a party chief or higher and have demonstrated experience working with the Maryland Plane Coordinate System – NAD 83/91 and NAVD 88, or similar. The surveyor shall use competent personnel and state of the art equipment for all engineering work required to set and maintain the elevations and dimensions as specified in the Contract Documents.

**107.03.03 Control Markers.** The Design-Builder shall be responsible for preserving the centerline and benchmarks set by the Design-Build Engineer. When the centerline and benchmarks are disturbed or destroyed, they shall be replaced by the Design-Builder at no additional cost to the Administration.

**107.03.04 Control Stakes.** For roadways as specified in 107.03.01, the Design-Builder shall furnish, set and preserve stakes at each station along each side of the project on the right-of-way or easement line, whichever is furthest from the center line of construction. Where only part of an ultimate dual highway is to be constructed, the stakes on the side of the future improvement shall be set 10 ft beyond the construction limits. On each of these stakes shall be marked its offset distance from the center line and its top elevation or the

cut or fill to the profile grade line. Additional stakes as needed for horizontal and vertical controls necessary for the correct layout of the work shall be set by the Design-Builder.

**107.03.05 Layout.** For structures as specified in 107.03.01, the Design-Builder shall proceed with the layout work. However, before any actual construction begins, the Design-Builder shall rerun and check the Design-Build Engineer's lines and grades and then establish all center line or working line intersections with the center line or center of bearing of all piers, bents and abutments. From these field layouts, the Design-Builder shall check the proposed span lengths by electronic distance measurement or chaining. When chaining is used, the measurements shall be compensated for temperature, sag, and horizontal alignment. The Design-Builder shall also check the location of the structure to affirm its correct location with relation to existing structures, roads, and existing conditions that are to remain in their original positions. If any discrepancies are found, the Design-Builder shall notify the Design-Build Engineer at once in writing, otherwise, it will be assumed that all planned dimensions, grades and field measurements are correct. All lines established on the ground shall be preserved or referenced, marked, and kept available at all times.

The Design-Builder shall establish the field elevations for all bridge seats and assume responsibility for finishing to proper grade. If any steel beams or girders are incorporated in the project, the Design-Builder shall run elevations over the tops of the beams or girders after they are in place, before any forms are attached to them, to determine the deflection of each member. This information shall then be applied to the deflection diagram to determine the corrected elevation of bottom slab forms and screed supports. After the Design-Builder has assembled this information, it will be checked by the Engineer before final adjustments are made and the placing of any concrete in the forms.

**107.03.06 Utilities.** The Design-Builder shall furnish to the utility companies or agencies working within the limits of the project, promptly upon request, reference to control points, alignment and grade data, so that they may properly locate and coordinate their work and improvements in relation to the project.

**Intersection Utility Stakeout.** The Design-Builder shall notify the appropriate agencies listed below a minimum of 72 hours (excluding weekends and holidays) prior to the Design-Builder's anticipated beginning of any underground work.

- (a) Request a MISS UTILITY stakeout and possess a valid MISS UTILITY clearance ticket number for any underground work.
- (b) Contact all utilities within the limits of the project who are not a member of MISS UTILITY and obtain a stakeout of their respective facilities.

- (c) Request the Office of Traffic & Safety's Signal Operations Section to stakeout Administration maintained traffic signal facilities.
- (d) Request the District Engineer to stakeout their lighting facilities.

The Design-Builder shall stakeout the proposed construction as indicated in the Contract Documents and allow the Design-Build Engineer to verify location of the proposed facilities.

**107.03.07 Right-of-Way and Easement Lines.** The Design-Builder shall define only right-of-way and easement lines of the project for adjacent property owners, promptly upon request.

**107.03.08 Subgrade, Subbase and Base Controls.** The Design-Builder shall furnish for subgrade, subbase and base courses, a string line and grade with fixed controls having a maximum longitudinal and transverse spacing of 25 ft.

The Design-Builder shall place along each form line for cement concrete pavement line and grade with fixed controls not to exceed 25 ft.

**107.03.09 Flagging.** The flagging shall be placed continuously through wetland areas. In areas where trees are not to be disturbed, the Design-Builder shall individually flag those trees in a line along the clearing limits that are not to be moved or destroyed. If the clearing or wetland flagging has been destroyed and the Engineer determines that its use is still required, the Design-Builder shall reflag the areas

If the Design-Builder does not replace destroyed flagging within 48 hours after notification by the Engineer that replacement flagging is needed, the Engineer may proceed to have the area reflagged. The cost of the reflagging by the Engineer will be charged to the Design-Builder and deducted from any monies due under the Contract.

At the completion of construction, the Design-Builder shall remove all flagging.

**107.04 MEASUREMENT AND PAYMENT.** Payment for all work for Construction Stakeout FOR Design-Build Projects shall be included in the Lump Sum Price shown on the Schedule of Prices for the all-inclusive Project Lump Sum. The payment will be full compensation for furnishing, placing and maintaining construction layout stakes, flagging of clearing limits and wetlands, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

**CATEGORY 100**  
**PRELIMINARY**

**DELETE:** SECTION 109 — CRITICAL PATH METHOD PROJECT SCHEDULE in the Standard Specifications in its entirety.

**INSERT:** The following.

**SECTION 109 – CRITICAL PATH METHOD PROJECT SCHEDULE DESIGN-BUILD**

**109.01 DESCRIPTION.** Plan, schedule, and construct the project by using a Critical Path Method Project Schedule (CPM). Use the CPM for coordinating and monitoring the work specified in the Contract Documents including all activities of subcontractors, vendors, suppliers, utilities, railroads, the Administration, and all other parties associated with the construction of the Contract. The CPM schedule shall be used for coordinating activities for both design and construction tasks by incorporating all activities into one CPM schedule. All work including but not limited to activities associated with design elements, milestones, permits, utility relocations, and submittals shall be represented by schedule activities. All work including but not limited to submittals, major procurement, delivery, and construction activities shall be included. All appropriate schedule logic relationships between the design element activities and the corresponding construction activities shall be shown. Base the CPM upon the entirety of the Contract Documents. Utilize CPM software that generates files compatible with Primavera Project Planner.

**Float.** The CPM utilizes float. Float is defined as the amount of time between when an activity “can start or finish” and when an activity “must start or finish”. Float is a shared commodity for the use of the Administration and the Design-Build Team and is not for the exclusive use or benefit of either party. Both parties have the full use of the float until depleted.

**Scheduling Representative.** Designate a scheduling representative prior to submission of the Initial Critical Path Method Project Schedule (ICPM). The scheduling representative is the person primarily responsible for development and maintenance of the CPM schedule, the Design-Build Team’s representative in all matters regarding the schedule, and the designated attendee for all schedule related meetings. Replacement of the scheduling representative will require written approval from the Administration.

Submit the qualifications of the scheduling representative to the Administration for approval. This approval is required before the ICPM will be accepted. The scheduling representative shall have at least three years of verifiable experience for preparing and maintaining CPM project schedules on Contracts of similar size and complexity.

**Initial Critical Path Method Project Schedule (ICPM).** The ICPM shall consist of:

- (a) A time scaled diagram of acceptable scale and format that is acceptable to the Engineer. Clearly label and identify each activity. Show all relationships between activities.
- (b) Tabular reports with activities sorted as follows:

- (1) Activity ID. Provide predecessors and successors for each activity with leads and lags shown.
- (2) Activity ID. Provide and clearly define the resources assigned to each activity.
- (3) Early Start, Total Float.
- (4) Total Float, Early Start.
- (5) Project Area (if applicable).
- (6) Project Phase (if applicable).
- (7) Responsibility, e.g., Design-Build Firm, Designer, Constructor, specific subcontractor, specific supplier, the Administration, etc.

Provide in the header of each tabular report: the project name, Contract number, data date, run date and number, and report type.

Provide in the body of each report: the activity identification, activity description, original and remaining duration, early/late start and finish dates, percent complete, actual start/finish dates, total float, and calendar designation for every activity.

- (c) Written Narrative (WN). Comply with the requirements described hereinafter.
- (d) Printed Calendars. Include a listing, description, and calendar form tabulation of all calendars used. Include the total number of anticipated work days required to complete the Contract work.  
  
Delineate holidays and anticipated nonwork days or periods. Explain in the WN the basis for determining each nonwork day or period.
- (e) A data disc containing all of the information contained in the ICPM and in a format compatible with Primavera Project Planner software. All construction activities shall have durations not exceeding 10 working days, unless otherwise approved. Activities representing review and approval of construction submittals by the Administration shall be given a duration of not less than 30 calendar days. Activities representing review and approval of design submittals by the Administration shall be given a duration of not less than 45 calendar days. A short list of highly critical approval activities may be submitted. The Engineer will make every effort to expedite the approval of these submittals; however, this will not alter the requirement to include 30 calendar days for construction submittal approvals and 45 calendar days for construction submittal approvals. Schedule the duration for activities such as curing and pre-load in calendar days. Durations for procurement activities will be evaluated on a case-by-case basis.

The latest calculated early finish date in the ICPM shall equal the calendar date for completion specified in the Contract Documents. If an earlier completion date is submitted, the Administration, upon approval of the ICPM, will issue a change order to adjust the Contract time to the completion date shown on the ICPM.



Resource load all construction activities in the schedule with the material, equipment, and manpower planned to be utilized in accomplishing each activity. Provide a full explanation of the resource loading in the WN.

The Engineer reserves the right to specify the number of activities and to require an additional breakdown of the activities at any time.

Utilize activity codes to categorize activities by at least the following: project area; construction phase; design phase; and responsibility, e.g. Design-Build Firm or specific subcontractors.

Provide a WN as part of the ICPM. Explain the sequence of work, the critical path, interim completion dates, project phasing, nonwork days or periods, maintenance of traffic, and labor and equipment resources. Explain how the ICPM provides for permit requirements, environmental requirements, coordination with other public Contractors, milestone dates (for the Contract or other related contracts), coordination with other entities, coordination with all utility companies, special nonwork days or periods, and weather. Explain the specific scope of each activity and the basis used to determine the original duration of each activity, i.e. production rates and anticipated quantities. Address all activities quantified in the Contract Documents. Explain the following in the WN.

- (a) Relationships between activities not obviously identified.
- (b) Equipment usage and limitations.
- (c) Manpower usage and limitations.
- (d) Use of additional shifts and overtime.
- (e) Activity codes, abbreviations, and activity identification system.
- (f) All calendars utilized in the CPM.
- (g) Date or time constraints.
- (h) All abbreviations.
- (i) Use of calendars.
- (j) Scheduling of weather and temperature sensitive activities.
- (k) Design Phase/milestone dates.

Complete and submit the proposed ICPM within 30 calendar days after receiving the Notice of Award. Submit five sets of all required information for review and acceptance. Do not start any work until the ICPM is accepted. Upon issuance of the Notice to Proceed, the start date utilized in the ICPM will be adjusted to comply with the Notice to Proceed.

The Engineer will complete the review of the ICPM within 30 calendar days after submittal. If required, a Joint Review Conference will be convened at which time the Engineer and Design-Build Firm may make corrections and adjustments to the proposed ICPM. If a revision is necessary due to the Engineer's review or the Joint Review Conference, submit the proposed revision within seven calendar days after receiving the Engineer's review comments or within seven calendar days after the date of the

Joint Review Conference, whichever is the latest. Make revisions in accordance with the requirements for the ICPM. The Engineer will respond to the revised ICPM within seven calendar days after receipt.

Any delay in starting work caused by the acceptance of the ICPM by the Engineer will not be considered as a basis for any adjustment in the Contract amount or time.

Upon notification that the ICPM has been accepted, that document will become the CPM of record. The CPM of record shall be the Design-Build Firm's work plan for completing the entire Contract as specified in the Contract Documents.

Failure to adhere to the CPM of record will be cause for the Administration to deny requests for additional compensation or extensions of the Contract duration and may result in the withholding of pay estimates.

**CPM Updates.** Provide monthly updates of the CPM of record. Update submissions shall include the activity data as specified in (a) through (e) of the ICPM. Use the update to describe the progress to date. The WN shall include a description of the work performed during the update periods, current critical path, the amount of float on the critical path, any delays or disruptions experienced during the period of the update, any change in manpower or equipment, and any potential delays or disruptions.

The scheduling representative and the Engineer will meet to review, mutually agree to, and sign-off on the information required to update the schedule (actual start and finish dates, remaining durations, and percentages complete). Use an acceptable update form. The data date for each update shall be seven days prior to the cut-off date of the pay estimate for that month. Submit the update within seven calendar days from the data date. Failure to submit the update on a timely basis may result in the withholding of pay estimates. Upon acceptance by the Engineer, the update shall become the CPM of record for the period between its data date and the data date of the next approved update or revision.

Do not include any revisions to the CPM without prior approval.

**Revisions to the Schedule of Record.** Revisions are defined as one or more of the following:

- (a) A change in the original duration of an activity.
- (b) A change in the logic of the schedule.
- (c) A change in the calendars or to the calendar to which an activity is assigned.
- (d) A change to resources.
- (e) A change to any actual date, previously established.
- (f) The deletion or addition of an activity.
- (g) A change to, addition of, or deletion of a date or time constraint.
- (h) A change to, addition of, or deletion of an activity code.
- (i) A change to an activity description.
- (j) Any change other than updating an activity.

Discuss any proposed revision to the CPM verbally with the Engineer. If the revision is minor in nature, the Engineer may allow the revision to be included on the next Update of the CPM. If the Engineer determines that the revision is not minor in nature, submit the proposed revision for review and approval prior to deviating from the approved CPM.

When a revision to the CPM is required due to changes in the Contract initiated by the Engineer, immediately contact the Engineer to discuss the changes. If the revision is minor in nature, the Engineer may allow the revision to be included on the next Update of the CPM. If the Engineer determines that the revision is not minor in nature, submit the proposed revision for review and approval prior to deviating from the approved CPM.

The Engineer may allow a deviation from the approved CPM for specific mitigating activities.

Submit the proposed revision in the same format and with the same requirements used for the ICPM. The proposed revision shall be made to the CPM of record at the time the revision is made, i.e. the revision shall include all update information and revisions previously approved and the additional progress to the date of the revision. The WN accompanying the proposed revision shall describe the reason for the revision, the resulting critical path, and all particulars of the revision. These shall include but not be limited to changes in the method or manner of the work, changes in specifications, changes in resources, addition or deletion of work, increased or decreased quantities, defective work, and acceleration of the work.

The Engineer will review and respond to the proposed revision within 14 calendar days after receipt. Resubmit, if required, within seven calendar days after receipt of the Engineer's review comments. The Administration reserves the right to reject any proposed revision that adversely impacts the Administration, utilities, or other concerned parties.

**Extensions of Contract Time.** Make requests for extension of Contract time in writing and subject to the notice and timeliness of submission provisions as provided for elsewhere in the Contract. Requests for an extension of Contract time will be evaluated by the Engineer's analysis of the CPM of record and any proposed revision submitted. The request shall include a WN of the events, which would require an extension of the Contract time.

Only delays to activities that affect the Contract completion date will be considered for an extension of Contract time. The extension of the specified Contract completion date will be based upon the number of calendar days the Contract completion date is impacted as determined by the Engineer's analysis.

When an acceptable Update or Revision is not submitted within the time limits prescribed above, pay estimates may be withheld until an acceptable Update or Revision is submitted.

**109.02 MATERIALS.** Not Applicable.

**109.03 CONSTRUCTION.** Not Applicable.

**109.04 MEASUREMENT AND PAYMENT.** Payment for the accepted Initial Critical Path Method Project Schedule, Critical Path Method Project Schedule Revisions, and all accepted Critical Path Method Project Schedule Updates shall be included in the Contract Lump Sum Price for the Design-Build item.

**CATEGORY 200**  
**GRADING**

**SOIL NAILING**

**DESCRIPTION.** This work consists of designing and constructing a permanent soil nail system as specified. Furnish all labor, plans, drawings, design calculations, materials and equipment required to construct the soil nail system. Insert soil nails into existing soil masses using high-pressure air or insert self-drilling nails. Soil nails reinforce locally unstable shallow soil sloughs by transferring the tensile and shear resistance developed by the soil nails from the stable side of the slip plane to the unstable side. Install soil nails to the limits shown on the plans or as determined.

**Design Requirements.** The soil nail system design shall be performed by a professional Geotechnical Engineer licensed in the State of Maryland with experience in the design and construction of permanent soil nail walls.

Design the soil nail system using Allowable Stress Design (ASD) method as outlined in FHWA's Geotechnical Engineering Circular No.7 "Soil Nail Walls". Refer to applicable FHWA documents such as FHWA – FPL -93-003 "Application Guideline for Launched Soil Nails" for additional guidelines. The design calculations shall demonstrate that a minimum factor of safety of 1.3 against global slope failure shall be attained with the design spacing, length etc. of the soil nails.

**MATERIALS.**

**Soil Nails.** Use one of the following types depending the approved design.

- (a) **Launched Soil Nails:** Furnish launched soil nails composed of a 1.5 inch outside diameter, 0.120 inch wall thickness, hot-dipped galvanized, 36ksi steel tube. Provide perforated tubes that can serve as both horizontal drains and as tensile elements when necessary. Do not reuse excess cutoffs from previously launched nails.
- (b) **Permanently Cased Soil Nails:** Furnish permanently cased soil nails that are part of a three-stage construction, including:
  - (1) Installation of an outer tube with a minimum 1.5 inch outside diameter, minimum 0.120 inch wall thickness hot-dipped galvanized steel tube that is mechanically deformed, threaded, or specially galvanized through a dressing process to produce a plurality of surficial asperities:
  - (2) Neat cement grout that completely fills the outer tube; and
  - (3) An inner bar consisting of epoxy coated, #6 (or greater) grade 60 or grade 75 rebar or thread bar depending on final design load. Provide perforated tubes that can be pressure grouted

when necessary.

- (c) **Self-Drilling Soil Nails:** Furnish self-drilling soil nails that consist of a hollow, threaded bar with a sacrificial drill bit. Multiple bars may be coupled to produce final length. Bar thread pattern should be continuous and conform to the pullout requirements of ASTM A 615. Bar outer diameters shall be a minimum of 1.5 inches and up to and 3 inches depending on design load.

<b>Bearing Plates.</b>	M183
(a) Plate Material:	A36 Steel or stronger
(b) Plate Coating:	A153/A123, Hot dip galvanized
(c) Plate Thickness:	3/8 or 1/2 inch, depending on design
(d) Plate dimensions:	Square or Diamond Shaped, minimum area 48 square inches

**Shotcrete.** 423

**Welded Wire fabric.** M55

(a) **Wire Strength:** 75 ksi. or greater

(b) **Wire Coating:** A90. Minimum of 0.8 ounces/square foot.

B750. Zinc/Aluminum Alloy. Plain hot-dip galvanized is not acceptable.

Mesh Opening Size: 2.56 inches or smaller (using maximum circle method). Area of opening shall not be less than 8.2 square inches

**Grout.** Grout shall consist of 846 lb/yd<sup>3</sup> of Type II portland cement, 6 ± 1 percent air entrainment by volume, mortar sand aggregate, and water proportioned to provide a pumpable mixture. The 28-day compressive strength shall be 3500 psi minimum.

**CONSTRUCTION.** The Contractor shall have completed at least 3 permanent soil nail system projects during the past 3 years totaling at least 10,000 square feet of face area and at least 500 permanent soil nails. The general guidelines for construction are as follows:

- (a) **Launched Nails:** Insert launched nails with a single stroke at a chamber pressure between 750 and 3000 psi. Determine inserted length and spacing based upon the shop drawings. Do not leave more than 4 feet of launched soil nail exposed after launching unless otherwise approved. Cut off the exposed portion of installed nails for inclusion into shotcrete or flush to ground when in the

shotcrete work is not required. Do not reuse remaining lengths from cut nails for launched soil nails. The Contractor bears the risk of unforeseen groundwater or adverse launching conditions.

- (b) Permanently Cased Soil Nails:** Construct permanently cased soil nails by launching an outer tube with a single stroke at a chamber pressure between 750 and 3000 psi or by drilling a hole to prescribed depth at the location shown. Insert a 1.5 inch (or larger) outside diameter steel pipe to stabilize the drill hole, fully encasing the inside of the outer tube with grout and immediately inserting an epoxy coated #6 (or larger depending on required tensile strength) reinforcing bar as the inner bar. Provide perforated tube and grout under pressure. The Contractor bears the risk of unforeseen groundwater or adverse launching or drilling/casing conditions, including excess grout take.
- (c) Self-Drilling Soil Nails:** Use drilling rigs capable of drilling through materials to be encountered to the dimensions and orientations required for the soil nail design. Drill straight and clean holes at the locations shown. Drill hole locations and inclinations are required to be within 6 inches and 5 degrees as unless otherwise approved. Drill all self-drilling nails with continuous grout injection unless otherwise approved. The Contractor bears the risk of unforeseen groundwater or adverse drilling conditions, including excess grout take.
- (d) Welded Wire Fabric:** Stretch the mesh tight across the slope and over the nail tips. Dig shallow depressions at least 12 inches in diameter and at least 8 inches deep around the nail tips. Install galvanized steel plates over the nail.
- (e) Shotcrete:** Construct shotcrete to the thickness shown on the approved shop drawings. Clean the face of the excavation and other surfaces to be shotcreted of loose materials, mud, rebound, overspray or other foreign matter that could prevent or reduce shotcrete bond. Protect adjacent surfaces from overspray during shooting. Avoid loosening, cracking, or shattering the ground during excavation and cleaning. Remove any surface material loosened or damaged to a sufficient depth to provide a base that is suitable to receive the shotcrete. Remove material loosened as the shotcrete is applied. Do not place shotcrete on frozen surfaces.

Maintain a clean, dry, oil-free supply of compressed air sufficient for maintaining adequate nozzle velocity. Use equipment capable of delivering the premixed material accurately, uniformly, and continuously through the delivery hose. Control shotcrete application thickness, nozzle technique, air pressure, and rate of shotcrete placement to prevent sagging or sloughing of freshly-applied shotcrete.

Orient perpendicular to the working face nozzle at a distance so that rebound will be minimal and compaction will be maximized. Pay special attention to encapsulating reinforcement. Do not work rebound back into the construction. Where shotcrete is used to complete the top ungrouted zone of

the nail drill hole near the face, position the nozzle into the collar of the drill hole to completely fill the void.

A clearly defined pattern of continuous horizontal or vertical ridges or depressions at the reinforcing elements after they are covered with shotcrete will be considered an indication of insufficient reinforcement cover or poor nozzle techniques. Immediately suspend the application of shotcrete in this case and implement corrective measures before resuming the shotcrete operations. Correct the shotcreting procedure by adjusting the nozzle distance and orientation, by insuring adequate cover over the reinforcement, by adjusting the water content of the shotcrete mix or other means.

Repair shotcrete surface defects as soon as possible after placement. Remove and replace shotcrete that exhibits segregation, honeycombing, lamination, voids, or sand pockets. In-place shotcrete not meeting the specified strength requirement will be subject to remediation. Possible remediation options include placement of additional shotcrete thickness or removal and replacement at no cost.

Clean and wet the surface of a joint before adjacent shotcrete is applied. Where shotcrete is used to complete the top ungrouted zone of the nail drill hole near the face, to the maximum extent practical, clean and dampen the upper grout surface to receive shotcrete.

Do not install shotcrete if the ground is frozen. Maintain cold weather protection if the temperature after placement is below 40°F until the in-place compressive strength of the shotcrete is greater than 725 psi. Cold weather protection may require blankets, heating under tents, or other acceptable means. Deposit the shotcrete mix at a temperature of not less than 40°F or more than 100°F.

Suspend shotcrete application during high winds and heavy rains unless suitable protective covers, enclosures or wind breaks are installed. Remove and replace newly placed shotcrete exposed to rain that washes out cement or otherwise makes the shotcrete unacceptable. Provide a polyethylene film or equivalent to protect the work from exposure to adverse weather.

Use 6 to 12-inch strip drains full width of shotcrete (down slope) at six-foot centers to eliminate water build-up behind the shotcrete. Strip drain shall be fully encased in filter media. Drains shall extend beyond the face of the shotcrete at the downhill face. Ensure that bottom ends are open and free of shotcrete.

**Soil Nail Sampling And Testing.** Acceptance of the soil nails will be by the Contractor's certification to SHA stating the material composition and installation conforms to these specifications, combined with visual inspection of the in-place soil nails and shotcrete by SHA. SHA reserves the right to require testing by the Contractor. Any requested testing of the soil nail shall follow appropriate procedures as outlined in FHWA Geotechnical Engineering Circular No. 7 and manufacturer's recommendations. Materials found not in compliance with the requirements shall be rejected. Remove and replaced at no cost.

Soil nails that do not penetrate minimum design length from the slope surface shall be rejected. Do

not remove nails which do not meet minimum design length. An additional nail will be installed within an 18 in. radius of the rejected soil nail.

**Submittals.** Submit the documentations outlined below at least 45 days prior to the start of construction of soil nailing. The contractor is responsible for detailing the general layout of the proposed soil nail wall system. Working drawings shall conform to TC-4.01.

Additional time required due to incomplete or unacceptable submittals shall not be cause for time extension, impact, or delay claims. All costs associated with incomplete or unacceptable submittals shall be at no cost.

Prepare and submit two copies of the submittal. One copy should be submitted to the Engineer. Submit the second copy to the following:

Maryland State Highway Administration  
Engineering Geology Division  
7450 Traffic Drive  
Hanover, MD 21076

Approval of the above submittals does not relieve the Contractor of his responsibility for the successful completion of the work.

The submittal shall include:

- (a) The Contractor shall submit a brief description of at least 3 projects, including the owner agency's name, address, and current phone number; location of project; project contract square foot of soil nail system installed including number of soil nails; and scheduled completion date and actual completion date for the project.
- (b) Design plans, shop drawings and design computations shall be prepared and signed by a registered Professional Engineer licensed in the State of Maryland. Plans and calculations shall include the following:
  - (1) An elevation view indicating elevations at top and bottom of soil nail wall.
  - (2) Length, size, and spacing of soil nails.
  - (3) All culverts, utilities, signs, lights, etc. that affect the soil nail system.
  - (4) Any general notes required for construction of the soil nail.
  - (5) Slope stability computations, including computer output, and an explanation of assumptions and analysis details within the program.
  - (6) Cross section plots showing critical failure planes for internal and global failure modes; and a summary of the critical failure surface(s) search.
  - (7) Cross section plots showing critical failure planes for internal and global failure modes; and a summary of the critical failure surface(s) search.
  - (8) Sliding stability computations.



- (9) Pullout computations.
- (c) The Contractor is responsible for providing the necessary survey and alignment control; soil nail locations and verifying limits of soil nail installation. Submit a Construction work Plan to the Engineer that includes the following.
- (1) The start date and proposed detailed wall construction sequence.
  - (2) Drilling and grouting methods and equipment, including the drill hole diameter proposed to achieve the specified pullout resistance values shown on the plans and any variation of these along the wall alignment.
  - (3) Nail grout mix design, including compressive strength test results (per AASHTO T106/ASTM C109) supplied by a qualified independent testing lab verifying the specified minimum 3-day and 28-day grout compressive strengths. Previous test results for the same grout mix completed within one year of the start of grouting may be submitted for verification of the required compressive strengths.
  - (4) Nail grout placement procedures and equipment.
  - (5) Shotcrete materials and methods.
  - (6) Soil nails testing methods and equipment setup.
  - (7) Identification number and certified calibration records for each test jack and pressure gauge and load cell to be used. Jack and pressure gauge shall be calibrated as a unit. Calibration records shall include the date tested, the device identification number, and the calibration test results and shall be certified for an accuracy of at least 2 percent of the applied certification loads by a qualified Independent testing laboratory within 90 days prior to submittal.
  - (8) Manufacturer Certificates of Compliance for the soil nail ultimate strength, nail bar steel, Portland cement, centralizers, bearing plates, epoxy coating, and encapsulation.

**MEASUREMENT AND PAYMENT.** The soil nail system measured for payment will be the nearest whole number of square feet of treated slope face between within the limits shown on the plans or as determined by the Engineer. Payment will be full compensation for design, working drawings, on-site representation, preparation of the site, mobilization, geotechnical investigation, supply and installation of strip drains, soil nails, shotcrete and welded wire fabric, bearing plates, grout, and for all other material, labor, equipment, tools, and incidentals necessary to complete the work.

**CATEGORY 200  
GRADING**

**REINFORCED SOIL SLOPE**

**DESCRIPTION.** This work shall consist of design, furnishing materials and construction of Reinforced Soil Slope (RSS) to the lines and grades shown on the Plans, cross sections and/or as directed by the Engineer using Geosynthetic Reinforcement. The term “Geosynthetic Reinforcement” shall be considered to be inclusive of geotextile and geogrids and shall be applicable to both primary and secondary reinforcements as shown on the plans.

**MATERIALS.**

Geosynthetic Reinforcement.  
Wire for Welded Wire Face

900  
AASHTO M55

**Reinforced Fill Material.** The reinforced fill material for Reinforced Soil Slopes shall conform to the following requirement:

	Requirement	
Gradation	Sieve Size	Percent Passing (by mass)
	2"	100
	No. 4	50 (max)
	No. 200	7 - 12
PI	Less than 5%	
PH	3-9 (AASHTO T 289)	

AASHTO A-2-6, A-2-7, A-4, A-5, A-6 and A-7 materials are not acceptable as reinforced fill material. The reinforced fill material shall be free from organic, recycled and other deleterious materials.

**CONSTRUCTION.**

The Contractor shall design and construct the RSS in conformance with the typical sections shown on the plans and the following design and construction requirements. The Contractor shall be responsible for all aspects of the RSS design and construction.

**a) Design Criteria.**

The Contractor shall use the following design criteria for the RSS and FHWA NHI-00-043 Mechanically Stabilized Earth Walls and Reinforced Soil Slopes Design and Construction Guidelines.

Criteria		Requirement
Design life		75 years (min)
Total strain in primary reinforcement		10% (max)
Design Traffic Surcharge		250 lb/ft <sup>2</sup>
Embedment length* for primary reinforcement		3-ft (min)
Minimum length of secondary reinforcement		6-ft (min)
Internal Factor of Safety	Internal stability (Internal & compound)	≥ 1.3
	Surficial Stability	≥ 1.3
	Pull-out Resistance	≥ 1.5
External Factor of Safety	Global Stability (deep seated failure)	≥ 1.3
	Failure against rapid drawdown conditions	≥ 1.1
	Sliding	≥ 1.3
	Local bearing failure (lateral squeeze)	≥ 1.3
	Bearing Capacity	≥ 2.5
Vertical spacing of Geosynthetic reinforcement	Primary reinforcement	3-ft (max)
	Secondary reinforcement	12-in (max)

\*The embedded length (Le) is defined as the length of reinforcement behind the most critical sliding surface. The embedded length for each reinforcement layer shall be sufficient to provide adequate pullout resistance as shown by the Contractor's design calculations.

The design of the reinforced soil slope shall consider the maximum ground water table and 100-year water surface elevation of the existing Storm Water Management (SWM) Pond.

**b) Soil Design Parameters:**

**Reinforced Fill materials.** The minimum angle of internal friction ( $\phi$ ), and the effective angle of internal friction ( $\phi'$ ) of the reinforced fill material shall be 32 degrees or greater. The Contractor shall use one of the following tests to determine the shear strength parameters of the reinforced fill material:

- 1) ASTM D 3080 sheared at a slow rate to insure adequate drainage or
- 2) ASTM D 4767 (CU) triaxial tests with the pore pressure measured to determine the effective strength parameters.

The Contractor shall provide at least three shear strength test results conforming that the Reinforced Fill material to be used meets or exceeds the above minimum requirements.

**Retained Soil and Foundation Material.** The above soil properties (table above) are derived based on the existing geotechnical information near the proposed RSS location. It is the Contractor's responsibility to confirm and use these soil parameters. The Contractor has the option of conducting geotechnical investigation at the RSS location for the design of the RSS. The Contractor's geotechnical investigation shall be in conformance with FHWA NHI-00-043 Mechanically Stabilized Earth Walls and Reinforced Soil Slopes Design and Construction Guidelines and applicable AASHTO Guidelines

**c) Drainage.**

A drainage blanket shall be installed along the interface of the retained fill and reinforced fill material to intercept the seepage water. The drainage blanket shall be composed of AASHTO #57 Aggregate wrapped in Class SE geotextile filter and be a minimum of 2/3 of the height of the slope. The drainage blanket shall have 100% coverage for the entire slope. Underdrain pipe shall be used to collect the water from the drainage blanket. Under drain shall be outletted at all low points and at intervals not to exceed 50 feet. A minimum of two outlets shall be provided for each slope. The Contractor shall refer to the typical reinforced soil slope section included on the Contract plans for the details.

**d) Secondary Reinforcement and Surficial Stability.**

Secondary reinforcement shall be used to provide long term surficial stability. Surficial stability calculations for the secondary (intermediate) reinforcement shall be provided. Refer to (a) Design Criteria for surficial stability requirements.

**e) Facing Construction and Erosion Control**

The Contractor shall use Welded Wire Facing for the facing construction. The Contractor shall submit construction details showing the construction of the facing with installation details for the Engineer's approval.

*Welded Wire Facing:* The welded wire facing consists of galvanized welded wire mesh and galvanized wire support struts. The galvanized welded wire mesh shall meet the requirements of AASHTO M 55 and AASHTO M 111. The welded wire mesh shall have minimum length 10 feet, maximum 4-inch by 4-inch mesh opening. The wire used shall have minimum wire size number W 4, and minimum Coating Thickness Grade 65.

Horizontally adjacent facing panels shall be butted together such that no gap between facings exists. Butted together facing panel splices shall be offset from each other in adjacent layers so that the splices do not line up with one another from layer to layer. The maximum height of each welded wire facing shall be 2-ft.

The Contractor shall install permanent erosion control. The installation of SSM permanent erosion control shall be in conformance with the facing construction method selected by the Contractor. As part of the RSS design submission, the Contractor shall submit Slope Erosion Control Plans and installation details for SSM for the Engineer's approval. The contractor shall maintain the surficial stability of the RSS during construction of the project. The RSS shall be vegetated immediately after construction to prevent or minimize erosion due to rainfall and surface runoff.

**f) Geosynthetic Delivery, Storage and Handling.**

Geosynthetic roll identification, storage and handling shall be in conformance to ASTM D 4873. Each shipping document shall include a notation certifying that the material is in accordance with the manufacturer's certificate. Geosynthetic material shall be wrapped with a material that will protect the geosynthetic from damage due to shipment, water, sunlight, mud, dirt, debris and contamination. The protective wrapping shall be maintained during periods of shipment and storage. The geosynthetic roll shall be elevated off the ground and adequately covered to protect them from the following: site construction damage, precipitation, ultra-violet radiation including sunlight, chemicals that are strong acids or strong bases, flames including welding sparks, temperature greater than 140 F, and lower than -20 F and any other environmental condition that may damage the physical property of the geosynthetic. The material shall be accompanied by a certification stating that the geosynthetic material delivered conforms to the properties used in design. This certification shall be given to the Engineer. Damaged geosynthetic shall be replaced by the Contractor, at no cost to the Administration.

**g) On Site Representative.**

The geosynthetic supplier shall provide a qualified and experienced representative with at least five (5) years of geosynthetic construction for RSS on site, for a minimum of 3 days, to assist the Contractor and the Engineer at the start of construction of the Reinforced Soil Slope. The representative shall also be available on an as needed basis as requested by the Contractor or Engineer during construction of the slope.

**h) Excavation and Foundation Preparation**

The foundation surface for the Reinforced Soil Slope shall be level and its width shall be at least the design length of the bottom reinforcing element. The Contractor shall maintain the stability of the back slope of excavation at all times during construction. The Contractor shall direct all surface runoff from adjacent areas away from the RSS construction site.

The RSS foundation shall be prepared, and proof rolled as specified in 204.03.01. Unstable foundation materials encountered during foundation preparation for the RSS shall be removed to the depth as specified by the Engineer. The removed material shall be backfilled with material meeting the requirements of Select Borrow in Section 916 or other equivalent material as approved by the Engineer. Spring Control shall be as directed by the Engineer and in conformance with Section 306.

The Contractor is alerted that boulders have been encountered in the project area and may be encountered during the excavation for the RSS.

**i) Geosynthetic Placement**

The geosynthetic reinforcement shall be installed in accordance with the manufacturer's recommendations, unless otherwise modified by these specifications. The geosynthetic reinforcement shall be placed within the layers of the compacted soil as shown on the plans or as directed.

The geosynthetic reinforcement shall be placed in continuous longitudinal strips in the direction of main reinforcement. Correct orientation of the geosynthetic reinforcement shall be verified by the Contractor and approved by the Engineer. Joints in the machine (strong) direction (perpendicular to the slope) shall not be permitted with geotextile or geogrid. Horizontal coverage of less than 100 percent shall not be allowed unless specifically detailed in the construction drawings. In the case of 100% coverage in plan view, adjacent strips need not be overlapped.

Place only that amount of geosynthetic reinforcement required for immediately pending work to prevent undue damage. After a layer of geosynthetic reinforcement has been placed, the next succeeding layer of soil shall be placed and compacted as appropriate. After the specified soil layer has been placed, the next geosynthetic reinforcement layer shall be installed. The process shall be repeated for each subsequent layer of geosynthetic reinforcement and soil.

**j) Reinforced Fill Material Placement.**

Reinforced fill material placement for the Reinforced Slope shall be in conformance with 204.03 except as modified below:

Reinforced fill material shall be placed, spread, and compacted in a manner that minimizes the development of wrinkles and displacement of geosynthetic reinforcement. Reinforced fill material shall be graded away from the slope crest and rolled at the end of each work day to prevent ponding

of water on the surface of the reinforced soil mass. During construction of the slope, the contractor shall grade the top of the slope to ensure that surface runoff is directed away from the face of the RSS. The Engineer may direct that an earth berm be used to direct runoff away from the face of the RSS. This grading shall be maintained until vegetative growth is established to the satisfaction of the Engineer.

Geosynthetic reinforcement shall be placed to lay flat and pulled tight prior to backfilling. After a layer of geosynthetic reinforcement has been placed, suitable means, such as pins or small piles of soil, shall be used to hold the geosynthetic reinforcement in position until the subsequent soil layer can be placed.

When using geogrid, the geogrid shall be installed on the top of flat surface and be tensioned prior to placement of fill material. No bending or tilting or dip is allowed for the Geogrid. The geogrid shall be tensioned with the help of rods or equivalent material. Sharp, heavy rocks shall not be used to secure the geogrid.

Tracked construction equipment shall not be operated directly upon the geosynthetic reinforcement. A minimum of 6 in. of uncompacted fill is required prior to operation of tracked vehicles over the geosynthetic reinforcement. Turning of tracked vehicles shall be kept to a minimum to prevent tracks from displacing the fill and the geosynthetic reinforcement. Rubber-tired equipment may pass over the geosynthetic reinforcement at speeds less than 10 mph as approved by the Engineer. Sudden braking and sharp turning shall be avoided.

The front 6-inches of the reinforced fill material at the slope face shall be thoroughly mixed with topsoil, seeding and fertilizer to create a vegetated face.

Reinforced fill material shall be compacted to 92% of maximum dry density within  $\pm 2$  percentage points of optimum moisture content when tested as specified in T 180. The frequency T 180 testing shall be one test every 500 cubic yards of reinforced fill material placed.

**k) Installation of guardrail posts, pavement underdrain etc**

The Contractor shall take into consideration the installation guardrails posts and underdrains in the design of the RSS.

The Contractor shall install guardrail posts, pavement under drains, and etc in a manner that prevents bulding of the slope face and prevents ripping, tearing or pulling of the geosynthetic reinforcement. Holes through the geosynthetic reinforcement shall be the minimum size necessary for the guardrail post. The contractor shall demonstrate to the Engineer prior to beginning guardrail post inslattaltion that the installation method will not rip, tear or pull the geosynthetic.

**l) Final Slope Geometry Verification.**

The Contractor shall confirm that as-built slope geometry conforms to approximate geometry

shown in the Contract Documents.

### **CONTRACTOR QUALIFICATIONS**

The Contractor shall have successfully completed at a minimum of three (3) RSS projects within the past five years. The projects shall be identified by project name, location, project description, size, completion date, and contract manager. The Contractor's qualification shall be submitted to the Engineer for review and approval at least 30 days prior to start of the RSS construction.

### **CONTRACTOR SUBMITTALS**

At least 30 working days prior to the construction of RSS, the Contractor shall submit for Administration's approval, three sets of detailed design calculations, working drawings which shall include the geosynthetic certification package, and six sets of inspection verification samples. Geosynthetic samples shall be of sufficient size to permit direct comparison and verification. The calculation and drawings shall be prepared and signed by a professional engineer licensed in the State of Maryland. The reinforced slope design and construction materials shall be approved by the Administration, and all decisions concerning the approval will be final unless directed by the Engineer. No work on the RSS shall begin without written approval of the Engineer. The submittal shall be sent to the Engineer and to the following address:

**Maryland State Highway Administration  
Engineering Geology Division  
7450 Traffic Drive  
Hanover, MD 21076**

Working drawings shall conform to Section TC-4.01 of MDSHA's Standard Specifications for Construction and Materials (July 2008). Design calculations and working drawings shall include the following:

- a) Plan and elevation sheets:
  - I. An elevation view indicating elevations at top and bottom of RSS.
  - II. Length, size, spacing, and type or grade of primary reinforcement, including secondary reinforcement.
  - III. Internal drainage alignment, elevations, slope face exit points and outlet details.
  - IV. Plan view shall reflect the horizontal alignment and shall indicate the offset from the horizontal control line to the front face of the slope.



- V. All culverts, utilities, signs, lights, etc. that affect the reinforced soil slope.
  - VI. Any general notes required for construction of the reinforced soil slope.
  - VII. Limits and extent of reinforced soil fill volume.
  - VIII. Right of Way Limits.
  - IX. Erosion and Sediment Controls.
- b) Cross sections showing limits of construction fill requirements, excavation limits and drainage alignment.
  - c) Geosynthetic reinforcement materials certification package.
  - d) Facing construction details, erosion control for reinforced slopes, and all details for facing modules, showing all dimensions necessary to construct the element, erosion control, reinforcing steel, and the location of reinforcing attachment devices embedded in the panels. All details of the architectural treatment or surface finishes. Material description and properties for erosion control.
  - e) Secondary reinforcement details including material type, spacing, material properties with certification, and construction.
  - f) Temporary slope face support, if required.
  - g) All details for construction of the Reinforced Soil Slope around drainage facilities, overhead sign footings, abutments and other obstructions to geosynthetic placement. If additional steeping of the slope is required at large cross pipes, box culvert, etc., details shall be provided.
  - h) Detailed design computations including:
    - I. Allowable strength computations for the geosynthetic reinforcement. The allowable tensile strength shall be based on the ultimate tensile strength and partial factors of safety approved by the Engineer. The use of an allowable strength without the supporting documentation of the ultimate tensile strength and partial factors of safety will not be acceptable by the Administration.
    - II. Slope stability computations, including computer output, and an explanation of assumptions and analysis details within the program. The reinforced slope stability microcomputer program used for the stability computations must meet the requirements of FHWA NHI-00-043 Mechanically Stabilized

Earth Walls and Reinforced Soil Slopes Design and Construction Guidelines and applicable AASHTO Guidelines.

- III. Cross section plots showing critical failure planes for internal and global failure modes; and a summary of the critical failure surface(s) search.
  - IV. Sliding stability computations.
  - V. Pullout computations.
  - VI. Seismic stability computations, where applicable.
  - VII. Surficial stability calculations.
  - VIII. Erosion control and surficial stability measures considered for permanent stability of the slope
- i) Proposed schedule for construction of the Reinforced Soil Slope including the date of start of construction, sequence of construction detail, and date of seeding and mulching.
  - j) Laboratory testing for gradation, PH, plasticity index test results confirming that the Reinforced fill material meets or exceeds the requirement specified in materials section of this specification.
  - k) The Contractor shall also provide at least three shear strength test results conforming that the Reinforced Fill material to be used meets or exceeds the requirement specified in materials section of this specification.
  - l) The Contractor shall submit three samples (each weighing at least 35 pounds) of the reinforced fill material approved for Reinforced Soil Slopes to the Administration for verification purpose at least 30 days prior to its use.
  - m) Statement of design responsibility as specified in the design requirements of this Specification.
  - n) The Plans and design computations shall be prepared and signed by a registered professional engineer, licensed in the State of Maryland.
  - o) The Contractor shall provide documentation of experience in design, material installation and construction of similar previously constructed Reinforced Soil Slope projects. This includes a list of at least four (4) RSS projects successfully completed by the Contractor.

Additional time required due to incomplete or unacceptable submittals will not be cause for time extension, impact, or delay claims. All costs associated with incomplete or unacceptable submittals

shall be at no additional cost to the Administration. Approval by the Engineer will not relieve the Contractor of its responsibilities to design and install the RSS in accordance with the plans and specifications.

**MEASUREMENT AND PAYMENT.**

Reinforced Soil Slopes will be measured and paid for at the Contract bid unit price per vertical square foot. Payment will be full compensation for design, working drawings, on-site representation, preparation of the site, excavation, geotechnical investigation, supply and installation of geosynthetic reinforcement, all fill materials (both in the reinforced zone and behind the reinforced zone), laboratory testing, facing system, soil stabilization matting, any temporary forms for facing support, any additional borrow required, compaction of backfill materials, spring control, drainage blanket and underdrain, surficial stability control, temporary earth retaining systems, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

Excavation of unsuitable foundation materials located within the limits for the Reinforced Soil Slopes will be measured and paid for at the Contract bid unit price per cubic yard for Class 1-A Excavation. Backfill material for these areas will be measured and paid for at the Contract bid unit price per cubic yard for the pertinent excavation or borrow item.

**CATEGORY 400  
STRUCTURES**

**SECTION 440 — PRESTRESSED CONCRETE BEAMS AND SLAB PANELS**

**440.02 MATERIALS**

**DELETE:** 440.02.05 in its entirety.

**440.03 CONSTRUCTION**

**440.03.20 Erection.**

**DELETE:** Subsection (g) in its entirety.

**INSERT:** The following.

- (g) Grout the shear keys by overfilling the joints. Drive the grout or compactly tamp it into the keyways; do not vibrate. After 5 minutes, strike off the excess grout flush with the top of the panels. Follow the manufacturer's recommendations for grouting in cold or hot weather.

**DELETE:** Subsection (k) in its entirety.

**INSERT:** The following.

- (k) Allow a minimum of 24 hours between grouting of shear keys and final tensioning of lateral tie rods provided temperature is 70 F and above when shear key grout is placed. If temperature is below 70 F during the initial 24 hours, cure for a total of 72 hours or per the approved manufacturers specifications. Contractor has the option to provide cold weather protection to ensure temperature does not fall below 70 F during the initial 24 hours.

**440.03.21 Bearing Pads.**

**DELETE:** The first sentence in the second paragraph, "Coat the surfaces... epoxy adhesive."

**INSERT:** The following.

Coat the surfaces of the concrete bearing areas that will be in contact with the bottom of the bearing pads and the full contact area of the bottom of the bearing pads with epoxy adhesive.

**DELETE:** 440.03.22 in its entirety.

**INSERT:** The following.

**440.03.22 Placing and Finishing Concrete Overlay.** Place and finish the overlay as specified in 420.03 including superstructure placement restrictions.

**SPECIAL PROVISIONS INSERT**  
440 — PRESTRESSED CONCRETE BEAMS AND SLAB PANELS

CONTRACT NO. BA0065172  
2 of 2

Unless otherwise noted on the contract plans, place the entire bridge slab overlay in one continuous pour. No transverse or longitudinal joints will be permitted.

Place the finishing machine's supporting rails outside the overlay limits. Do not use hold down devices that are shot or drilled into the concrete. Submit plans for anchoring support rails and the concrete placing procedure for approval.

Take precautions to secure a smooth riding surface as specified in 420.03.07(d). Prior to placement operations, review the equipment, procedures, and personnel with the Engineer. Place the concrete overlay using the following sequence of operations.

- (a) Placement of the overlay may occur once the parapet and curbs have cured for 24 hours. Concrete curbs and parapets may be placed once the lateral tie rods have been tensioned to the final tensioning force and the shear key grout has met the curing requirements.
- (b) Before placing the reinforcing steel mat, thoroughly clean and water blast the entire surface that will be in contact with the overlay then clean the surface with air blast.
- (c) Place and tie the support chairs to the underside of the reinforcing mat to locate the reinforcing mat 2 1/2 in. clear of the top of the deck overlay .
- (d) Set-up the finishing screed and make a dry run of the finishing operation to verify that the reinforcing is properly located and the finished deck elevation shown on the plans can be achieved.
- (e) Prior to concrete placement, air blast the surface to receive the overlay to remove any foreign material that may have collected since the water blasting. Following the air blast, moisten the entire surface with a misting operation for at least 1 hour immediately prior to the placement of the concrete overlay. Keep the top surface of the prestressed slabs moist until the placement of the overlay and throughout the placement operation and remove any puddling of water prior to and throughout the concrete placement.
- (f) Allow no vehicular traffic on the prepared deck surface before overlay placement.

**SPECIAL PROVISIONS**

CONTRACT NO. BA0065172

456.01 — TREE BARK/FRACTURED GRANITE

1 of 1

**CATEGORY 400  
STRUCTURES**

**SECTION 456 — ARCHITECTURAL TREATMENT**

**456.01 TREE BARK/FRACTURED GRANITE.**

**456.01.01 DESCRIPTION.** This work shall consist of constructing a tree bark/fractured granite surface on the concrete locations specified in the Contract Documents. This work shall include developing, furnishing and placing form liners and applying a color system to the finished concrete surface as shown on the Plans or directed by the Engineer.

**Form Liner.** The tree bark/fractured granite finish shall be consistent from edge to edge of form liner.

- (a) Tree Bark. Fitzgerald Form Liners, Inc. Pattern No. 16027.
- (b) Fractured Granite. Fitzgerald Form Liners, Inc. Pattern No. 16987.
- (c) Tree Bark. Architectural Polymers Pattern No. 202.
- (d) Fractured Granite. Custom Rock Pattern No. 2902.
- (e) Alternates. As approved by the Engineer.

**456.01.02 MATERIALS.** Refer to 456.00.

**Concrete Stain.** The color of the concrete stain shall be as specified in 456.00.

**456.01.03 CONSTRUCTION.** Refer to 456.00.

**456.01.04 MEASUREMENT AND PAYMENT.** Development and preparation of working drawings, the development and furnishing of all form liners, the construction and finishing of all sample panels, the application of the Falls Road form liner finish including application of colors, and all materials, labor, equipment, tools, and incidentals necessary to complete the work will not be measured but the cost will be incidental to the Contract price for the pertinent Concrete or structure item.

**CATEGORY 400**  
**STRUCTURES**

**SECTION 456 — ARCHITECTURAL TREATMENT**

**456.07 EXPOSED AGGREGATE.**

**456.07.01 DESCRIPTION.** This work shall consist of constructing an exposed aggregate finish surface on the concrete locations specified in the Contract Documents. This work shall include developing and furnishing the finished concrete surface as shown on the Plans or directed by the Engineer.

**456.07.02 MATERIALS.** Refer to 456.00.

**Aggregate.** The coarse aggregate shall be AASHTO size no. 57 washed quartz gravel.

**456.07.03 CONSTRUCTION.** Refer to 456.00.

Care shall be taken to prevent cement laden spray and spatter created from the process of exposing the aggregate from adhering to any other finished surfaces. Surfaces shall be washed to remove cement laden spray, dust, and other foreign matter. When this finish is performed in a prefabrication plant, it shall be done prior to shipping. Abrasive blasting is not an acceptable method for exposing the aggregate. Care shall be taken to produce a consistent, high quality finish.

When used for stacked panel system noise barriers, the Contractor shall take extreme care to ensure that the panels stacked within a single frame match in quality and appearance. Aesthetic inspections for all panels shall be made in out-door lighting conditions. Panels failing to conform to these requirements may be rejected.

**Concrete Stain.** Concrete stain shall not be applied to the exposed aggregate surfaces.

**456.07.04 MEASUREMENT AND PAYMENT.** Development and preparation of working drawings, the construction and finishing of all sample panels, the application of the exposed aggregate finish, and all materials, labor, equipment, tools, and incidentals necessary to complete the work will not be measured but the cost will be incidental to the Contract price for the pertinent Concrete or structure item.

**CATEGORY 400**  
**STRUCTURES**

**SECTION 456 — ARCHITECTURAL TREATMENT**

**456.03 CONSTRUCTION**

353 **INSERT:** The following after 456.03.08

**Architectural Treatment Type and Location.** The type of architectural treatment and its location shall be as follows:

**TABLE 456.00**

<b>ARCHITECTURAL TREATMENT</b>			
<b>STRUCTURE</b>	<b>TREATMENT</b>	<b>COLOR*</b>	<b>LOCATION</b>
XXXXX	Tree Bark/Fractured Granite	20140	Inside and Outside faces of parapets where required. All retaining walls, not including copings.
XXXXX	Tree Bark/Fractured Granite	20140	Highway Side of Noise Barrier
	456.07	None	Residential Side of Noise Barrier

\*Color of stain shall match Federal Standard 595.





**SPECIAL PROVISIONS**  
**SYNTHETIC HOT APPLIED STAMPED SURFACE**

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A manufacturer's representative must be on site to provide technical assistance during surface preparation, material placement and during any necessary remedial work.

**Quality Assurance.** The Administration will provide quality assurance by:

- (a) Verifying that the imprinting templates and surface treatments are supplied from the same manufacturer.
- (b) Monitoring the Contractor's conformance with the Quality Control Plan.
- (c) Verifying that the Contractor Surface Treatments conform to the materials specifications.

**Control Strip Test.** At least 2 weeks prior to the applying of the stamped patterned synthetic asphalt pavement treatment, a 4 ft x 4 ft control strip of the completed stamped pattern and treatment shall be made. Determine the location of the test strip as approved by the Engineer.

**Pavement Surface Preparation.** Grind the area where the material is to be placed to the depth as specified by the manufacturer or as shown on the plans. Saw cut the installation area boundaries prior to excavating the existing material. The pavement surfaces shall be dry and free of sand, dirt, oil, grease, foliage, and any other contaminants that may interfere with the bond between the epoxy binder material and existing surfaces prior to treating and stamping. Surfaces may need to be washed with a mild detergent, rinsed, and dried using a hot compressed air applicator. Clean contaminated surfaces to a width of 2 to 3 ft outside of proposed treatment area. Cover and protect all non removed pavement markings and utilities prior to placement. Clean and fill all inadequately sealed joints and cracks, including shoulder areas. Any pavement, utilities or markings damaged in the preparation process shall be repaired or replaced at no additional cost to the Administration.

**Pavement Markings.** Stamped patterned synthetic asphalt pavement treatment shall not be used as a roadway marking for traffic control. Pavement markings shall not be installed within the areas designated for the stamped pattern.

**Utility Cuts.** Complete all utility, traffic loop detector and other items requiring a cut and installation under the asphalt surface prior to installation of the stamped patterned synthetic asphalt pavement treatment.

**Formulation Selection.** Purchase and install materials that conform to the Manufacturer's and this Specification. All containers of materials shall be unopened and sealed by the Manufacturer. No previously opened containers shall be accepted for use in this project.

**Pattern Template.** Obtain the stamping pattern template from the same manufacturer of the sealing materials. Check the pattern imprint depth by taking random sample lots such that the sum of the grid area sample units is approximately 10 percent of the total treated area. Depth can be measured with a standard ruler.

If any of the chosen sample areas have an imprint depth that is less than 5/16 in., re-stamp the entire imprinted area while the epoxy is still in its molten state. If the epoxy treatment has cooled beyond its molten state, remove the entire imprinted epoxy area from the project site as waste. A new epoxy treatment will then be placed and stamped according to this specification.

**Weather.** Complete the stamping and sealing process in conformance with the manufacturer's climactic and temperature range recommendations. No asphalt treatment shall be done when the ambient temperature will be less than 45 F or greater than 90 F, or when precipitation occurs within a 12-hour period before or after the start of the treatment process.

**Epoxy Surface Treatment Material Installation.** Mix the surface treatment material using a low speed machine according to manufactures recommendations. Place the surface treatment in accordance with the manufacturer's recommended methods at the thicknesses and geometries shown in the contract documents. The mix may be machine or hand applied onto the cleaned surface at a minimum coverage rate of 0.085 lb / cu ft.

Distribute the epoxy material uniformly over the section to be treated and heated within the temperature range recommended by the manufacturer. Operations shall proceed in such a manner that will not allow the epoxy material to chill, set up, dry, or otherwise impair retention of the covered aggregate.

Uniformly spread hand applied binder onto the substrate surface by means of a serrated edged squeegee. Machine applied distributing equipment shall include accurate measuring devices and calibrated containers and thermometers for measuring the binder temperature prior to placement.

Interfaces with adjacent surfaces shall be flush, providing smooth transition from surface to surface. If material is placed over existing pavement, construct 13/16 in. deep by 6 in. wide keyways at all edges. Use a hot compressed air lance immediately prior to application to remove any remaining dust and to provide a good adhesion to the substrate. Precautions to protect the immediate perimeter around the installation are to be taken. Install grade control devices to ensure the required 13/16 in. thickness of the epoxy material. Immediately apply the silica aggregate at a rate of 1.95 ±0.1 lb / sq ft. The placement of this material does not require any compaction.

**Imprinting the Pattern Design.** Stamp the pattern into the semi molten material immediately after the aggregate application, using an approved mold capable of providing a 5 / 16 +/- 1/16 in. deep impression in accordance to the design details shown on the plans. Use a manufacturer approved release agent to prevent the epoxy material from sticking to the mold.

**Curing.** Allow the treatment to cure in accordance with manufacturer recommendations, approximately 5 hours at an ambient temperature of 70 F. Add 1 hour cure time for every 10 F less, and an hour less for every 10 F more, to prescribed maximum and minimum temperature limits. While curing, remove the excess aggregate by hand or suction sweeping prior to opening to traffic. Additional sweeping may be necessary after the treatment fully cures.

**SPECIAL PROVISIONS**  
**SYNTHETIC HOT APPLIED STAMPED SURFACE**

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Any pavement, utilities or pavement markings damaged in the installation process shall be repaired or replaced at no additional cost to the Administration. The area of the synthetic asphalt pavement surface treatment shall be protected from traffic and environmental effects until the treatment is completely imprinted, set, dried and cured according to the manufacturer's specifications.

**Observation and Maintenance Period.** The Contractor shall be responsible for any defects in materials and workmanship of the treatment product for a period of 2 years from the date of completion of the roadway project. Refer to GP 4.10.

**MEASUREMENT AND PAYMENT.** Synthetic Hot Applied Stamped Surface will be measured and paid for the Contract unit price per square foot for the imprinting and treatment complete. The payment will be full compensation for grinding, pavement preparation, furnishing and installing the imprint and treatment product, testing, and for all material, labor, equipment, tools, and incidentals necessary to complete the work required.

**CATEGORY 500**  
**PAVING**

**SECTION 500 — TUBULAR MARKERS**

**DESCRIPTION.** Furnish and install tubular markers, and surface mount or ground mount bases as specified in the Contract Documents, or as directed by the Engineer.

**MATERIALS.**

Tubular Markers	QPL
Reflectorization	950.03

Provide tubular markers that comprise of a tubular mast and a surface mount or a ground mount base.

The mast shall have a diameter of 2 to 2.5 in. which remains constant along its length, and shall be 36 in. long. The mast shall be formed of a durable, non-discoloring, co-extruded polyethylene material. The top of the mast shall capped to prevent the intrusion of water. The bottom of the mast will be designed to be compatible with the base, and be reinforced where it inserts into the base.

**Flexibility.** The mast shall be tested for flexibility as follows:

One mast will be selected at random, conditioned at 100 degrees Fahrenheit for 2 hours, and then bent at 90 degrees. The time required for the post to straighten will be recorded, and the mast reconditioned for 20 minutes at 100 degrees. The bending/conditioning process will be repeated for a total of 5 bends, with all times to straighten recorded. If the mast takes longer than 60 seconds to straighten for any cycle, the tubular marker is unacceptable. If the mast exhibits any splits or cracks which are open from the exterior to the interior, the tubular marker is unacceptable.

**Color.** The tubular markers mast color shall meet the requirements of the MUTCD and shall be as specified in the contract documents. The color shall be integral to the material from which the post is formed. Painted posts are not acceptable.

**CONSTRUCTION.** The mast will be designed to be inserted into a surface or ground mount base and secured by a pin lock. The connection will securely hold the mast upright, while allowing for the masts removal and replacement, using the same base, when the mast is damaged.

The retroreflective bands shall consist of 3 in. strips of retroreflective material which go completely around the mast. A minimum of 2 bands will be used. The top band will be located 2 in. from the top of the tubular markers. Each band shall be separated from the band above by a minimum of 2 in.

**SPECIAL PROVISIONS**  
500 — TUBULAR MARKERS

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The surface mount base shall be held in position by a bonding epoxy, butlepac, or thermoplastic material as recommended by the manufacturer. Each base shall have a locking mount compatible with the mast. When secured to the roadway, the base shall not project more than 3 in. above the roadway.

The ground mount base shall be installed in accordance with manufacturer's specifications.

**MEASUREMENT AND PAYMENT.** Tubular Markers will be measured and paid for at the contract unit price per each. The payment will be full compensation for layout, furnishing and placing of the tubular marker, surface or ground mount base, and for all labor, equipment, tools and incidentals necessary to complete the work.

**CATEGORY 500**  
**PAVING**

**SECTION 525 — PORTLAND CEMENT CONCRETE SPALL REPAIR**

**525.01 DESCRIPTION.**

Repair spalled areas at various locations as specified in the Contract Documents or as directed. Spalling consists of small areas of cracking, breaking, chipping, or fraying of portland cement concrete (PCC) slabs that typically occur within 2 ft of the edge of joints. Some spalling may occur in the middle of the slab away from the joints.

**525.02 MATERIALS**

Rapid Hardening Cementitious Materials for Concrete Pavement Repair	902.14
Portland Cement Concrete Mix #9 using No 7 aggregate	902.10
Epoxy Adhesive	921.04

**525.03 CONSTRUCTION.**

Repair spalled areas according to the following.

**525.03.01 Repair Guidelines.**

- (a) Rapid Hardening Cementitious material or Portland Cement Concrete Mix #9 using No. 7 aggregate may be used in spalled areas that are less than 4 ft<sup>2</sup> and less than 3 in. deep.
- (b) Use Portland Cement Concrete Mix #9 using No. 7 aggregate only in spalled areas are 4 ft<sup>2</sup> or greater or when the known depth is 3 in. deep or more. Rapid-hardening cementitious materials with extender aggregate may be used "instead of Mix #9.
- (c) The maximum repair width shall not be greater than one-third of the travel lane.
- (d) Repair areas greater in width than one-third of the travel lane, deeper than one-third of the slab thickness, or where reinforcing steel is exposed as a Type I or Type II full-depth patch as specified in Section 522.

**525.03.02 Repair Procedure:** Refer to Section 522 and the following.

- (a) Sound the area around the spalling with a light hammer to locate the extent of the repair. Mark the perimeter 3 in. beyond the delamination marks.

**SPECIAL PROVISIONS INSERT**  
**525 — PORTLAND CEMENT CONCRETE SPALL REPAIR**

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- (b) Do not make repairs on spalls less than 6 in. long and less than 1.5 in. wide.
- (c) Combine any two spalled areas less than 2 ft apart into one area of repair.
- (d) Make a vertical saw cut along the outside perimeter of the repair area using a diamond-bladed saw set to a depth of approximately 2 in.
- (e) Use a chipping hammer fitted with a spade bit having a maximum weight of 30 lbs. to remove the unsound concrete until sound and clean concrete is exposed along the entire bottom of the repair area. Expose the area to a depth of no more than 1/3 of the slab thickness. When more chipping is required, or when any reinforcing steel is exposed, repair the area as specified in Section 522.
- (f) Removal of spalled or delaminated concrete may be performed by carbide milling rather than sawing and chipping to a depth of no more than 1/3 of the slab thickness. When any reinforcing steel is exposed, repair the area as specified in Section 522.
- (g) Sound the bottom of the repair area with a light hammer to locate any remaining weak spots.
- (h) Clean the repair area thoroughly of all loose and foreign material.
- (i) Coat the repair area with an epoxy bonding compound according to C881 Type V.
- (j) Place the repair material in one continuous operation. Consolidate the concrete using spud vibrators or as recommended by the manufacturer. Finish the repair as specified in 522.03. Trowel the repair outward to push the repair material against the walls of the repair.
- (k) Cure the repair as specified in 522.03.11.

**525.04 MEASUREMENT AND PAYMENT.**

Portland Cement Concrete Spall Repair will be measured and paid for at the Contract unit price per cubic yard for the pertinent portland cement concrete pavement item. The payment will be full compensation for all saw cutting, carbide milling, chipping, concrete, rapid hardening cementitious materials, epoxy bonding compound, cleanup of the patched areas, forms, reinforcement steel, chairs, epoxy coating, finishing, curing, joints, joint construction, joint saw cutting, joint sealing, tack coat, all hauling of materials, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.



**SPECIAL PROVISIONS INSERT**  
557 — SNOWPLOWABLE RAISED PAVEMENT MARKERS

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**CATEGORY 500**  
**PAVING**

**SECTION 557 — SNOWPLOWABLE RAISED PAVEMENT MARKERS**

**557.03 CONSTRUCTION**

**557.03.03 Quality Control Test Strip.**

**DELETE:** The last sentence.

**INSERT:** The following.

Repair or replace any incorrect groove cuts and any incorrect holder placements within the test strip at no additional cost to the Administration.

**CATEGORY 600**  
**SHOULDERS**

**SECTION 603 - SIDEWALKS**

**INSERT:** The following after the first paragraph.

The minimum width for concrete sidewalk and/or sidewalk ramps shall be 5'-0". A Design Waiver approved by the Director or District Engineer of the lead design office must be obtained for any locations where the width of sidewalk is less than 5'-0".

**603.03 CONSTRUCTION**

**603.03.01 Concrete Sidewalks.**

**DELETE:** 603.03.01(f) in its entirety.

**INSERT:** The following.

**(f) Cold Weather Construction and Curing.** Refer to 520.03.02 and 520.03.12, except the requirement for an approved spraying machine with drive wheels is waived when using the liquid membrane forming compound method. Do not allow pedestrian and vehicular traffic during the curing period.

**603.04 MEASUREMENT AND PAYMENT.**

**DELETE:** 603.04 in its entirety.

**INSERT:** The following:

**603.04 MEASUREMENT AND PAYMENT.** The payment will be full compensation for all excavation, backfill, concrete, asphalt, disposal of excess or unsuitable material, forms, reinforcement when specified, joints, sub-grade preparation, sealer, compaction, vertical adjustment of existing utilities, curing, finishing, and for all materials, labor, equipment, tools, and incidentals necessary to complete the work.

The Contract Unit Price for Concrete Sidewalk and/or Asphalt Sidewalk shall include vertical adjustments of existing utilities. Vertical adjustment will include any required coordination and for all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Temporary and permanent stabilization of disturbed area for Sidewalk installation shall be incidental to the pertinent item and shall include all necessary backfill, topsoil, reseeding, sod, seed and mulch, and for all materials, labor, equipment, tools and incidentals necessary to temporarily or permanently stabilize the disturbed area adjacent to the Sidewalk installation.

When existing concrete or asphalt sidewalk is removed and replaced with new concrete sidewalk, the cost to remove the existing sidewalk will be incidental to the Contract unit price for 5 Inch Concrete Sidewalk or Asphalt Sidewalk. When existing concrete

**SPECIAL PROVISIONS**  
603 — SIDEWALKS

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or asphalt sidewalk is removed and not replaced the cost of the removal will be paid for at the Contract unit price for Class 2 Excavation.

**603.04.01** Concrete Sidewalks will be measured and paid for at the Contract unit price per square foot of finished surface including sidewalk ramps.

**603.04.02** Asphalt Sidewalk will be measured and paid for at the Contract unit price per ton for the mixture placed.

**CATEGORY 600**  
**SHOULDERS**

**BRICK AND STONE SIDEWALK**

**DESCRIPTION.** Remove and salvage existing brick or stone sidewalk and construct new brick or stone sidewalk at locations specified in the Contract Documents or as directed by the Engineer.

**MATERIALS.**

Mortar Sand	901.01
Brick	903.03
Slate	-----
Curing Materials	902.07
Form Release Compound	902.08
Concrete Mix No.3	902.10
Joint Sealer	911.01
Preformed Joint Filler	911.02

**CONSTRUCTION.** Remove sections of the existing brick or stone sidewalk and stockpile as required for use in the proposed sidewalk. Note the color and type of brick or stone used on the existing sidewalk as this information will be used to replicate and construct the areas of proposed sidewalk.

Lay brick or stone as directed by the Engineer and according to the American's With Disabilities Act (ADA) Policy and Guidelines. Place the proposed or reset brick or stone sidewalk on a concrete base layer, 3 in. thick.

Place a thin layer of leveling sand between the concrete base layer and brick or stone layer in order to ensure the top of bricks or stones are level within the requirements of American's With Disabilities Act (ADA) Policy and Guidelines. Brush sand over completed brick or stone surface to fill gaps between adjacent bricks or stones.

Supply samples of the new brick or stone to the Engineer for comparison to the existing material and approval prior to construction of the proposed sidewalk.

Refer to 603.03 for additional construction details.

**MEASUREMENT AND PAYMENT.** The payment will be full compensation for the removal and stockpiling of existing brick or slate, additional brick or slate, concrete base, leveling course, sand, forms, resetting, excavation, backfill, vertical adjustment of existing utilities, disposal of excess material, joint sealer, and for all material, labor, equipment, tools, and incidentals

**SPECIAL PROVISIONS**  
**BRICK AND STONE SIDEWALK**

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necessary to complete the work.

The removal and salvaging of existing brick or stone sidewalk will be measured in the original position and paid for at the contract unit price per square foot of Remove and Salvage Brick and Stone Sidewalk.

The removal and resetting of existing brick or stone sidewalk will be measured in the original position and paid for at the contract unit price per square foot of Remove and Reset Decorative Brick Sidewalk.

Brick and Stone Sidewalk will be measured and paid for at the contract unit price per square foot of Brick Sidewalk.

The Contract Unit Price for Brick, Stone or Remove and Reset Decorative Brick Sidewalk shall include vertical adjustment of existing utilities. Vertical adjustment will include any required coordination and for all materials, labor, equipment, tools, and incidentals necessary to complete the work.

**CATEGORY 600**  
**SHOULDERS**

**SECTION 604 — CONCRETE TRAFFIC BARRIERS**

**604.04 MEASUREMENT AND PAYMENT**

**DELETE:** 604.04.03 in its entirety.

**INSERT:** The following:

**604.04.03** Reflective Delineators will not be measured and the cost will be incidental to the pertinent Concrete Traffic Barrier, Concrete Traffic Median Barrier or Concrete Traffic Barrier Transition item. The spacing and location shall be as specified in Standards MD 665.02, MD 665.03 and MD 665.04.

**CATEGORY 800**  
**TRAFFIC**

**AS-BUILT ITS PLANS**

**DESCRIPTION.** Provide As-Built construction plans as specified in the Contract Documents or as directed by the Engineer.

**MATERIALS.** Submit the As-Built plans and construction details on CD-ROM(s) utilizing the latest Microstation format used by the Administration's Office of Traffic & Safety. In addition, provide a hard copy of the As-Built plan(s).

**CONSTRUCTION.** As-Built construction information shall indicate the exact location and size of all conduits, poles, pedestals, handholes, detectors, cameras, signals, and other equipment, and the routing and destination of all wiring to within 6 in. of actual location as dimensioned and referenced to physical features. A construction-details listing shall also be provided.

- (a) Submit As-Built information in latest Microstation format used by the Administration's Office of Traffic & Safety and also, adhering to the latest standard features table developed by the Office of Traffic and Safety. The standard features table and current Microstation format can be obtained by contacting the Chief, Traffic Engineering Design Division. If available, the Administration will furnish the contractor with existing design plans in Microstation format. Create the base plans for the As-Built in Microstation as required in the Contract Documents using one of the following methods:
  - (1) If neither electronic files nor hardcopies of the plans are available, the contractor shall re-survey to create the As-Built plans.
  - (2) If a hard copy only of the plan(s) is/are available, digitize existing plans to create the As-Built plans.
  - (3) If electronic files are available, the contractor shall use existing plan on disk to create the As-Built plans.
- (b) As-Built for traffic signal plans shall have a 1"=20' scale.
- (c) As-Built for ITS systems shall have a 1"=50' scale showing all system equipment. Provide all necessary detail as it relates to the system, including connection diagrams for the ITS components.

**MEASUREMENT AND PAYMENT. MEASUREMENT AND PAYMENT.** As-Built plans will be measured and paid for at the contract Lump Sum price bid. The payment will be full compensation for all consulting and survey fees, materials and other equipment necessary to complete the work, including submitting the final product in hard copy and Microstation format on CD-Rom.

**CATEGORY 800**  
**TRAFFIC**

**AS-BUILT LIGHTING INVENTORY**

**DESCRIPTION.** Provide as-built lighting inventory information to the Administration for use in the Asset Data Warehouse. Data provided shall be in the appropriate format as described below.

**MATERIALS.** Mapping Grade Global Positioning System (GPS) receiver and software capable of providing the output as described herein.

A data dictionary including input fields will be provided by the Administration to be used with the GPS receiver. GPS receiver shall be compatible with Terra Sync and Pathfinder Office software currently being used by the Administration.

**CONSTRUCTION.** Collect as-built lighting inventory data for all new and relocated light poles, manholes/handholes, lighting panels and structures (sign structures with lighting) including the data fields described below. Existing equipment which is to remain at a new or reconstructed interchange shall be captured as part of the inventory.

Collect as-built lighting inventory data for all modified light poles and structures (sign structures with lighting) including the data fields described below.

Provide data in hard copy and digital spreadsheet formats. The following fields shall be included and used as Column Headings. The order in which they are shown below shall be matched from left to right in the spreadsheet provided by the contractor.

**Light Poles:**

EASTING (X) COORDINATE LOCATION DATA  
NORTHING (Y) COORDINATE LOCATION DATA  
NUMBER OF LIGHTS (Per Pole)  
POLE HEIGHT  
ARM LENGTH  
WATTAGE  
COMMENTS  
ON/OFF  
LIGHT\_POLES\_ID  
BASE TYPE  
BULB TYPE  
EXIT NUM  
INTERCHANGE/INTERSECTION NAME  
DATE COLLECTED



**SPECIAL PROVISIONS**  
AS-BUILT LIGHTING INVENTORY

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**Lighting Panels:**

EASTING (X) COORDINATE LOCATION DATA  
NORTHING (Y) COORDINATE LOCATION DATA  
AMPERAGE  
COMMENTS  
METER NUM UNMETERED  
LIGHT\_PANELS\_ID  
DATE COLLECTED  
COMMENTS

**Structures (Sign structures with lighting):**

EASTING (X) COORDINATE LOCATION DATA  
NORTHING (Y) COORDINATE LOCATION DATA  
NUMBER OF LIGHTS  
LUMITRACK  
LIGHTING\_STRUCTURES\_ID  
STRUCTURE TYPE  
LED  
DATE COLLECTED  
COMMENTS

**Manholes/Handholes:**

EASTING (X) COORDINATE LOCATION DATA  
NORTHING (Y) COORDINATE LOCATION DATA  
DATE COLLECTED  
COMMENTS

**GPS location information shall conform to the following requirements:**

- (a) Mapping grade GPS receivers shall be used which have sub-meter accuracy.
- (b) The data provided must be able to be post-processed as necessary after data gathering has taken place using Terra Sync and Pathfinder office software suites
  - (1) Projection - NAD\_1983\_HARN\_StatePlane\_Maryland\_FIPS\_1900\_Feet
  - (2) Geographic Coordinate System - GCS\_North\_American\_1983\_HARN
  - (3) Datum - D\_North\_American\_1983\_HARN\_Feet
- (c) Units of distance shall be published in US Survey Feet.
- (d) All horizontal location information shall be Easting (X) and Northing (Y).

**SPECIAL PROVISIONS**  
**AS-BUILT LIGHTING INVENTORY**

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As-Built lighting inventory data shall be submitted to the Assistant District Engineer for Maintenance at the following locations:

District 1:	P.O. Box 2679, 660 West road, Salisbury MD 21802	410-677-4010
District 2:	615 Morgnec Rd, Chestertown MD 21620	410-810-3250
District 3:	9300 Kenilworth Ave, Greenbelt MD 20770	301-513-7304
District 4:	320 West Warren Road, Hunt Valley MD 21030	410-229-2361
District 5:	138 Defense Highway, Annapolis MD 21401	410-841-1013
District 6:	1251 Vocke Road, LaVale MD 21502	301-729-8457
District 7:	5111 Buckeystown Pike, Frederick MD 21704	301-624-8105

**MEASUREMENT AND PAYMENT.** As-Built Lighting Inventory Data will not be measured but the cost will be incidental to other pertinent items in the Contract Documents and will include GPS receivers, software and for all material, labor, equipment, tools and incidentals necessary to complete the work.

As-Built Lighting Inventory data shall be collected for all new and relocated light poles, manholes/handholes, lighting panels and structures (sign structures with lighting). Lighting systems will not be taken over for maintenance by the Administration until As-Built Lighting Inventory Data is received and accepted as correct by the Administration.

**CATEGORY 800**  
**TRAFFIC**

**BACKUP UPS SYSTEM FOR CCTV CAMERAS**

**DESCRIPTION.** Furnish and install rack-mounted, commercial-grade, software-driven microprocessor-controlled, double-conversion battery-backup UPS power systems, battery systems, and rack-mounted outlet strips for Closed-Circuit Television (CCTV) traffic cameras and other CHART devices as shown in the Contract Documents or as directed by the Engineer.

**MATERIALS.** The backup system shall meet the following requirements.

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FCC Part15 Subpart B Class A  
CE

**CONSTRUCTION.**

**UPS System.** The UPS system shall be a digital, true sine wave, always on-line (double-conversion), solid state, microprocessor controlled power conditioner and controlled high-frequency inverter and battery backup system, utilizing insulated-gate bipolar transistor (IGBT) technology.

- (a) Capacity: 2.0 kVA (1400 watts).
- (b) The system shall continuously regenerate and condition the AC output sine wave to insure that 100 percent of the power supplies all connected loads, whether the system is operating on the public utility or on batteries.
- (c) The UPS system shall be capable of operating at its rated power level with all equipment that is connected to the output outlets, regardless of the composition of the load. The UPS shall produce all digital fully regenerated, conditioned and true sine wave power that is fully compatible with CCTV cameras and control equipment, including:
  - (1) CCTV camera assemblies, including pan/tilt/zoom mechanisms.
  - (2) Heaters that are an integral part of the CCTV camera or lens assembly.
  - (3) CCTV Local Control Units (LCU's).
  - (4) Routers and other pieces of equipment that employ plug-in transformers or power packs as a power source.
- (d) The normal operating mode shall be continuous regenerated power (double-conversion).

**SPECIAL PROVISIONS**  
**BACKUP UPS SYSTEM FOR CCTV CAMERAS**

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- (e) The UPS shall be SNMP ready and include local and remote communication capabilities.
- (f) The UPS shall be equipped with an Ethernet RJ-45 communication port. The UPS shall be Ethernet ready, regardless of user readiness to deploy system Ethernet capability.
- (g) The UPS shall be equipped with a back-lit programmable LCD front panel display to allow for monitoring of the UPS and batteries.
- (h) Overcurrent capacity. 110% for 10 minutes.  
200% for .05 seconds.  
150% for 10 seconds (45 second interval).
- (i) Output voltage range. 85V to 135VAC.
- (j) Voltage regulation.  $\pm 2\%$  Max.
- (k) Frequency: 60Hz.
- (l) Frequency range.
  - (1) Normal (Utility Power) Operation:  $\pm 1\%$  Max.
  - (2) Battery Operation:  $\pm 0.5\%$  Max.
- (m) Voltage distortion.
  - (1) Linear load 3% Max.
  - (2) Non-linear load 7% Max.
- (n) Transient voltage regulation.
  - (1) Input Voltage step:  $\pm 5\%$  Max.
  - (2) 100% step load:  $\pm 5\%$  Max.
- (o) Power Factors.
  - (1) Input: 5 percent.
  - (2) Output: 5 percent.
- (p) Input protection: 30A breaker.
- (q) The UPS System shall have the capability of:

- (1) Accepting an NTCIP-ready adapter, or
- (2) Accepting a Spread-Spectrum Radio modem.
- (3) Local and remote communications capabilities.
- (4) Local or remote UPS control.

**Battery System.**

- (a) The maximum battery voltage shall be 48 VDC, supplied by four (4) deep-cycle gel or lead-acid 12 VDC batteries connected in series. The maximum battery size shall be Group 27.
  - (1) All batteries shall have a polypropylene case and a built-in handle with finger grips or similar design to allow carrying the batteries without undue discomfort.
  - (2) Batteries shall have a nominal capacity of 100 amp-hours at 100 C, and a minimum capacity of 90 amp-hours at 20 C.
  - (3) Batteries shall be valve-regulated to prevent electrolyte spillage.
- (b) The battery charging system shall be a 3-stage system designed for extended life of the battery system by temperature compensated as well pulse charging in addition to automatically regulated current levels.
- (c) Battery charging shall be as required regardless whether the UPS is running on utility power or an auxiliary power source such as a generator.
- (d) The UPS shall continue to supply clean regulated power even if the batteries are depleted and the system is on utility or auxiliary (generator) power.
- (e) The battery system shall be certified to meet or exceed NEMA temperature standards for deep-cycle lead-acid or gel batteries.
- (f) Hydrogen gas emissions shall meet Mil-Spec #MIL-B-8565J.

**Cabling.**

- (a) The UPS System shall utilize #8 AWG cables and dedicated harnesses to connect the UPS to the Battery System. The harnesses shall use keyed, locking quick release connectors that plug into the front panel of the UPS. Braided nylon jacketing shall be used over all conductors. The connectors shall feature:
  - (1) A flat wiping contact system.

**SPECIAL PROVISIONS**  
**BACKUP UPS SYSTEM FOR CCTV CAMERAS**

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- (2) An interchangeable, genderless design.
- (3) Colored, modular housings.
- (4) Polarized housings.
- (5) UL94 V-0 housing material.

**Rack-Mounted Outlet Strip.**

- (a) 19-inch Rack Mount.
- (b) 1 Rack Unit in Height.
- (c) UL 1363, 1449 (Pending) SVR = 330.
- (d) 15-Amp, 6-outlet (NEMA 5-15).
- (e) 8-Ft. NEMA 5-15 cord.
- (f) 3-Color LED Indication.
- (g) 18-Guage Steel housing.
- (h) Black Powder-Coated finish.
- (i) External 1/4-20 Grounding Stud.
- (j) Voltage Protection Level (Vpl):
  - (1) 8 x 20 uS @ 500A = 275V.
  - (2) 8 x 20 uS @ 3kAA = 440V.
  - (3) 10 x 1000 uS @ 250A = 290V.

**Mechanical: UPS Unit.**

- (a) Dimensions: Width = 19" rack mount, Height = 3 rack units.
- (b) Weight: UPS: Less than 35 lbs.

**Environmental.**

- (a) The UPS System shall meet or exceed NEMA temperature standards from  $-40^{\circ}\text{C}$  to  $+74^{\circ}\text{C}$ .
- (b) The UPS shall be certified and field proven to meet or exceed NEMA temperature standards. A certificate of compliance shall be made available upon request.

**Communications, Controls & Diagnostics.**

- (a) Alarm Monitoring: The UPS system shall come standard with alarm monitoring, indicating:
  - (1) Loss of Utility Power,
  - (2) Inverter Failure, and
  - (c) Low Battery.
- (b) An Ethernet port shall be provided via an RJ-45 connector allowing full, interactive, remote computer monitoring and control of the UPS functions.
- (c) The UPS shall be SNMP ready and include local and remote communication capabilities. If the unit requires an add-on card to achieve SNMP capability, the card shall be included with each unit at no additional cost to the Administration. The SNMP version shall be the latest, non-Beta release in effect as of the date of this contract advertisement. The following alarm “traps” shall be user-programmable from the front panel:
  - (1) Loss of AC power
  - (2) Restoration of AC Power
  - (3) Battery temperature
  - (4) Battery Voltage
- (d) Front Panel controls: Power ON/Input breaker, Cold (DC) Start, Alarm Silence, Battery Test, Bypass Breaker, and DC/Battery Breaker.

- (e) A front panel connector with a PCB-style terminal strip with setscrews for Alarms and Timers. The outputs shall include:
- (1) On/Batt.
  - (2) Timer.
  - (3) Low Battery.
  - (4) Battery Temperature.
  - (5) UPS Status.

**Reliability.** Calculated MTBF shall be 100,000 hours based on component ratings.

**Warranty.** The UPS system shall carry a standard manufacturer's 2-year warranty from the date of delivery against any imperfections in workmanship and material.

**Training.** See "TRAINING".

**Documentation.** The UPS system supplier shall provide three sets of operating manuals, service manuals, wiring diagrams, schematics, and maintenance instructions for all components of the UPS system. In addition, the UPS System supplier shall provide a fourth set of schematics and wiring diagrams which shall be furnished in the wiring diagram holder in the controller cabinet.

**Experience.** The manufacturer shall provide the names, addresses, and telephone numbers of at least three transportation agencies in the U.S. currently using the manufacturer's UPS System.

The agencies so named shall confirm that the manufacturer's systems have operated as specified in their contract documents and any applicable revisions for a period of at least one year, and that all maintenance agreements and/or warranties have been honored.

**MEASUREMENT AND PAYMENT.** Backup UPS Systems shall be measured and paid for at the contract unit price each, which shall include the complete UPS System including one complete set of batteries, the outlet strip, installation, electrical work, grounding, and all other incidentals needed to provide a working system. The payment shall be full compensation for all materials, labor, equipment and all other incidentals necessary to complete this work.

In the event that the Contract Documents contain a bid item for UPS batteries, that item shall be for the purpose of establishing a unit price for spare batteries.



**CATEGORY 800**  
**TRAFFIC**

**BAND SIGN TO SUPPORT**

**DESCRIPTION.** Band signs to signal, lighting or sign structures as specified in the contract documents or as directed by the Engineer.

**MATERIALS.**

Universal Channel Clamp	Type 304 16 Gauge Stainless Steel
Medium Channel	6061 – T6 Aluminum Alloy
Banding (0.75 in. by 0.03 in. thick)	Type 201 Stainless Steel
Blind Rivet	5154A Aluminum Alloy & Stainless Steel Mandrel

**CONSTRUCTION.** Attach universal channel clamp to signal, lighting or sign structure using stainless steel bands. Attach sign to channel with blind rivets every 6 in. on center. Attach universal channel clamp to medium channel. Refer to Standard MD 813.08 for details.

Install sign with minimum undersign clearance of 7 ft. to top of road grade or top of sidewalk grade.

**MEASUREMENT AND PAYMENT.** Band Sign to Support will be measured and paid for at the contract price per each sign panel banded to a lighting, signal or sign structure. The payment will be full compensation for stainless steel bands, clamps, rivets and for all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Signs will be measured and paid for as specified in Section 813.

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**CATEGORY 800  
TRAFFIC**

**CLOSED CIRCUIT TELEVISION CAMERA CABLE ASSEMBLY**

**DESCRIPTION.** Furnish and install closed circuit television (CCTV) camera cable assembly, as specified in the Contract Documents, or as directed by the Engineer. The camera cable assembly shall consist of a single Category 5e Ethernet cable supporting Power-over-Ethernet and all CCTV control and video signals, and all necessary connectors.

**MATERIALS.** The camera cable assembly and all component parts shall meet the latest edition of the American National Standards Institute (ANSI), Telecommunications Industry Association (TIA), and Insulated Cable Engineers Association (ICEA), as applicable. The advertising date of this Contract shall be used to determine the date of the applicable standards.

**CONSTRUCTION.** Furnish and install all cable, connectors, materials, supplies, and manufactured articles, and perform all operations and equipment testing necessary to connect CCTV camera assembly to its respective field equipment cabinet to create a fully operational CCTV camera site. The camera cable assembly shall be purchased from the manufacturer or a manufacturer-approved distributor. CCTV camera cable assembly may be furnished and installed three ways:

- (a) Factory cut lengths with pre-installed connectors,
- (b) Factory cut lengths with a pre-installed connector at the camera end, and a separate camera controller connector that the Contractor must install on-site, and
- (c) 500-foot spools of camera control cable, with loose connectors that the Contractor must install on-site at both ends.

Choose any of the three options above, or any combination thereof. However, the Contractor shall be responsible for any mistakes in measuring or ordering the camera cable assembly.

**MEASUREMENT AND PAYMENT.** Closed-circuit television camera cable assembly will be measured and paid for at the contract unit price bid per Linear Foot of Closed-Circuit Television Camera Control Cable, actually installed. The payment will be full compensation for the cable, connectors, materials, labor, testing and test equipment rental fees (if applicable), and all other incidentals necessary to complete the work.

**CATEGORY 800**  
**TRAFFIC**

**COATING NEW GALVANIZED STRUCTURES**

**DESCRIPTION.** Coat new galvanized steel structures, including exposed anchor bolts, flange bolts, nuts, and washers, as specified in the contract documents or as directed by the Engineer. Color will be as specified in the contract documents.

**MATERIALS.** Materials shall conform to one of the systems described below. All coatings in the system shall come from the same manufacturer. The Manufacturer shall be on the “Approved List of Manufacturers” maintained by the Office of Materials and Technology, Metals, Coatings and Structural Materials Team.

Colors shall conform to the following Federal Standards, or as specified in the contract documents.

Brown	Federal Standard Number 595a-20040
Black	Federal Standard Number 595a-27038
Green	Federal Standard Number 595a-24108

**Paint System.**

- (a) **Primer.** Shall be an Epoxy Polyamide meeting the requirements of Section 912.03.02 and must have a dry film thickness of 2 to 5 mils (50 to 125  $\mu\text{m}$ ).
- (b) **Finish Coat.** Shall be an Aliphatic Polyurethane meeting the requirements of Section 912.04.02 and must have a dry film thickness of 2 to 4 mils (50 to 100  $\mu\text{m}$ ).

**Fusion Bonded Polyester Powder System (all Signal & Lighting Structures).**

**Polyester Powder.** Polyester Powder shall meet the requirements of Section 917.

**CONSTRUCTION.**

**Paint System.**

**Surface Preparation.** Galvanized steel shall not be permitted to have been water or chromate quenched. The surface shall be solvent cleaned per SSPC SP-1 using a non-residue solvent and a lint free cloth. The surface shall also be brush off blasted per SSPC SP-7 using Grit. Any damaged areas shall be repaired according to ASTM A-780. If repair is made using an Organic Zinc Rich primer, the primer shall conform to Section 912.02.03.

**SPECIAL PROVISIONS**  
**COATING NEW GALVANIZED STRUCTURES**

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**Paint Application.** Following the brush off blasting and prior to the application of the prime coat, store each item in an environment free of moisture and dust. Apply the primer within twelve (12) hours of brush off blasting and in accordance with the manufactures recommendation.

Once the primer has properly cured, apply the finish coat in accordance with the manufacturers recommendations.

The finished painted surface shall be holiday free when tested with a low voltage holiday detector (minimum 30 volts), using regular tap water. If holidays are detected, the coatings could be repaired with additional coatings or they may be stripped and repainted at the Contractor's expense.

**Fusion Bonded Polyester Powder System.**

**Surface Preparation.** Prepare the galvanized surface by solvent cleaning conforming to SSPC SP-1, followed by brush off blast cleaning conforming to SSPC SP-7 using grit. The blast profile shall be 2 to 3 mills as determined in conformance with D 4417, method C. When blast cleaning exposes bare steel, spot prime the bare steel with an Organic Zinc Rich Coating in conformance with A 780. Apply the polyester powder within 24 hours of surface preparation.

**Application.** Apply fusion bonded polyester powder per manufacturers recommendations.

**MEASUREMENT AND PAYMENT.** Coating New Galvanized Structures will not be measured and paid, but the cost will be incidental to the contract item. The payment will be full compensation for all material, labor, equipment, tools and incidentals necessary to complete the work.

**CATEGORY 800**  
**TRAFFIC**

**CONTINGENT ROCK EXCAVATION**

**DESCRIPTION.** This work shall consist of the excavation of rock for traffic control and Intelligent Transportation System (ITS) structures having concrete foundations as detailed on the Plans, in conformance with the requirements of this Special Provision, and as directed by the Engineer.

**MATERIALS.** None

**CONSTRUCTION.** The provisions of 201.03.04 are not applicable under this Contract.

If rock is encountered during the excavation and/or drilling for foundations for the proposed traffic control and ITS structures supported on concrete foundations, the Contractor shall stop the work at the given location, adequately protect the open excavation as approved by the Engineer, and notify the Engineer immediately prior to continuing with the work. No additional foundation work shall proceed at this location until directed by the Engineer. No extension in Contract time will be given to the Contractor for delays caused by the presence of rock and the need to mobilize additional equipment or redesign of the foundations.

The use of blasting to perform the rock excavation shall not be permitted.

For the purposes of this special provision, rock is defined as a continuous intact natural material which cannot be penetrated with conventional earth excavation equipment and requires the use of pneumatic hammers or rock breaking techniques to be used at the approval of the Engineer. This definition excludes discontinuous loose natural materials such as disintegrated rock, boulders and man-made materials such as concrete, asphalt, steel, timber, etc. The removal of these materials will be covered under the pertinent concrete foundation item.

**MEASUREMENT AND PAYMENT.** Contingent Rock Excavation will be measured and paid for at the contract unit price per cubic yard for the volume of rock material actually removed from within the limits specified. The volume of rock excavation to be measured for payment shall consist of the foundation size for the pertinent traffic control device or ITS concrete foundation shown on the plans or standard details, or as adjusted by the Engineer.

Payment will be full compensation for all excavation, use of alternative equipment necessary to perform the rock excavation (including mobilization and demobilization), removal and disposal of excavated material, protection of the open excavation during work stoppage, dewatering, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

The excavation of material other than rock, as defined herein, and the concrete, reinforcement steel, forms, anchor bolts, and backfill will be measured and paid for under the concrete foundation item specified in the Contract. No extension in Contract time will be given to the Contractor for delays

**SPECIAL PROVISIONS**  
CONTINGENT ROCK EXCAVATION

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caused by the presence of rock and the need to mobilize additional equipment or redesign of the foundations.

**CATEGORY 800**  
**TRAFFIC**

**DECORATIVE TUBULAR SIGN POST**

**DESCRIPTION.** Furnish and install decorative tubular sign posts as specified in the Contract Documents or as directed by the Engineer.

**MATERIALS.** Provide decorative tubular sign posts that include a tubular sign post, sign support arms, sign supports and brackets, a base plate, decorative pole cap, and decorative nut covers. The post shall measure between 16 ft and 21 ft from base to top of pole, not including the decorative cap. Furnish all parts of the decorative tubular sign post as specified in the contract documents or as directed by the Engineer.

**CONSTRUCTION.** Not applicable.

**MEASUREMENT AND PAYMENT.** The payment will be full compensation for the sign post, sign support arms, sign mounting hardware, finish, decorative top, decorative nut covers, and for all material, labor, equipment, tools and incidentals necessary to complete the work.

Decorative Tubular Sign Post-Back to Back- Any Size will be measured and paid for on a per each basis.

Decorative Tubular Sign Post-Double Sign-Any Size will be measured and paid for on a per each basis.

Decorative Tubular Sign Post-Single Sign-Any Size will be measured and paid for on a per each basis.

**CATEGORY 800**  
**TRAFFIC**

**DISCONNECT, PULLBACK AND REROUTE EXISTING CABLE**

**DESCRIPTION.** Disconnect existing cable(s) from traffic control device(s), pullback and reroute through new or existing conduit systems, handholes, span wires, mast arms and/or structures for reconnecting the traffic control device(s) as specified in the contract documents, or as directed by the Engineer.

**MATERIALS.** Not Applicable

**CONSTRUCTION.** Notify the Engineer and Traffic Operations Division representatives at least 5 working days before intended work is to be completed. Plan the work to minimize interference and/or down time of any existing traffic control device.

Disconnect specified cable(s) from the traffic control device and pullback to the point noted or as directed, reroute the cables through the specified raceway(s) and back to the device specified.

**MEASUREMENT AND PAYMENT.** Disconnect, Pullback & Reroute Cable will be measured and paid for at the contract price per linear foot and shall apply for one or as many cables as are disconnected from a specified device and rerouted back to a device (not per cable). The payment will be full compensation for all materials, labor, equipment, tools, and incidentals necessary to complete the work.



**CATEGORY 800**  
**TRAFFIC**

**DYNAMIC MESSAGE SIGN WALK-IN ENCLOSURES**

**DESCRIPTION.** Furnish and Install walk-in style enclosures for overhead, pedestal, and ground-mounted Dynamic Message Signs (DMS's) as specified in the Contract Documents or as directed by the Engineer. This work shall include all necessary hardware and electrical work associated with the enclosure and its sub-assemblies.

The sign enclosure shall be designed and constructed to present a clean, neat, appearance. The equipment housed within shall be protected from moisture, dust, dirt, and corrosion. The housing shall permit the replacement of any component of the sign, including the signface Lexan sheeting, without closing the traveled lanes of the roadway below.

**MATERIALS.** All materials furnished, assembled, fabricated, or installed under this specification shall be new, corrosion resistant, and approved by the Engineer.

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

- (a) The serial number and model number shall be etched, stamped, or molded.
- (b) The use of adhesive backed labels is not acceptable.

**CONSTRUCTION.**

**(a) Mechanical.**

- (1) **Sheet Metal.** The exterior skin of the enclosure shall be 5052-H32 aluminum sheet or an equivalent approved by the Engineer, with a thickness of not less than .125 in. Aluminum sheet with a thickness of 0.080 in. will be permitted for the door and end panels, as long as the same type of aluminum sheet is used throughout.
- (2) **Structural Members.** Framing structural members shall be made of aluminum alloy 6061-T6 or an equivalent approved by the Engineer.
- (3) **Wind Load.** The design wind load of the housing shall be 51.92 psf or greater (100 MPH wind velocity, plus 30 mph gusts) without permanent deformation).
- (4) The front of the sign shall be angled downward toward the roadway at an angle of approximately 6 degrees to optimize the visibility of the LED display to motorists. The back of the sign shall be parallel to the truss members for overhead signs, or the mounting post for pedestal signs. The sign housing shall not be angled. The top depth dimension of the sign will be approximately 6 in. greater than the bottom dimension.

There will be no exceptions granted to this requirement. Catalog cuts submitted to the Engineer with a request for an exception to this requirement will be rejected without further review.

**(5) Sign-to-structure mounting:**

**(a) Overhead Structure Mounted.** The sign housing shall be attached to the structure using 4 in., 0.250 in. thick, horizontal Z-bars, mounted on the back of the sign housing, and vertical W 4 x 13 galvanized steel supports. A minimum of three (3) Z-bars shall be used, at the approximate top, middle, and bottom of the sign housing, as shown in the Contract Documents.

- (1) The horizontal Z-bars (minimum of 3) shall be pre-installed by the sign manufacturer.
- (2) The W 4 x 13 vertical supports shall be spaced at 4 ft. intervals ( $\pm$  12 in.), and shall be attached to the sign structure using two, 0.50 in. diameter Stainless Steel U-bolts at each location where the support and structure chord intersect.
- (3) The horizontal Z-bars and vertical W 4 x 13 supports shall be connected with two, 0.75 in. diameter Stainless Steel bolts.

**(b) Pedestal-Mounted.** The sign housing shall be bolted to a single, centrally-located post, as shown in the Contract Documents.

**(c) Ground-Mounted.** The sign housing shall be furnished by the manufacturer with 4 in., 0.250 in thick, horizontal Z-bars, mounted on the back of the sign housing. Two (2) Z-bars shall be supplied, at the approximate top, and bottom of the sign housing, as shown in the Contract Documents.

- (1) The horizontal Z-bars shall be pre-installed by the sign manufacturer.
- (2) The sign housing Z-bars will be attached two (2), non-breakaway, vertical W-Sections (I-Beams), supplied by the Contractor. The size of the W-Sections will be determined by the physical size and weight of the DMS.
- (3) The Z-bars and W-Section supports shall be fastened at each point of intersection with two, 0.75-in. diameter Stainless Steel bolts.

**(6) Seams.** Seams shall be continuously welded using an inert gas process. All welding shall be Gas Tungsten Arc or Gas Metallic Arc type in accordance with the standards set forth by the American Welding Society (AWS). The manufacturer shall provide written documentation that these standards have been met.

**(7) Dimensions.** All sign enclosures shall be dimensioned as shown on the Plans. No exceptions to these dimensions will be considered, unless approved in writing by the Engineer at least 10 business days in advance of the bid opening date of this contract. Requests for exceptions after that date will be automatically rejected.

The overall weight (deadload) of the sign shall not exceed 5,500 pounds.

- (8) Natural Ventilation.** Provisions shall be made for natural ventilation inside the sign enclosure by means of screened air outlets at the top, rear of the enclosure, and filtered inlets near the bottom of the enclosure. These inlets and outlets shall be suitably baffled or louvered to prevent the entry of birds, and wind-blown moisture and dust. The filters shall be standard, furnace-style filters, and shall be easily removable for replacement.
- (9) Forced Air Ventilation.** The housing shall also be equipped with a thermostat that activates a forced-air ventilation system in the event that the temperature inside the enclosure exceeds 110 F. The forced-air system is described in Section(d), sub-section (3) of this specification. This system shall be integrated with the natural ventilation system so that the inlets and outlets are shared by both systems.
- (10) Drainage.** Screened weep holes shall be provided in the bottom of the housing, to permit the escape of any moisture that may collect in the sign housing. A minimum of two (2) weep holes shall provided for each section formed by internal structural members.
- (11) Floor System (Interior Maintenance Walkway).** The housing shall contain a floor system capable of safely supporting a weight of 1,000 pounds. The floor shall be constructed of aluminum grating, with a rubberized, non-skid coating. The walkway shall have easily removable panels for access to underlying spaces. Screened weep holes shall be provided along the walkway, at the discretion of the enclosure manufacturer, to permit the drainage of moisture. This requirement is waived if the floor system is constructed of open aluminum grating.
- (12) Access Doors.** The enclosure shall contain one or two access doors, depending upon the sign style. Pedestal and ground-mounted signs shall have a single door, located at the approximate center of the rear of the sign housing. Overhead signs shall have two doors, located on each side of the enclosure.
- (a)** Doors shall be at least 24 inches wide and 72 inches high, and shall be mounted to the housing using stainless-steel, continuous piano-style hinges. On overhead signs, with doors on the sides, each door shall be hinged on the side closest to the back of the sign. The back-mounted pedestal sign door shall be hinged on the left side.
- (b)** Each door shall have a closed cell neoprene gasket around the mating surface of its entire perimeter to seal out moisture and other contaminants when the door is closed.
- (c)** Each access door shall be equipped with a dead bolt locking mechanism which secures the door at both the top and bottom by turning a single handle. This locking mechanism shall be keyed to open with a standard Maryland #2 traffic key.

**(13) Maintenance Access.**

**(a) Overhead Signs.** Furnish and install two galvanized steel mesh external walkways with each DMS to permit the safe movement of service personnel to and from the enclosure doorways. These walkways shall be attached to the overhead structure as shown in the Contract Documents. The walkways shall have the same approximate width as the sign housing, and shall extend from each side of the sign housing to the center of their respective shoulders.

**(1)** A continuous, 36-inch high safety handrail shall be provided on the open side of each walkway.

**(2)** The shoulder end shall be open, so that service personnel can access the walkway from a bucket truck.

**(3)** The walkway shall be capable of safely supporting a distributed load of at least 200 pounds per foot.

**(b) Pedestal and Ground-Mounted Signs.** Furnish and install a galvanized steel mesh maintenance platform and access ladder system with each DMS to permit the safe movement of service personnel to and from the rear door of the housing, as shown in the Contract Documents.

Shop drawings for DMS access systems and all associated hardware shall be submitted to the Engineer for design approval with the DMS structure shop drawings.

**(14) Photocells.** The light output from the sign pixels shall be controlled by three photocells. These photocells shall be serviceable from inside the enclosure, and shall not require special tools.

**(15) Lexan Sheeting.** The Lexan sheeting that protects the DMS pixels and modules shall be completely replaceable from inside the sign housing.

**(b) Finish.**

**(1) Exterior.** Sign faces shall be painted matte black. The remainder of the enclosure shall be natural aluminum finish.

**(a)** Special treatment systems, such as anodization or kynar fluoropolymer resin coatings, may be permitted for the sign faces subject to approval by the Engineer.

**(b)** Catalog cuts describing the exterior paint finish shall be submitted to the Engineer for approval before the enclosure is painted.

(2) **Interior.** The interior finish shall be natural aluminum (mill finish).

(c) **Electrical.**

(1) **Emergency Flasher System.** The enclosure shall contain four 12 in., Yellow LED signal heads and 8 in tunnel visors, arranged as shown in Attachment A of this specification. The signal modules shall employ a lens assembly that presents an appearance that is similar to those found on standard incandescent signals.

(a) Yellow LED signal modules shall comply with all requirements of the most recent, formally-ratified version of the ITE Interim Purchase Specification – Vehicle Traffic Signal Control Heads, Part 2: Light Emitting Diode (LED) Vehicle Traffic Signal Modules, and the ADMINISTRATIONS LED signal specification, titled LED TRAFFIC SIGNAL MODULES.

(b) LED signals shall be certified by the manufacturer to meet or exceed all requirements of BOTH specifications over their entire warranty period.

(c) The signal heads shall be wired to a two-circuit NEMA flasher so that the flasher will activate alternate pairs of bulbs simultaneously. One cycle will light bulbs 1 and 3, and the next will light bulbs 2 and 4.

(d) The entire flasher and signal head system shall be installed and pre-wired to the main sign connection terminal block by the sign manufacturer.

(e) The operation of the emergency flasher system shall be controlled by software command, at the discretion of the system operator. Upon issuing the command, the controller shall activate the NEMA flasher, which will then activate the signal heads as described above.

(f) Each signal module shall be secured to the signface mounting panel using a hinged aluminum plate, hinged on one side, with wing nuts on the other side to hold the signal module in place. The plate thickness shall be at least 0.125 inches. The mounting system shall employ neoprene gaskets to prevent the entrance of moisture or other contaminants into the sign enclosure.

(g) Shop drawings for the complete emergency flasher system shall be submitted to the Engineer for approval along with the shop drawings for the walk-in enclosures before commencing with the fabrication of either system.

(2) **Lighting.** The interior of the enclosure shall be illuminated by no less than three (3), double lamp fluorescent fixture with diffusers. The fixtures shall be supplied with 40-watt, cool white, rapid-start lamps. The ballast shall be cold-start type. The fixtures shall be evenly-spaced along the top or top rear of the sign enclosure to provide uniform

lighting within the enclosure.

- (a) The lighting shall be controlled by a SPST mercury-type switch, mounted on the left hand side of the enclosure, positioned so that service personnel can easily reach the switch before entering the enclosure.
  - (b) The switch shall be mounted in a weather-resistant box, and clearly labeled "LIGHTS." The label shall be permanently mounted to the box cover; the use of stick-on labels will not be permitted.
- (3) Forced-Air Ventilation System.** The interior of the sign housing shall contain a forced air ventilation system whose purpose is to remove excess heat from the sign's interior during normal sign operation or while service personnel are working in the sign. The system shall draw in fresh air through filtered openings near the bottom rear of the enclosure, and exhaust hot air near the top of the rear of the enclosure. The system shall have two methods of control; an industrial-style thermostat, and a 60-minute mechanical rotary timer switch.
- (a) The thermostat shall be a normally-open design, pre-adjusted to close at 110 degrees Fahrenheit. The set point of the thermostat shall be adjustable from 90 F to 130 F.
  - (b) The blower timer shall be clearly labeled "BLOWER", in the same manner as the light switch, and shall be mounted directly adjacent to the light switch. It is acceptable to mount the blower switch and the light switch in the same weather-resistant switch box.
  - (c) The thermostat and timer shall be wired in parallel, so that service personnel, upon entering the sign enclosure, can manually override the thermostat, and activate the forced-air ventilation system.
  - (d) The forced-air ventilation system shall be capable of providing a minimum of one sign enclosure volume change per minute.
  - (e) The forced-air ventilation system may use the same air intakes and outlets that are used to provide natural ventilation (shared vents).
  - (f) Shop drawings and estimated performance specifications for the forced-air ventilation system shall be submitted to the Engineer for approval prior to sign enclosure fabrication.
- (4) Electrical Outlets.** The sign enclosure shall have Ground-Fault Interrupter (GFI) duplex outlets for maintenance personnel. Outlets shall be spaced no more than six feet apart. The outlets shall be mounted three feet above the maintenance walkway, and evenly spaced along the back wall, with an outlet within 3 feet of each end of the

enclosure. The outlets shall be protected by a 15-ampere circuit breaker.

**(d) Sign Face and Border.** The character modules shall be surrounded by a matte black border.

- (1) This border shall be contained entirely within the dimensions of the sign housing (internal border), and shall consist of dark metal sections of the signface that are not a part of the text display area. Signs with external borders of any type or size (sheet metal, extrusions, etc) will be not be accepted. There will be no exceptions granted to this requirement. Catalog cuts submitted to the Engineer with a request for an exception to this requirement will be rejected without further review.
- (2) For signs with a character height of 18 inches, this border shall be 18 in. at the bottom and sides of the sign face.
- (3) For signs with a character height of 18 inches, this border shall be 30 in. at the top of the sign face.
- (4) Signs with 12-inch character heights shall have reduced borders as shown on the Plans.
- (5) Complete details for pedestal, ground-mounted, and overhead-style DMS sign faces can be found in the Contract Documents.

**(e) Miscellaneous.** In addition, the following items shall be included with each enclosure:

- (1) A fiberglass ladder of sufficient height to permit servicing all modules, and all other components in the enclosure.
- (2) A basic technician's tool kit, containing all mechanical and electrical tools necessary for servicing the sign.

**MEASUREMENT AND PAYMENT.** Walk-In DMS Enclosures will not be measured, but the cost will be incidental to each dynamic message sign furnished, and shall include all items necessary for the installation and acceptance of the enclosure. The exterior aluminum mesh maintenance walkways for overhead DMS and the pedestal and ground-mount access systems described in Section (12), above will be measured and paid for separately, as described below.

Maintenance Walkways for overhead DMS will be measured and paid for at the Contract unit price per linear foot for all walkway furnished and installed. The payment will be full compensation for the aluminum mesh walkway, mounting hardware, labor, and all incidentals necessary to complete the work.

Pedestal and Ground-Mount DMS access platform and ladder systems will be measured and paid for at the Contract unit price for each assembly furnished and installed. The payment will be full compensation for the access platform, caged access ladder system, locking trapdoors, mounting hardware, labor, and all incidentals necessary to complete the work.

**CATEGORY 800**  
**TRAFFIC**

**FIBER OPTIC BLANKOUT SIGN WITH SINGLE MESSAGE**

**DESCRIPTION.** Furnish and install fiber optic blankout signs with a single message as specified in the Contract Documents or as directed by the Engineer. There are two types of fiber optic displays, as described herein. Provide signs capable of displaying the message as described, or appearing blank.

**MATERIALS.** Provide UL rated components for the fiber optic blankout sign. The sign enclosure shall be NEMA 3R.

**CONSTRUCTION.**

**General.** The fiber optic blankout sign shall operate continuously under all weather conditions, in an ambient temperature range of -35 F to +120 F with a relative humidity of up to 100 percent.

Design the fiber optic blankout sign so as to preclude the intrusion of water.

Provide fiber optic blankout signs compliant with MdMUTCD requirements, and the Contract Documents.

The fiber optic blankout signs shall be easily accessible, and all parts removable with a screwdriver as the only required tool.

The fiber optic blankout sign shall be designed for a life cycle of 15 years minimum, exclusive of lamps.

**Symbols.** The Fiber Optic Blankout Sign shall display the one of the two following illuminated messages: The first type of message shall be a Left Only Symbol with an "ONLY" word message in white as shown on MD Standard R3-5L sized to Standard size. The border as shown in these referenced standards shall be eliminated with the symbolic message centered within the face of the sign. The second type of message shall be a "LANE ENDS MERGE RIGHT" word message in white as shown on MD. Standard W9-2(4) sized to Standard size. The border and horizontal divider as shown in these referenced standards shall be eliminated with the message centered within the face of the sign.

Each letter or symbol shall be outlined by light points.

**Message Control.** The Fiber Optic Blankout Sign shall be equipped with one set of terminals for each message which can be displayed.

Message turn on of the Fiber Optic Blankout Sign shall be accomplished with a relay or solid-state device, so that the current required at the control terminals for Fiber Optic Blankout Sign



**SPECIAL PROVISIONS**  
FIBER OPTIC BLANKOUT SIGN WITH SINGLE MESSAGE

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operation is 100 milliamperes or less at 120 VAC. Message switching shall be arranged so that the entire message shall be activated from when one set of terminals is energized.

Connection to the controller shall consist of hardwired connections using 5 conductor No. 14 AWG cables.

**Visibility.** The symbol displayed shall be clearly discernible for a minimum of 500 ft under all natural and manmade lighting conditions.

The Fiber Optic Blankout Sign shall not display a symbol, which is not illuminated regardless of lighting conditions.

Multiple lamps will be used for each symbol. In the event of a single lamp failure, the fiber optic blankout sign shall still be fully discernible.

The light output will not vary more than 50 percent of maximum for a beam angle of 20 degrees centered around the optical axis.

Each light point shall be at least 0.039 in. in diameter.

White light points shall have a maintained luminance greater than 14,000 Cd./( $M^2$ ) on the optical axis.

**Optical.**

The Fiber Optic system shall consist of glass fiber bundles assembled on a flat black matrix panel. Matrix panel shall have a flat black non-reflective finish.

The Light sources shall consist of quartz halogen lamps, operating at 12 volts, 50 watts with a 6000 hour rated life. Each lamp shall be easily replaceable without the use of tools.

Two fiber optic bundles, or one bifurcated bundle, will be used so that in the event of failure of one light source the other shall continue to provide a discernible message.

The glass fibers at the input and output ends shall be ground smooth and optically polished to a minimum of an 8 micron finish.

The common end assemblies and lamp assemblies shall be mounted on a shock absorbing platform.

Each fiber optic bundle shall contain a convergence cone at the output end to increase light output.

A minimum of 5 percent spare bundles shall be provided with reject bundles clearly labeled.

The Fiber Optic harnesses shall be easily field replaceable with individual bundles

mechanically held in place on the Fiber Optic Blankout Sign face. The Fiber Optic bundles shall be removable and replaceable without the use of any tools. Glass lenses epoxied to a faceplate are not acceptable.

A PVC jacket extruded over the bundle to preclude damage to them in the process of relamping, cleaning or routine maintenance shall protect each individual optical fiber bundle. Raw glass bundles or sprayed on coatings are not acceptable.

The lenses shall be protected by a clear sheet of polycarbonate. The sheeting shall be 1/8 in. thickness U/V stabilized Lexan. The interface shall exhibit a high gloss finish. Voids and scratches shall not be permitted.

### **Electrical.**

For each Fiber Optic Blankout Sign, 3 complete sets of schematic wiring diagrams, descriptive parts lists with generic part numbers where applicable, instruction and maintenance manuals, and connection diagrams shall be supplied.

No moving parts are permitted.

All schematics shall include numbered test points with operating voltages, waveforms and amplitude indicated.

Message switching at the fiber optic blankout sign shall be accomplished with a solid state device, so that the current required at the control terminals is 100 milliamperes or less at 120 VAC.

All wire termination's are to be made at terminal blocks (Marathon 1500 or equivalent).

Supply voltage to the fiber optic blankout sign will be 120 VAC. The transformers reducing supply voltages to that required by the internal components of the fiber optic blankout sign shall be integral to the fiber optic blankout sign.

### **Hardware.**

The housing shall be aluminum alloy (tempered) with a minimum thickness of 0.125 in and meet NEMA 3R. All exterior seams shall be continuously welded and made smooth. The sides of the housing shall be formed of extrusions, while the front and back will be formed from plate. Sufficient internal stiffeners shall be installed to insure the housing, and face shall not deform under wind loads when mounted as designed.

The outside of the housing shall measure approximately 36 in x 36 in x 9 in. (Face dimensions may be increased slightly, if necessary, to avoid interference with the side flanges of the housing when centering the symbols.)

**SPECIAL PROVISIONS**  
FIBER OPTIC BLANKOUT SIGN WITH SINGLE MESSAGE

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The entire housing shall be weatherproof.

The Fiber Optic Blankout Sign shall be designed to be securely mounted on a signal mast arm, a 1½-inch hub shall be installed on top and bottom of the housing, and connected to the internal stiffeners. Mounting hardware assembly shall be as detailed for rigid mount signal heads on MD 814.01.

The exterior housing finish shall be high quality clear anodized. Painted housings are not acceptable.

Drainage shall be provided by a minimum of two ¾ in. diameter drainage holes located at the bottom of the housing. Drainage holes shall be made insect proof by use of screens.

The fiber optic blankout sign face shall be hinged to the top of the housing and serve as the access door. The face shall have 2 stainless steel pressure snaps to tightly secure the door to the housing. The fiber optic blankout sign door shall be held in the open position by one gas strut at each end. All hinge pins, nuts, bolts, lockwashers, cotter pins and washers shall be stainless steel.

The door shall have a neoprene gasket to provide a weather tight seal. The seal shall be treated with a silicone spray to prevent the seal from sticking to the sign housing when the door is closed.

Written certification that the enclosure meets NEMA 3R after modification shall be furnished by the contractor from a laboratory, recognized by the State Fire Marshal for Specific Consumer Products.

**MEASUREMENT AND PAYMENT.** Fiber Optic Blankout Signs will be measured and paid for at the contract unit price per each for each type of sign as follows: Fiber Optic Sign with Single Message “LEFT ONLY” or Fiber Optic Sign with Single Message “Lane Ends Merge Right”. The payment will be full compensation for all materials, labor, mounting equipment, tools and incidentals necessary to complete the work.

**CATEGORY 800**  
**TRAFFIC**

**FIELD EQUIPMENT CABINETS FOR CCTV UPS SYSTEMS**

**DESCRIPTION.** Furnish and install base-mounted, NEMA size 5 cabinet for CCTV camera UPS system batteries, as specified in the Contract Documents or as directed by the Engineer. This work shall include all necessary hardware and electrical connections.

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

Anchor bolts/Bolts/Nuts/Washers  
Cabinets and doors  
Mounting hardware  
Conduit  
Power service conditioning and distribution equipment  
Electrical wires, harnesses and connectors  
Environmental control equipment

**CONSTRUCTION.**

**(a) 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.

The use of adhesive backed labels is not acceptable.

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 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) Electronic equipment (controllers, multiplexers, etc.) to be installed in the field cabinets shall be as specified in the Contract Documents or as directed by the Engineer, and shall be paid for separately.
- (b) **Electrical.** Electrical power for the battery cabinet shall be obtained from a 20-ampere breaker from the electrical panel inside the CCTV equipment cabinet.
  - (1) The battery cabinet shall be equipped with a commercial-grade terminal block for connecting the breaker in the host cabinet load center to the fan and heater circuits.
  - (2) All wiring between the conduit entry point and the terminal block shall be encased in flexible metal sheathing.
    - (a) All conductor wire runs shall be continuous with no splices.
    - (b) 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.
    - (c) All cabinet back and panel harness wiring shall be soldered at its destination point as specified.
    - (d) 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.
    - (e) All conductors used in the controller cabinet wiring shall conform to the following color code requirements.
      - AC Neutral conductors shall be identified by a continuous white color.
      - AC Ground conductors shall be identified by a continuous green color.
      - AC Positive conductors shall be identified by a continuous black color.
      - All other conductors shall be identified by any color not previously specified.
  - (3) All bolts used for electrical connections shall be fabricated from stainless steel.

- (4) All hardware used for electrical connections and terminal facilities shall be fabricated using cadmium plated brass.
- (5) All fuse holders shall be of the encased type 3 of 8.
- (6) 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
- (7) All welds shall be neatly formed and free of cracks, blow holes and other irregularities.
- (8) All inside and outside edges of the cabinet shall be free of burrs.
- (9) All access door openings shall have a double flange on all four sides.

**(c) Mechanical.**

- (1) **Size.** NEMA TS-2, size 5, unless shown otherwise on the Plans. Size 5 cabinets shall be forty-eight inches in height by thirty inches in width by sixteen inches in depth (48 in. H x 30 in. W x 16 in. D).
- (2) **Shelving.** Battery shelves shall be reinforced, and spaced at heights of 12 and 25 inches, as shown in the details.

If the Contractor or UPS system supplier believes that a conflict between these shelf heights and the batteries or battery cabling might occur, the Engineer shall be notified before the shelves are fixed at those positions.

The back vertical support rails shall stop flush with the surface of the top shelf.

- (3) **Fan-Forced Ventilation.** Two thermostatically controlled cooling fans shall be provided for all cabinets.

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

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

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

The fan bearing mechanisms shall be of ball bearing design.

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

Each 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 F to +113 degrees F (-25 C to +45 C) without requiring fans, in the event the cabinet cooling system fails.

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 extra filters shall be supplied for each cabinet installed.

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

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

The exhaust area shall be screened with a material having a maximum hole diameter of 1/8 in.

- (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.

The door opening shall be a minimum of 80 percent of the front surface area of the cabinet.

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.

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

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

All hinging shall be bolted to the cabinet and door utilizing 1/4-20 stainless steel carriage bolts and nylon lock nuts.

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

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

All cabinets shall include a door restraint to restrict the door to a maximum one hundred and thirty-five degrees of swing. The restraint mechanism shall provide latching positions at ninety degrees and at one hundred and thirty-five degrees. 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 Contractor shall provide the State with a minimum of one key each per cabinet.

All cabinets shall have a weather-resistant, 12 x 16 in. or larger, clear plastic folder on the inside of the door for schematic and wiring diagrams, and other maintenance information.

- (8) Interior Lighting.** Each cabinet shall be supplied with modular LED traffic cabinet light assemblies, located vertically on either side of both front and rear doors to provide uniform illumination of the cabinet and rack assembly.
- (a)** Cool White: 5000 K
  - (b)** Operating Temperature: -10C to +40 C Free air or cabinet mounted.
  - (c)** 24 Volt
  - (d)** 280 lumens per single module.
  - (e)** Class 2 Power supply included.
  - (f)** Switched to activate whenever either door is opened.
  - (g)** UL-2108 Approved
- (9) Internal Heating.** A heater rated for traffic cabinet use shall be installed in the bottom, and conforming to the following requirements:
- (a)** The heating element shall be rated at 500 watts and have a minimum output of 1700 BTU/hr.
  - (b)** The heating element shall have a built-in quick response thermostat with sealed contacts with a temperature control range of 40 F to 100 F, and a built-in thermal cut-off to automatically turn off the heater in case of overheating.
  - (c)** The heating element shall have a protective cover with vent holes to prevent damage to adjacent wires or burns to service personnel.



- (10) **Cabinet Installation.** Securely fasten Detector Cabinets-Type 332/334 on new or modified concrete bases, in pole-mounted configurations as shown on the Plans, or as directed by the Engineer. New foundations shall be incidental to the cabinet item.
- (a) Bolted stainless steel connections shall be provided with lockwashers, locking nuts, or other approved means to prevent the connection nuts from loosening.
  - (b) Dissimilar materials shall be isolated from one another by stainless steel fittings.
  - (c) Cabinets shall have a continuous neoprene gasket between the base and the foundation
- (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 complete sets of wiring and schematic diagrams. Schematics shall include a list of tests points with the following information provided for each point: Nominal operating voltage, Wave form and all pertinent information regarding the wave form at each test point, Integrated circuit schematics, Connection and I/O diagrams.

**MEASUREMENT AND PAYMENT.** Furnish and Install base-mounted, NEMA size 5 cabinets for CCTV camera UPS system batteries will be measured and paid for at the contract unit price for each type specified. The payment will be full compensation for the cabinets, battery shelves, terminal blocks and cabling, material, labor, and all incidentals necessary to complete the work.

**SPECIAL PROVISIONS**

20 FT GALVANIZED STEEL DETECTOR POLE WITH BREAKAWAY BASE

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**CATEGORY 800  
TRAFFIC****20 FOOT GALVANIZED STEEL DETECTOR POLE WITH BREAKAWAY BASE**

**DESCRIPTION.** Furnish and install 20 ft. galvanized steel detector pole with breakaway base suitable for use with this pole when specified.

**MATERIALS.** Will comply with the standard drawings 818.17-10 and 821.01-01 and the following criteria:

**(a) 20 FOOT STEEL POLE**

- (1) 3 gauge (0.3125 in.) wall thickness
- (2) 7½ in. Diameter at the base
- (3) Tapered 0.14 in. per foot.
- (4) Steel Pipe (A 595, Grade A)
- (5) Hot Dip Galvanized

**(b) BREAKAWAY TRANSFORMER BASE (when specified)**

- (1) Breakaway pole bases will be in accordance with section 821 of the Standard Specifications for Construction and Materials dated July 2008.
- (2) All breakaway transformer bases must be certified by the FHWA as meeting the crashworthiness criteria of NCHRP report 350.
- (3) Top and bottom bolt holes will accommodate 1 in. diameter bolts.
- (4) The hinged inspection door will be provided with a stainless steel hex head bolt and chime.
- (5) Overall height 17 in.
- (6) Top bolt circle slotted to accept patterns from 10-1/2 in. to 13-1/3 in.
- (7) Bottom bolt circle slotted to accept patterns from 10-1/2 in. to 12-15/16 in.

**CONSTRUCTION.****(a) 20 FOOT STEEL POLE**

- (1) Welded 2 in. conduit couplings will be placed at the top of the pole as shown on the standard detail 818.17-10 the welded coupling shown at the bottom of the pole will be increased to 4 in.
- (2) ID plates containing "SHA" will be installed 6 inches from the bottom of the pole.
- (3) Pole caps will be provided and installed.
- (4) Base plate will be 1 in. thick
- (5) Anchor bolt circle 11 in. in diameter
- (6) Bolt holes 1-1/8 in.

**MEASUREMENT AND PAYMENT.** 20 ft. galvanized steel detector poles will be measured and paid for at the Contract unit price per each pole. The payment will be full compensation for all materials, labor, equipment, tools, concrete and incidentals necessary to complete the work.

- (a) Concrete foundation will not be measured and will be incidental to 20 ft or 40 ft galvanized steel detector poles.

**SPECIAL PROVISIONS**

20 FT GALVANIZED STEEL DETECTOR POLE WITH BREAKAWAY BASE

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- (b) Breakaway Base Support Systems, when specified in the Contract Documents, will be measured and paid for at the contract unit price per each pedestal.
- (c) Conduit bends will not be paid and are considered incidental to the detector pole.

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**CATEGORY 800**  
**TRAFFIC**

**GENERATOR SYSTEM FOR TRAFFIC SIGNALS**

**DESCRIPTION.** Furnish and install pad-mounted, commercial-grade, backup generator power systems for Traffic Signal cabinets as shown in the Contract Documents or as directed.

**MATERIALS.**

- (a) UL1778-Fourth Edition (File # E226092)
- (b) FCC Part15 Subpart B Class A
- (c) CE

**CONSTRUCTION.**

**Generator System.** Generator systems shall utilize commercially-available system components to facilitate maintenance, and the purchase of replacement parts once the systems have become the property of the Administration.

- (a) Generator systems shall be electric start, with built-in charging systems for the starting battery.
- (b) Generator systems shall automatically start immediately upon sensing a loss of AC power, and automatically stop upon sensing restoration of AC power.
- (c) Backup generator systems shall use natural gas, with the option for conversion to propane gas
  - (1) The system shall have enhanced cold temperature starting
  - (2) Generators shall have natural gas carburetor heat, applied below 40 F.
- (d) Generators shall have the following detection systems
  - (1) Loss of utility power (A/C fail) detection.
  - (2) Low oil detection.
- (e) Generators shall provide 120 volt, single-phase A.C. power, with a continuous output of 3.0 KW
  - (1) Generator units shall be of the brushless type.
  - (2) Generators shall have A.C. output voltage regulation.
- (f) Generators shall have a manual start switch and maintenance panel.
- (g) Generator systems shall be supplied in bug and rodent-resistant natural aluminum finish NEMA 3R rated enclosures with a graffiti-resistant clear coat.
  - (1) The maximum surface area occupied by the cabinet shall be 6.0 sq. ft.
  - (2) The enclosure shall lock with a standard #2 Corbin signal cabinet key.
  - (3) The enclosure's engine air intake and exhaust ports shall be designed to preclude tampering or intrusion by foreign objects (vandalism prevention)
- (h) The enclosure shall have ground mounting ears.
- (i) The overall system noise level shall not exceed 70 dB.
- (j) The generator system shall be designed for continuous operation.

**SPECIAL PROVISIONS**  
**GENERATOR SYSTEM FOR TRAFFIC SIGNALS**

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- (k) The engine used in the generator system shall have cast-iron or steel cylinders or sleeves to improve longevity.
- (l) The engine shall utilize full lubrication (as opposed to splash) and shall use a commercially-available spin-on oil filter.
- (m) The engine shall have a high-capacity, washable air filter.
- (n) The generator system engine shall have an hour of operation meter or gauge.
- (o) Generator systems shall have an auto-test feature that starts the generator once a week and operates the system for a period of 15 minutes.
- (p) The major components and the overall generator system shall be UL listed/compliant.
- (q) The system shall have a manual starting battery disconnect for shipping and storage.

**Mechanical: Generator Unit**

- (a) Dimensions:           Width: 24 in  
                                  Depth: 33 in.  
                                  Height: 30.667 in.
- (b) Weight: Less than 185 lbs.

**Engineering and Diagnostics.** The generator vendor shall provide the following design services:

- (a) Develop engine control /power detection circuitry based available relays (time delay and multifunction).
  - (1) AC utility power detect input
  - (2) Generator ignition interrupt
  - (3) Generator start detect
  - (4) Generator start control
  - (5) Restart control
  - (6) Starting time-out function
  - (7) Generator cabinet heat control
  - (8) Generator stop control
  - (9) Install and test the LP/LNG fuel system.
- (b) Full product testing:
  - (1) Cold weather starting.
  - (2) Auto restart testing.
  - (3) AC line fail testing.
  - (4) AC utility line restore testing.

**Reliability.** Calculated MTBF shall be 100,000 hours based on component ratings.

**Warranty.** The generator system shall carry a standard manufacturer's 2-year warrantee from the date of delivery against any imperfections in workmanship and material.

**Training.** See "TRAINING"

**Documentation.** The generator system supplier shall provide three sets of operating manuals, service manuals, wiring diagrams, schematics, and maintenance instructions for all components of the system. In addition, the supplier shall provide a fourth set of schematics and wiring diagrams which shall be furnished in the wiring diagram holder in the controller cabinet.

**Experience.** The manufacturer shall provide the names, addresses, and telephone numbers of at least three transportation agencies in the U.S. currently using the manufacturer's generator system.

The agencies so named shall confirm that the manufacturer's systems have operated as specified in their contract documents and any applicable revisions for a period of at least one year, and that all maintenance agreements and/or warranties have been honored.

**MEASUREMENT AND PAYMENT.** Generator System for Traffic Signals shall be measured and paid for at the contract unit price each, which shall include the complete generator system, design services, installation, electrical work, grounding, and all other incidentals. The payment shall be full compensation for all materials, labor, equipment and all other incidentals necessary to complete this work.

**CATEGORY 800  
TRAFFIC****HIGH DEFINITION IP BASED VIDEO TRAFFIC DETECTION CAMERAS**

**DESCRIPTION.** Furnish and install self contained high definition (HD) Internet Protocol (IP) based video detection cameras that monitor vehicles on a roadway via the integrated video sensor with embedded camera-processor for analysis of color video images, and provide outputs to a traffic controller or similar device, as well as streaming video over a common ethernet connection, as specified in the Contract Documents or as directed by the Engineer.

**MATERIALS.** Provide video traffic detection cameras, mounting hardware, cabinets, and all component parts that meet the latest edition of the National Electrical Manufacturers Association (NEMA) Standards and Underwriters Laboratory (UL), as applicable. Provide ISO 9002 and CE certified camera components. Use the advertising date of this Contract to determine the date of the applicable standards.

If available, permanently engrave serial numbers and model numbers on all removable components and hardware. Etch, Stamp or mold the serial number and model number. The use of adhesive backed labels is not acceptable.

**Features.**

- (a) Built-in IP based addressing with a unique Ethernet MAC address. No plug-in devices or cards shall be necessary.
- (b) Integrated high definition color camera with remote controllable zoom lens.
- (c) Phase color input support for delay on red and extend on green on a detection zone basis.
- (d) Web-server interface and network connection via standard RJ-45 Ethernet port through CAT 5, CAT 5E or CAT 6 Ethernet cable.
- (e) Easy locking connector that allows technicians/installers to pull power cable either up or down a pole without splicing
- (f) Zoom configuration may be conducted at the cabinet or remotely over Ethernet.
- (g) H.264 streaming video via any standard digital video player, with variable selectable bit rate.
- (h) 16x9 video format which provides a wider field of view.
- (i) Tracking algorithm technology for increased detection accuracy.

**SPECIAL PROVISIONS**

HIGH DEFINITION IP BASED VIDEO TRAFFIC DETECTION CAMERAS

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**Camera Hardware.** Supply hardware that consists of a color video image processing camera a 3-wire control & data transfer cable for signal control and streaming video image transfer and an Administration installed communication manager interface panel.

**Video Sensor.** Provide video detection system including video sensor that integrates a high definition camera with an embedded processor for analyzing the video and performing detection bundled into a sealed enclosure.

**(a) Camera and Processor:**

- (1) Color CMOS imaging array
- (2) Resolution: 720p minimum (1280 x 720 pixels)
- (3) Optical Zoom: 10X minimum
- (4) Focal Length: 3.8mm to 38mm
- (5) Field of View: Horizontal: 7.6 to 67 degrees
- (6) Field of View: Vertical: 4.3 to 37.7 degrees
- (7) Sensitivity: 1.4 Lux
- (8) Signal to Noise Ratio: Less than 50 db
- (9) Zoom must allow across-the-intersection detection objectives, including stop line and advanced detection.
- (10) Remotely control zoom from the traffic management center or local user maintenance via Ethernet. It shall be possible to zoom the lens as required for setup and operation.
- (11) Direct, real-time iris and shutter speed controlled by the integrated processor.
- (12) Processor shall support H.264 video compression for streaming output with variable bitrate (100 to 5,000 Kbps).
- (13) Image Format: 16x9

**(b) Video Sensor Enclosure Assembly**

- (1) Camera and Processor Enclosure Rating: Sealed IP-67 enclosure

**SPECIAL PROVISIONS**

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HIGH DEFINITION IP BASED VIDEO TRAFFIC DETECTION CAMERAS

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- (2) Glass faceplate with Hydrophilic faceplate coating to shed water, reduce debris accumulation and reduce maintenance.
  - (3) Thermostatically-controlled Indium Titanium Oxide (ITO) heater applied directly on the interior surface to keep faceplate clear of condensation, snow, ice and frost.
  - (4) Adjustable aluminum visor.
  - (5) Integral sight to assist with aiming detector during setup.
  - (6) Removable cap and cable strain relief to seal the power connector. Rear cap tethered to enclosure. Rear cap shall be fastened to body of video sensor with single captive bolt. Rear car and enclosure shall include gore breathers to equalize internal and external pressure.
  - (7) Self supporting sensor on manufacturers mounting bracket.
  - (8) Allow 360 degree field of view rotation without changing angle of visor.
- (c) Power and Communications
- (1) Power and communications including digital streaming video output and all data communications shall be transmitted over the three-conductor power cable. Coaxial cable not required.
  - (2) Termination of three-conductor cable shall be inside the rear cap of enclosure on a three-position, removable terminal block. Each connector shall attach to the terminal block via a screw connection.
  - (3) No supplemental surge suppression required outside the cabinet.
- (d) Environmental:
- (1) Temperature: -29° to +165°F
  - (2) Relative Humidity: In accordance with TS2 standards
- (e) Dimensions:
- (1) Height: 7 inches
  - (2) Width: 5.5 inches
  - (3) Length: 22.5 inches

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## SPECIAL PROVISIONS

HIGH DEFINITION IP BASED VIDEO TRAFFIC DETECTION CAMERAS

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- (4) Weight: 6.5 lbs
- (f) Electrical:
  - (1) Power Input: 89VAC to 265VAC, 60Hz or 50 Hz
  - (2) Power Consumption: Typical 13W to 15W, Maximum 18W (with heaters on).
- (g) Regulatory:
  - (1) FCC Part 15, Class A
  - (2) ICES
  - (3) EN55022, EN55024, EN61000-6-1
  - (4) NEMA TS2-2003

**Detection Zone Programming and Management Software.** Placement of detection zones, management of video sensors and configuration shall be by means of a portable laptop or desktop computer using the Windows 7 or 10 operating system, a keyboard, and a mouse. Software will communicate with the video detection system via Ethernet.

- (a) The PC monitor shall be able to show the detection zones superimposed on images of traffic scenes.
- (b) Software will automatically determine all video sensors and communication management interface panels available on the local network and populate a list of devices. The software will support assignment of names to video sensors.
- (c) User may zoom camera while viewing live video stream via management software.
- (d) Calibration of distances in the field of view may be completed via management software.
- (e) Software will provide a screen to monitor operation of a video sensor including high definition (1280x720) pixel resolution. The monitoring screen will provide indications of detection in real-time by changing the color of the detector. Software will provide the ability to monitor operation of the intersection with a quad-view video stream from the communication manager interface panel. Software will allow recording of a single video sensor or quad-view and the ability to save the file to the PC.
- (f) The mouse and keyboard shall be used to draw detection zones on the PC monitor. It shall be possible to:
  - (1) Download detector configurations from the PC to the video sensor and communication

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manager interface panel cabinet equipment.

- (2) Retrieve the detector configuration that is currently running on a video sensor.
  - (3) Back up detector configurations by saving them to the PC fixed disks or other removable media storage.
  - (4) Read or import all settings from a previously saved configuration file for a video sensor or communication manager interface panel
- (g) The mouse and keyboard shall be able to:
- (1) Edit previously defined detector configurations by altering size, shape or name.
  - (2) Adjust the detection zone size and placement.
  - (3) Add detectors for additional traffic applications.
  - (4) Reprogram the camera for different traffic applications, changes in installation site geometry, or traffic rerouting.
  - (5) Perform the above upload, store, and retrieve functions for video snapshots of the video sensor cameras view.
  - (6) Place detection zones anywhere in the field of view.
  - (7) Set desired color of detections in the on and off state.
  - (8) Assign each zone to detect vehicles, bicycles or both.
  - (9) Assign the same output to multiple zones such that the output will be on if any of the zones are detecting a vehicle or bicycle.
  - (10) Assign a single zone to more than one output.
  - (11) Program at least 99 detection zones per video sensor.

**Optimal Detection.** Provide video detection camera that provides optimal detection of vehicle passage and presence when the:

- (a) Video sensor is installed on lighting arm or mast arm across the intersection for presence (stop line) detection.



- (b) Video sensor is located horizontally on a mast arm or luminaire arm in a level position and aligned with the approaching lane.
- (c) Video sensor is mounted between 18 feet and 30 feet above the roadway. Generally the higher the camera is mounted, the better the view and detection coverage.
- (d) The distance to the farthest detection zone locations is not greater than 15 times the mounting height of the video sensor.
- (e) The deployment geometry provides an unobstructed view of each traveled lane where detection is required. Although optimal detection may be obtained when the video sensor is mounted directly above the traveled lanes, the video sensor shall not be required to be directly over the roadway.
- (f) The video sensor is able to view either approaching or receding traffic or both in the same field of view. The preferred image camera orientation for optimal detection shall be to view approaching traffic since there are more high contrast features on vehicles as viewed from the front rather than the rear.
- (g) The video sensor, when placed at a mounting height that minimizes vehicle image occlusion, is able to monitor a maximum of 7 traffic lanes when mounted at the roadside, or up to 8 lanes when mounted in the center with four lanes on each side.

**Count Detection Performance.** Using a video sensor installed within the optimal viewing specifications for count station traffic applications; the camera shall be able to accurately count vehicles, and store traffic flow data in non-volatile memory for later retrieval and analysis, with:

- (a) At least 98 percent accuracy under normal operating conditions (day and night).
- (b) No additional hardware or software required.
- (c) At least 93 percent accuracy under artifact conditions. Artifact conditions are combinations of weather and lighting conditions that result from shadows, fog, rain, snow, etc. The volume count shall be:
  - (1) Accumulated for the entire roadway (all traveled lanes).
  - (2) Accumulated over time intervals that contain a minimum of one hundred (100) vehicles to ensure statistical significance.

**Demand Presence Detection Performance.** Using a video sensor installed within the optimal viewing specifications described above for intersection control traffic applications; the video sensor shall be able to accurately provide demand presence detection.

- (a) The demand presence accuracy shall be based on the ability to enable a protected turning movement on an intersection stop line, when a demand exists.
- (b) The probability of not detecting a vehicle for demand presence (stop line) shall be less than 1 percent error under all operating conditions.
- (c) The probability of falsely detecting a vehicle that is not there for demand presence (stop line) shall be less than 3 percent error under all operating conditions.
- (d) To ensure statistical significance, the demand presence accuracy and error shall be calculated over 24 hour time intervals that contain a minimum of 100 vehicles per lane.
- (e) The calculation of the demand presence error shall not include turning movements where vehicles do not pass through the presence detectors, or where they stop short or stop beyond the combined detection zones.

**Failsafe Mode.** The video sensor will provide three failsafe options during optical contrast loss. The default will be maximum recall. The video sensor may be configured to use minimum recall or fixed recall, which is a user-defined number of seconds entered to hold a call, for failsafe mode.

The sensor continuously monitors the overall contrast in the video. If the overall contrast falls below the preset level due to dirt on faceplate, extreme fog, severe glare or ice on faceplate, the sensor will enable the chosen failsafe mode. After contrast is restored, the video sensor will exit failsafe mode.

The communication manager interface panel continuously monitors the connectivity status of the attached video sensors. If any video sensor goes offline due to electrical failure or internal software failure, the communication manager interface panel shall enable failsafe mode. Once the video sensor is back online, the device will exit failsafe mode.

**Speed Detection Performance.** The video sensor shall accurately measure average (arithmetic mean) speed of multiple vehicles with more than 97 percent accuracy under all operating conditions for approaching and receding traffic.

- (a) The average speed measurement will include a minimum of 100 vehicles in the sample to ensure statistical significance.
- (b) Optimal speed detection performance requires that camera location conform to the specifications described for count station traffic applications with the exception that the camera must be higher than 30 feet.
- (c) The video sensor will accurately measure individual vehicle speeds with more than 94 percent accuracy under all operating conditions for vehicles approaching the camera (viewing the front end of vehicles), and more than 90 percent accuracy for vehicles receding from the camera (viewing the rear end of vehicles).

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- (d) These specifications will apply to vehicles that travel through both the count and speed detector pair and will not include partial detection situations created by lane-changing maneuvers.
- (e) To ensure statistical significance, the average speed accuracy and error will be calculated over time intervals that contain a minimum of one hundred vehicles.

**18-Gauge Camera-to-Cabinet Cable.** The cable between the MVP and the cabinet interface shall consist of three conductors 18 AWG, with an overall UV-resistant low density polyethylene jacket.

### (a) Conductors.

- (1) Three, 18 AWG, 19 strands of 30 gauge tin-plated copper conductor diameter .046”/.052”.
- (2) Extruded polyethylene 200 conductor insulation, with nominal .030” wall thickness.
- (3) Black, green, and white colors.

### (b) Construction.

- (1) Extruded black polyethylene jacket .040”/.050” wall thickness, UV-resistant.
- (2) 0 .330” - .354” maximum outside diameter.
- (3) 600 volt (rms) rated.
- (4) The cable shall be imprinted with the manufacturer’s part number, number of conductors, conductor size, voltage rating, jacket material, and an indication that it is conduit rated.

**Communication Manager Interface Panel.** The video detection system will include an interface panel in the traffic signal cabinet that manages communications between video sensors, the traffic management center, a maintenance technical and the traffic signal controller. The communication manager interface panel will be furnished and installed by the Administration. This section is for reference only.

The communication manager interface panel cabinet equipment shall provide connection points and communicate directly with up to four (4) video sensors (cameras) and provide up to thirty-two (32) inputs and sixty-four (64) outputs or up to sixteen (16) contact closure inputs and twenty-four (24) contact closure outputs to a traffic signal controller.

The communication manager interface panel shall have the following features:

- (a) Four (4) sets of three (3) electrical terminations for three-wire cables for power and broadband-over-power communications for up to four (4) video sensors cameras.

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- (b)** High-energy transient protection to electrically protect the communication manager interface panel and connected video sensors.
- (c)** Predefined wire termination blocks for video sensor power and communication connections.
- (d)** A broadband-over-power transceiver that supports up to 70 to 90 Mbps inter-device communications. A broadband-over-power transceiver that supports communication over a distance of at least 1,000 feet of cabling to the video sensor.
- (e)** Power switch for each video sensor.
- (f)** An LED for each video sensor indicating the state of power to the sensor.
- (g)** An LED for each video sensor indicating the status of communication.
- (h)** The option of using either 120/240 VAC 50/60 Hz power.
- (i)** Fuse protection using two SLO-BLO fuses.
- (j)** One (1) NEMA TS2 Type 1 compatible SDLC interface which consists of a 15-pin female metal shell D sub-miniature type connector to support a standard NEMA TS2 or TEES SDLC cable to provide communications between the communication manager interface panel and the traffic signal controller through the cabinet.
- (k)** Supports a protocol interface to SDLC capable traffic controllers (NEMA or TEES).
- (l)** Supports SDLC protocol including up to sixty-four (64) detector outputs and thirty-two (32) inputs.
- (m)** SDLC connection capable of being wired to an input/output card which supports wired I/O in cabinets without an SDLC capable controller. Support at least twenty-four (24) outputs and sixteen (16) inputs via the wired I/O data communications link.
- (n)** Capability to connect and use both SDLC communications and communications to the wired I/O card simultaneously.
- (o)** 10/100/1000M Ethernet RJ-45 port for connection to traffic management center. Provide a communication manager interface panel which will proxy all network requests that arrive on the traffic management center connection to avoid unwanted network traffic from reaching the broadband-over-power network between the communication manager interface panel and the video sensors. A single IP address will be used for all communications through the traffic management center connection to the video detection system.

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- (p) Local user maintenance communications will be via a 10/100/1000M Ethernet RJ-45 port to connect the technician at the cabinet to the video detection system for maintenance purposes. A single IP address will be used for all communications through the local user maintenance connection to the video detection system. The local user maintenance port shall support DHCP to automatically assign an IP address to a maintenance user computer, if desired.
- (q) 802.11g WiFi access point to allow wireless connection to the video detection system at the cabinet for setup and maintenance purposes. The WiFi access point communicates to the video detection system through a single IP address and must support DHCP to automatically assign an IP address to a maintenance user computer, if desired. The WiFi access point consists of a dipole omnidirectional antenna. WiFi access point equipped with a momentary on/off switch. After a period of inactivity, the WiFi access point will turn itself off. An LED will indicate the status of the WiFi access point. The WiFi access point shall have the ability to operate simultaneously with the RJ-45 Ethernet ports for traffic management center and local user maintenance communications.
- (r) Two (2) USB 2.0 ports. USB ports capable of running software to reinstall system and application software from a USB memory stick without removal of the communication manager interface panel.
- (s) Environmental:
- (1) Temperature: -29° to +165°F
  - (2) Relative Humidity: 0-95% non-condensing
- (t) Dimensions:
- (1) Height: 2.5 inches
  - (2) Width: 7 inches
  - (3) Length: 11 inches
  - (4) Weight: 2.0 lbs
- (u) Electrical:
- (1) Power Input: 85VAC to 265VAC, 60Hz or 50 Hz
  - (2) Power Consumption: Minimum of 15W typical without sensors; 75W typicals with 4 video sensors; 140W maximum
- (v) Video Output:

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- (1) Digital Streaming: H.264 720p, 30 fps
- (2) Variable bitrate selectable (100 to 5,000 Kbps)

(w) Regulatory:

- (1) FCC Part 15, Class A
- (2) ICES
- (3) EN55022, EN55024, EN61000-6-1
- (4) NEMA TS2-2003

**Wired Input / Output (I/O) Card.** The video detection system will support an optional wired I/O card that communicates with the communication manager interface panel for real-time detection states and other I/O to the traffic signal controller. The wired I/O card may reside in a standard detector rack or shelf mount enclosure with power module. The wired I/O card will be furnished and installed by the Administration. This section is for reference only.

The wired I/O card will provide up to sixteen (16) contact closure inputs and twenty-four (24) contact closure outputs to a traffic signal controller.

The wired I/O card shall have the following features:

- (a) Comply with form factor and electrical characteristics to plug directly into a NEMA type C or D detector rack or Caltrans TEES input file.
- (b) Occupy two slots of the detector rack.
- (c) Provide four (4) detector outputs on the rear-edge connector.
- (d) Provide a front connector which allows up to sixteen (16) contact closure inputs and twenty-four (24) contact closure outputs to a traffic signal controller.
- (e) A front panel LED for each of the sixteen (16) contact closure inputs and twenty-four (24) contact closure outputs to indicate the state of each detector.
- (f) Supports optional expansion cards in other slots. Each expansion card supports four (4) outputs to the back edge of the card.
- (g) Optional harness for connection to input files or C1, C4, C11 and C12 ports to support Type 170 or Type 2070 controllers.

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- (h) Hot swappable card.
- (i) DB-44 pin connector that may connect the I/O harness from the cabinet to the wired I/O card including sixteen (16) inputs and twenty-four (24) outputs.
- (j) DB-9 pin connector to provide connection to communication manager interface panel.
- (k) Environmental:
  - (1) Temperature: -29° to +165°F
  - (2) Relative Humidity: 0-95% non-condensing
- (l) Dimensions:
  - (1) Height: 4.5 inches
  - (2) Width: 2.3 inches
  - (3) Length: 6.9 inches excluding handle
  - (4) Weight: 0.5 lbs
- (m) Electrical:
  - (1) Power Input: 10.8 VDC minimum; 26.5 VDC maximum
  - (2) Power Consumption: 50ma per channel
- (n) Video Output:
  - (1) Digital Streaming: H.264 720p, 30 fps
  - (2) Variable bitrate selectable (100 to 5,000 Kbps)
- (o) Regulatory:
  - (1) FCC Part 15, Class A
  - (2) ICES
  - (3) EN55022, EN55024, EN61000-6-1

**(4) NEMA TS2-2003**

**CONSTRUCTION.** Provide video detection cameras that consist of an HD IP based video camera and a 3-conductor power cable that carries both power to the camera, and video and data signals back to Administration installed video detection communication manager interface equipment in the controller cabinet. The video detection communication manager interface equipment installed in the cabinet permits direct communication to the traffic signal controller using the industry standard EIA-485 synchronous data link (SDLC) or to contact-closure hardwired devices. A 10/100/1000 Ethernet connection and the industry standard TCP/IP communications protocol allow connection to Ethernet/IP based networks.

**Mounting Hardware.** Supply mounting hardware capable of securely mounting the camera to the camera support and mounting the camera support securely to the structure. Provide mounting hardware capable of mounting the camera to a vertical, horizontal or angled structure in accordance with Maryland SHA Typical details. Provide a 60" vertical extension pipe when installing on a mast arms unless otherwise specified by the Contract Documents or as directed by the Engineer.

**Installation and Training.** The supplier of the video detection camera shall supervise the installation and testing of the video detection camera and any optional computer equipment.

**Warranty, Maintenance and Support.** The video detection camera shall be warranted by its supplier for a minimum of 3 years.

**Documentation.** The equipment supplier shall deliver a CD or USB drive containing operating manuals, service manuals, and maintenance instructions for the video traffic detection camera being supplied to the Administration's Office of Traffic & Safety, Signal Operations Division, located at 7491 Connelley Drive, Hanover, Maryland 21076. The phone number is 410-787-7650.

**MEASUREMENT AND PAYMENT.** HD IP Based Video Traffic Detection Camera and Any Length Lead-In Cable will be measured and paid for at the contract unit price per each. The payment will be full compensation for furnishing and installing the video traffic detection camera, equipment specified, all mounting hardware including camera support to structure, up to 60" vertical extension pipe, 3 conductor cable from the camera to the controller cabinet, labor, and all incidentals necessary to complete this work.

The HD IP-Based Video Detection Communication Manager Interface Panel, wired input/output card (if specified) and all other cabinet equipment will be furnished and installed by the Administration.



**CATEGORY 800**  
**TRAFFIC**

**INTERCEPT EXISTING ELECTRICAL SERVICES**

**DESCRIPTION.** Intercept up to three existing electrical or communications services within a 10 foot radius of a common point, and install a field equipment cabinet or the appropriate power or communications pedestals, as specified in the Contract Documents or as directed by the Engineer.

**MATERIALS.** All materials and equipment shall be new and approved by the Engineer.

**CONSTRUCTION.** Intercept up to three existing communications or electrical services at a common location, and install either a field equipment cabinet or the appropriate service pedestals. Foundations, cabinets or service pedestals installed will measured and paid for separately under their respective contract items.

- (a) The conduit installed under this item shall match the existing conduits that are intercepted in both diameter and schedule.
- (b) The existing conduits may be galvanized steel, or PVC.
  - (1) If the existing conduits are steel, properly-coupled Schedule 80 PVC may be used, as long as the PVC conduit is below grade.
  - (2) Power risers to an exposed disconnect switch shall be galvanized steel.

**MEASUREMENT AND PAYMENT.** Intercepting existing electrical or communications services and installing field equipment cabinets or service pedestals will be paid for at the Contract Unit price bid for this work. The payment will be full compensation for test pitting to find the conduits, conduit and conduit stubs, material, labor, and equipment, including all incidentals necessary to complete the work.

**CATEGORY 800**  
**TRAFFIC**

**IP BASED VIDEO TRAFFIC DETECTION CAMERAS**

**DESCRIPTION.** Furnish and install self contained internet protocol (IP) based video detection cameras that monitor vehicles on a roadway via the machine vision processing of color video images, and provide outputs to a traffic controller or similar device, as well as streaming MPEG-4 video over a common ethernet connection, as specified in the Contract Documents or as directed by the Engineer.

**MATERIALS.** Provide video traffic detection cameras, mounting hardware, cabinets, and all component parts that meet the latest edition of the National Electrical Manufacturers Association (NEMA) Standards and Underwriters Laboratory (UL), as applicable. Provide ISO 9002 and CE certified camera components. Use the advertising date of this Contract to determine the date of the applicable standards.

If available, permanently engrave serial numbers and model numbers on all removable components and hardware. Etch, Stamp or mold the serial number and model number. The use of adhesive backed labels is not acceptable.

**CONSTRUCTION.** Provide video detection cameras that consist of an IP based video camera and a 3-conductor power cable that carries both power to the camera, and video and data signals back to Administration installed video processing equipment in the controller cabinet. The cabinet equipment permits direct connection to the signal controller via a 10/100 Ethernet connection and the industry standard TCP/IP communications protocol, or to contact-closure hardwired devices.

**Features.**

- (a) Built-in IP based addressing with a unique Ethernet MAC address. No plug-in devices or cards shall be necessary.
- (b) Web-server interface and network connection via standard CAT-5 cable.
- (c) Easy locking connector that allows technicians/installers to pull power cable either up or down a pole without splicing
- (d) Zoom configuration is conducted at the cabinet.
- (e) MPEG-4 streaming video via any standard digital video player, with viewing rates of 5 fps to 30 fps, depending on bandwidth.
- (f) An access point in the cabinet that provides standard NTSC or PAL full-motion video output to an analog video monitor.

- (g) Internet browser interface with common Internet browsers for password-protected access over the internet. The embedded web server capability shall enable access to streaming video, configuration editing, and camera monitoring via the Internet.
- (h) Dual core processor with DSP image processing and ARM general-purpose processing.
- (i) Direct real-time iris and shutter speed control.
- (j) Non-volatile memory data storage.

**Camera Hardware.** Supply hardware that consists of a color video image processing camera, and a 3-wire control & data transfer cable for signal control and streaming MPEG-4 video image transfer.

**Machine Vision Processor (MVP).** Provide MVP camera that is an integrated imaging color CCD array with zoom lens optics, high speed, dual-core image processing hardware bundled into a sealed enclosure.

- (a) The CCD array shall be directly controlled by a dual-core processor, thus providing high-quality video for detection that has virtually no noise to degrade detection performance.
- (b) It shall be possible to zoom the lens as required for setup and operation.
- (c) The MVP shall provide JPEG video compression as well as standard MPEG-4 digital streaming video with flashing detector overlay.
- (d) The MVP shall provide direct real-time iris and shutter speed control.
- (e) The MVP camera shall be equipped with an integrated 22x zoom lens that can be changed using either configuration computer software.
- (f) The digital streaming video output and all data communications shall be transmitted over the three-wire power cable.
- (g) The MVP camera shall operate on 120/220 VAC, 50/60 Hz, with a maximum wattage of 25 watts.
  - (1) The camera and processor electronics shall consume 10 watts.
  - (2) The enclosure heater shall consume 15 watts.

**MVP Lens.**

- (a) Low-power thermostatically-controlled ITO faceplate.
- (b) Built-in heater.

- (c) Hydrophilic faceplate coating to shed water.
- (d) Weatherproof rear connector (IDC rapid termination industrial connector).
- (e) The lens shall be available in a standard configuration or wide-angle.
- (f) The focal length shall be 4.1mm to 87.8mm.

**Detection Zone Programming.** Placement of detection zones shall be by means of a portable or desktop computer using the Windows XP, or Vista operating system, a keyboard, and a mouse.

- (a) The PC monitor shall be able to show the detection zones superimposed on images of traffic scenes.
- (b) The mouse and keyboard shall be used to draw detection zones on the PC monitor. It shall be possible to:
  - (1) Download detector configurations from the PC to the MVP camera and cabinet interface module.
  - (2) Retrieve the detector configuration that is currently running in the MVP camera.
  - (3) Back up detector configurations by saving them to the PC fixed disks or other removable media storage.
- (c) The supervisor's mouse and keyboard shall be able to:
  - (1) Edit previously defined detector configurations.
  - (2) Adjust the detection zone size and placement.
  - (3) Add detectors for additional traffic applications.
  - (4) Reprogram the camera for different traffic applications, changes in installation site geometry, or traffic rerouting.
  - (5) Perform the above upload, store, and retrieve functions for video snapshots of the MVP cameras view.

**Optimal Detection.** Provide video detection camera that provides optimal detection of vehicle passage and presence when the:

- (a) The MVP camera is mounted 10 m (30 ft) or higher above the roadway.
- (b) The image camera is adjacent to the desired coverage area.
- (c) The distance to the farthest detection zone locations is not greater than 10 times the mounting height of the MVP camera.

- (d) The deployment geometry provides an unobstructed view of each traveled lane where detection is required. Although optimal detection may be obtained when the MVP camera is mounted directly above the traveled lanes, the MVP camera shall not be required to be directly over the roadway.
- (e) The MVP camera is able to view either approaching or receding traffic or both in the same field of view. The preferred image camera orientation for optimal detection shall be to view approaching traffic since there are more high contrast features on vehicles as viewed from the front rather than the rear.
- (f) The MVP camera, when placed at a mounting height that minimizes vehicle image occlusion and equipped with a lens to match the width of the road, is able to monitor a maximum of 7 traffic lanes when mounted at the roadside, or up to 8 lanes when mounted in the center with four lanes on each side.

**18-Gauge Camera-to-Cabinet Cable.** The cable between the MVP and the cabinet interface shall consist of three conductors 18 AWG, with an overall UV-resistant low density polyethylene jacket.

**(a) Conductors.**

- (1) Three, 18 AWG, 19 strands of 30 gauge tin-plated copper conductor diameter .046”/.052”.
- (2) Extruded polyethylene 200 conductor insulation, with nominal .030” wall thickness.
- (3) Black, green, and white colors.

**(b) Construction.**

- (1) Extruded black polyethylene jacket .040”/.050” wall thickness, UV-resistant.
- (2) 0.330” - .354” maximum outside diameter.
- (3) 600 volt (rms) rated.
- (4) The cable shall be imprinted with the manufacturer’s part number, number of conductors, conductor size, voltage rating, jacket material, and an indication that it is conduit rated.

**Count Detection Performance.** Using a MVP camera installed within the optimal viewing specifications described above for count station traffic applications; the camera shall be able to accurately count vehicles with:

- (a) At least 98 percent accuracy under normal operating conditions (day and night).
- (b) At least 93 percent accuracy under artifact conditions. Artifact conditions are combinations of weather and lighting conditions that result from shadows, fog, rain, snow, etc. The volume count shall be:
  - (1) Accumulated for the entire roadway (all traveled lanes).

- (2) Accumulated over time intervals that contain a minimum of one hundred (100) vehicles to ensure statistical significance.

**Demand Presence Detection Performance.** Using a MVP camera installed within the optimal viewing specifications described above for intersection control traffic applications; the camera shall be able to accurately provide demand presence detection.

- (a) The demand presence accuracy shall be based on the ability to enable a protected turning movement on an intersection stop line, when a demand exists.
- (b) The probability of not detecting a vehicle for demand presence shall be less than 1- Percent error under all operating conditions.
- (c) In the presence of artifact conditions, the MVP camera shall minimize extraneous (false) protected movement calls to less than 7 percent.
- (d) To ensure statistical significance, the demand presence accuracy and error shall be calculated over time intervals that contain a minimum of 100 protected turning movements performance specifications shall be achieved with a minimum of 2 presence detectors coupled with a single detector function (Type-9) to provide adequate road coverage to sample the random arrival patterns of vehicles at the stop line.
- (e) The calculation of the demand presence error shall not include turning movements where vehicles do not pass through the presence detectors, or where they stop short or stop beyond the combined detection zones.

**Speed Detection Performance.** The MVP shall accurately measure average (arithmetic mean) speed of multiple vehicles with more than 97 percent accuracy under all operating conditions for approaching and receding traffic.

- (a) The average speed measurement will include a minimum of 100 vehicles in the sample to ensure statistical significance.
- (b) Optimal speed detection performance requires that camera location conform to the specifications described above for count station traffic applications with the exception that the camera must be higher than 13 m (40) ft.
- (c) The MVP will accurately measure individual vehicle speeds with more than 94 percent accuracy under all operating conditions for vehicles approaching the camera (viewing the front end of vehicles), and more than 90 percent accuracy for vehicles receding from the camera (viewing the rear end of vehicles).
- (d) These specifications will apply to vehicles that travel through both the count and speed detector pair and will not include partial detection situations created by lane-changing maneuvers.

- (e) To ensure statistical significance, the average speed accuracy and error will be calculated over time intervals that contain a minimum of one hundred vehicles.

**Modular Cabinet Interface Unit (Access Point).** The modular cabinet interface unit will be furnished and installed by the Administration. This section is for reference only.

The modular cabinet interface unit shall communicate directly with up to eight (8) MVP cameras and shall comply with the form factor and electrical characteristics to plug directly into a NEMA type C or D detector rack providing up to thirty-two (32) inputs and sixty-four (64) outputs or a 170 input file rack providing up to sixteen (16) contact closure inputs and twenty-four (24) contact closure outputs to a traffic signal controller.

**(a) Additional Features.**

- (1) Easy IP addressable Ethernet connectivity using RJ-45 connectors.
- (2) USB 2.0 connector for a USB mouse.
- (3) Provides PAL or NTSC analog video output for MPEG-4 streaming digital video.
- (4) Detector rack or shelf mount installation.
- (5) 1500 volts RMS isolation between rack logic ground and street wiring.
- (6) Emulates the function of up to 4 TS2 Bus Interface Units (BIU).
- (7) Self diagnostics on power-up.
- (8) High-energy transient protection.

**(b) Power:** 12 to 24 VDC, 11W maximum.

**(c) Environmental.**

- (1) Temperature: -34° C to +74° C (-29° F to +165° F).
- (2) Relative Humidity: 0 to 95 Percent.

**(d) Dimensions and Weight.**

- (1) 114 mm H x 59 mm W x 175 mm L (4.5 in H x 2.34 in W x 6.9 in L)
- (2) Weight: 0.5 lb.

**(e) Complies with:** CE EN 55022, EN 61000-6-1 FCC Part 15, Class A.

**Communications Interface Panel.** The communications interface panel will be furnished and installed by the Administration. This section is for reference only. The communications interface panel shall have the following features:

- (a) Four (4) sets of three (3) electrical terminations for three-wire cables for powering up to eight (8) MVP cameras.

- (b) High-energy transient protection to electrically protect the modular cabinet Interface unit and connected MVP cameras.
- (c) Single-point Ethernet connectivity via RJ45 connector for communication to and between the modular cabinet interface module and the MVP cameras.
- (d) Predefined wire termination blocks for MVP power connections.
- (e) A Broadband-Over-Power-Line (BPL) transceiver that supports up to 10 MB/s inter-device communications.
- (f) An interface connector to cable directly to the modular cabinet interface unit.
- (g) The option of using either 110/220 VAC 50/60 Hz power.
- (h) Fuse protection using SLO-BLO, 1/2 amp fuses.

**Installation and Training.** The supplier of the video detection camera shall supervise the installation and testing of the video detection camera and any optional computer equipment.

**Warranty, Maintenance and Support.** The video detection camera shall be warranted by its supplier for a minimum of 2 years.

**Documentation.** The equipment supplier shall deliver a CD containing operating manuals, service manuals, and maintenance instructions for the video traffic detection camera being supplied to the Administration's Office of Traffic & Safety, Signal Operations Division, located at 7491 Connelley Drive, Hanover, Maryland 21076. The phone number is 410-787-7650.

**Mounting Hardware.** Supply mounting hardware capable of securely mounting the camera to the camera support and mounting the camera support securely to the structure. Provide mounting hardware capable of mounting the camera to a vertical, horizontal or angled structure in accordance with Maryland SHA Typical details. Provide up to 60" vertical extension pipe where required by Contract Documents or as directed by the Engineer.

**MEASUREMENT AND PAYMENT.** IP Based Video Traffic Detection Cameras will be measured and paid for at the contract unit price per each. The payment will be full compensation for furnishing and installing the video traffic detection camera, equipment specified, all mounting hardware including camera support to structure, up to 60" vertical extension pipe, 3 conductor cable from the camera to the controller cabinet, labor, and all incidentals necessary to complete this work.

The communications interface panel, modular cabinet interface unit, and all other cabinet equipment will be furnished and installed by the Administration.



**CATEGORY 800**  
**TRAFFIC**

**JELLY-FILLED COMMUNICATIONS CABLE**

**DESCRIPTION.** Furnish and install 6 or 12 pair jelly-filled communication cable as specified in the Contract Documents or as directed by the Engineer.

**MATERIALS.** IMSA 60-2.

**CONSTRUCTION.** The communication wire shall be #19 AWG twisted-pair copper cables, suitable for direct-buried or conduit installation, and shall meet the requirements of REA Specification PE-39.

Supply, install, and test twisted-pair cables which will provide communications between the field equipment and the corresponding communications leased services demarcation points.

- (a) Provide a manufacturer's certification that the offered communication wire complies with all electrical and mechanical requirements listed in this specification.
- (b) Twisted-pair communication wire shall contain 6 or 12 stranded conductors, as shown on the Plans or as specified in the Contract Documents.
- (c) Conductors shall consist of a stranded wire of plain annealed high conductivity copper, smoothly drawn, circular in section, uniform in quality, and free from defects.
  - (1) Each conductor shall be insulated with a colored, high density polyethylene jacket. The twisted-pair communication wires shall be color-coded using the REA standard color code.
  - (2) Insulated conductors shall be uniformly twisted to form pairs.

The twisted length of the pairs shall vary to minimize cross talk. Near-end crosstalk shall not exceed 56 Db @ 772 kHz within a 6-pair cable.

A non-hygroscopic dielectric tape shall be wrapped around the insulated pairs

- (d) A laid up core shall be wrapped with aluminum tape and bonded with an overlap to provide 100 percent shielding.
- (e) A black, high molecular weight, medium density, polyethylene jacket shall be extruded over the shield.
- (f) Filling compound materials used in the communication wire shall not support galvanic action.

**SPECIAL PROVISIONS**  
**JELLY-FILLED COMMUNICATIONS CABLE**

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- (g) The twisted-pair communication wire shall be manufactured for installation in an underground conduit.
- (h) The copper communication wire shall contain no faulty pairs and shall be capable of the transmission of 9600 bps over distances up to 3000 ft.
- (i) Mutual capacitance: shall not exceed 40 nF, +/-3 nF per kilometer.
- (j) DC Resistance shall not exceed 107.0 ohms per 1000 meters.
- (k) Characteristic impedance shall be less than 100 ohms (above 1 MHz).
- (l) Attenuation: 7.5 dB/Kilometer @ 150 kHz  
15.4 dB/Kilometer @ 772 kHz
- (m) The Contractor shall be responsible for all testing and documentation required to establish approval and acceptance of the production, and installation of twisted-pair cable.
  - (1) **DC Resistance.** The resistance of any conductor in any twisted-pair communication wire shall not exceed 9.38 ohms per 330 ft.
  - (2) **DC Resistance Unbalance.** The resistance unbalance between the two conductors of any pair shall not exceed 5 percent.
  - (3) **Mutual Capacitance.** The mutual capacitance of any pair shall not exceed 47.6 pF per 3.3 ft at 1 MHz.
  - (4) **Capacitance Unbalance - Pair to Ground.** The capacitance unbalance to ground at 1 kHz of any pair shall not exceed 3.3 pF per 3.3 ft.
- (n) The Contractor shall ensure that all installed cabling systems are in full compliance with the National Electrical Code (NEC) to ensure that electrical installations meet the necessary safety practices to prevent electrical shock hazards to personnel and to ensure fault clearance of unintentional electrical breakdowns.
- (o) The Contractor shall ensure that all installed cabling systems are in full compliance with the National Electrical Code (NEC) to ensure that electrical installations meet the necessary safety practices to prevent electrical shock hazards to personnel and to ensure fault clearance of unintentional electrical breakdowns.

**MEASUREMENT AND PAYMENT.** Jelly-Filled Communications Cable will be measured and paid for at the Contract unit price per linear foot, complete in place, for all cable furnished and installed. The payment will be full compensation for all cable, connectors, labor, materials, equipment, and all incidentals necessary to complete the work.

**CATEGORY 800**  
**TRAFFIC**

**LED LANE USE CONTROL SIGNALS**

**DESCRIPTION.** Furnish and install Light Emitting Diode (LED) Lane Use Control Signals as specified in the Contract Documents or as directed by the Engineer. Within the face, the Lane Use Control Signal shall contain up to three types of LED displays. One display shall include a red “X”, yellow “X” and green “Arrow”. Each symbol shall be 18 in minimum tall as shown on the Contract Documents. The physical appearance of the Lane Use Control Signals shall be a square shape. Each display shall create the appropriate symbol by a double stroked row of LED pixels. The symbols shall be clearly visible in normal daylight and nighttime conditions.

**MATERIALS.** All materials and equipment forming part of the LED Lane Use Control Signal shall be new and approved by the Engineer.

**Lane Use Control Signal Enclosure.**

Each enclosure shall meet the following physical characteristics:

- 1) Fabricate the weather proof enclosure from 0.125 in. aluminum, 5052-H32 series;
- 2) The enclosure shall have all corner and seams welded to provide a watertight seal around the entire case;
- 3) The sign face shall be aluminum, 5052-H32 series. The sign face shall be attached to the enclosure with two stainless steel lift-off hinges. A hand operated stainless steel latch shall secure the sign face to the enclosure. The sign face shall be removable and replaceable in the field without need for tools to allow for easy replacement without removing the entire enclosure. The sign face shall have a quick disconnect plug for easy door removal;
- 4) The 12 in. deep sign face visor shall be aluminum, 5032-H32 series, attached securely to the sign enclosure. The visor shall not impede the removal of the sign face;
- 5) A waterproof seal shall be created between the sign face and sign housing by use of a ¼ in. x 1 in. wide neoprene gasket;
- 6) The enclosure for the multiple display signals shall include a terminal block for termination of the 120 volt supply for the red “X” symbol, yellow “X” symbol, green “arrow” symbol and for the neutral. The enclosure shall include a terminal block for all alarm lead in cables. Each termination point will be labeled to correspond to the appropriate function;
- 7) Design the enclosure to be securely mounted on a signal mast arm, a 1 ½ in. hub shall be installed on top and bottom of the housing, and connected to the internal stiffeners. Mounting hardware assembly shall be as detailed for rigid mount signal heads on Maryland Standard MD 814.01;

**SPECIAL PROVISIONS**  
**LED LANE USE CONTROL SIGNALS**

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- 8) The housing, sign face and visor shall be fusion bonded polyester power Black coated per manufacture's recommendations;
- 9) Maximum Weight:  $\leq 100$  lbs;
- 10) Operating Temperature Range: -40 F to 165 F;
- 11) All materials used in construction shall be resistant to fungus growth and moisture deterioration;
- 12) Dissimilar metals shall be separated by an inert dielectric material;
- 13) No self-tapping screws may be used on the exterior of the sign unless approved in writing by the Engineer;
- 14) Sealed aluminum housing as per NEMA 4X requirements;
- 15) Poor workmanship shall result in rejection of the sign;
- 16) The housing height shall permit mounting the signs within the space shown in the Contract Documents;
- 17) Signs shall have at least two stainless steel latches per sign face to tightly secure the face against the gasket;
- 18) If cable attachments are used in the sign housing, the cables shall be securely clamped as approved by the Engineer. No adhesive attachments shall be allowed.
- 19) All external fasteners, washers, and hardware shall be stainless steel;
- 20) All components shall be readily accessible for maintenance when the sign face is open;
- 21) The sign construction shall be a modular concept consisting of the following "hand removable" self-contained modules: message display, rack mounted individual message drives, driver rack assembly and sign enclosure;
- 22) The assembly of the sign shall be designed to ensure all internal components are adequately supported to withstand mechanical shock and vibration from wind ratings meeting AASHTO requirement of 90 mph with a 30 percent gust factor.

**LED Message Display.**

The sign shall display two or more messages in the character size and font shown on the Plans and meet the following requirements:

- 1) The display shall consist of solid state LED's mounted on a Printed Circuit Board (PCB) matrix

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**SPECIAL PROVISIONS**  
**LED LANE USE CONTROL SIGNALS**

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- with a matte black mask to conceal solder joints and other circuit board features;
- 2) Signs shall be one-way with messages displayed on one side only;
  - 3) No phantom words or legend shall be seen under any ambient light condition;
  - 4) All characters shall be legible under all light conditions at a distance of 900 ft, within a 15-17 degree cone of vision centered about the optical axis;
  - 5) The LED's shall be arranged in a manner to form "double stroke" characters and shall be distributed evenly along the message. The maximum distance between consecutive LED's shall not exceed 2.5 times the diameter of the LED used, and shall not vary more than 10 percent;
  - 6) The PCB shall have a minimum thickness of 0.093 in;
  - 7) The PCB shall have a component identifier silk screen;
  - 8) The nominal luminous intensity of each LED shall be 6,000 mcd at 20 mA;
  - 9) The individual LED light sources shall be interconnected so that the catastrophic failure of a single LED will result in a total loss of not more than 5 percent of total number of LED's;
  - 10) There shall be no electronic components visible on the front of the display;
  - 11) The LEDs shall be individually mounted directly to the display module printed circuit board and shall be easily replaceable and individually removable using conventional repair shop methods;
  - 12) Each pixel shall be rated for 100,000 continuous operation with no more than 50 percent lumen depreciation;
  - 13) The red "X", yellow "X" and green "Arrow" shall have a minimum height of 18 in.;
  - 14) Only the LED's for the required message(s) shall be installed on the display matrix;
  - 15) The red and amber LED's shall be of the latest Alln GaP Technology. The green and lunar white LED's shall be of the latest In GaN technology;
  - 16) The rear side of the PCB shall be protected by a molded polymeric back cover to seal and protect it from any possible damage;
  - 17) The display PCB with back cover shall fit into front door which consist of an aluminum frame and face lens;
  - 18) The face lens shall be made of 0.250 in. (1/4 in.) non glare matte-finish polycarbonate with UV

resistant surface treatment. The lens shall have light transmission properties of at least 82 percent;

- 19) The entire face display shall be assembled as a one piece self-contained module that can be easily removed from the sign housing in less than one minute without need for any tool;
- 20) The door face shall be mounted on the sign housing on 2 stainless steel "lift-off" type hinges and shall be latched using 2 stainless steel ¼ turn link locks.
- 21) The display module shall have a multi-conductor cable with an individual 2 pin connector for each message;
- 22) A retaining rod shall be provided to hold the front door in the open position.

#### **Driver Rack Assembly**

- 1) The driver rack assembly shall be a single part self-contained module consisting of an interconnect PCB and anodized aluminum frame;
- 2) The driver rack shall have the capabilities to house up to 6 drive modules;
- 3) The aluminum rack shall be vented from top to bottom and shall include latches to lock the modules in place;
- 4) The driver rack assembly shall be secured in the sign enclosure by 4 captive type spring-loaded thumbscrews. The entire assembly shall be removable in less than one minute with the need of any tools;
- 5) The interconnect PCB shall include connectors for 6 drive modules and 6 display messages;
- 6) The interconnect PCB shall include terminals for all field wiring, 120 VAC controls, external photocell and alarm signals;
- 7) All interconnections within the Lane Use Control Signal shall be accomplished through the PCB, no internal wiring shall be permitted with the exemption of a single cable for the message display;
- 8) All connectors and terminals shall be identified via the silk screen identifier on the surface of the PCB;
- 9) The driver rack assembly shall be UL certified.

#### **Message Control**

- 1) The sign shall be equipped with enclosed (weather-protected) control terminals;

**SPECIAL PROVISIONS**  
**LED LANE USE CONTROL SIGNALS**

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- 2) The sign shall have one individual LED drive module for each message. The drive module shall be compatible with Malfunction Management Unit (MMU). Each drive module shall be capable of providing an alarm output;
- 3) The drive modules shall be designed to be “rack mounted” as per industry standard 6.5 inch x 4.5 in. dimensions;
- 4) The drive modules shall consist of a PCB with a minimum thickness of 0.62 in. with an aluminum front plate and handle as commonly used for vehicle detectors;
- 5) The drive modules shall drive the LED’s at a DC current not exceeding the maximum rating recommended by the LED manufacturer;
- 6) The drive modules shall regulate the LED drive current to compensate for line voltage fluctuations over the range of 90 VAC to 135 VAC. The luminous output of the display shall not vary more than 1 percent over the voltage range and shall not be perceptible to the human eye;
- 7) The drive modules shall be fused and include voltage surge protection to withstand high-repetition noise transients and low-repetition high-energy transients as per NEMA TS-2 Section 2.1.6;
- 8) The circuitry shall ensure compatibility and proper triggering and operation of load switches and conflict monitors in signal controllers currently in use by the Administration;
- 9) The drive modules shall have a capability of 25 watts or greater;
- 10) The drive modules shall be designed to maintain a consistent LED drive current regardless of outside temperatures;
- 11) On-board circuitry shall meet FCC regulations;
- 12) The drive modules shall be designed to provide automatic dimming while connected to an external photocell;
- 13) An external photocell shall be provided;
- 14) LED drive current shall be regulated just as efficiently when in “dimmed state”;
- 15) The drive modules shall be capable of providing a “confirmation” or “alarm” signal, the signal shall be configured for 120 VAC;
- 16) Drive modules shall include a green LED for power status, a yellow LED for dimming status and a red LED for alarm status.

**Supply Voltage.** The nominal supply voltage required at the sign housing for full brightness operation shall be 120 VAC. Power supplies shall be modular and rack mounted for easy access and replacement. The drive modules shall meet the latest requirements of ITE led specifications for electrical characteristics such as power factor, THD, surge protection, electronic noise and load switch compatibility.

**Brightness Control.** The light output of the pixels shall be automatically adjusted via the photocells using pulse width modulation of the DC current.

- 1) The frequency of the modulation shall not be less than 100 Hz;
- 2) The duty cycle shall be adjustable from 1 to 99 percent, in 0.5 percent or smaller increments;
- 3) The dimming feature shall have a built-in 30 sec delay to prevent external interference and shall dim the display “progressively” based on the ambient light level;
- 4) The automatic dimming circuitry shall be tuned to reduce the light intensity of the display by approximately 35 percent.

**Components.**

- 1) All components other than the LEDs shall be standard industry type, available from wholesale electronics distributors or component manufacturers;
- 2) Components shall carry standard industry identification markings to permit cross-referencing by Administration service personnel after the signs have been accepted for maintenance;
- 3) All discrete components, such as resistors, capacitors, diodes, transistors, and integrated circuits shall be individually replaceable. Components shall be arranged so they can be easily accessed for testing and replacement.

**Heating.** The sign face will be heated with a thermostically-controlled heater. The heater shall have sufficient power to prevent icing or condensation on either side of the sign face during the most severe winter weather conditions found in Maryland.

**Ventilation.** The ventilation system shall be natural convection, for both the display modules and the sign housing interior.

- 1) The exhaust port shall be on the top of the housing, screened, and shielded to be rain-tight.
- 2) The air inlet ports shall be screened, and on the bottom of the housing.

**Documentation.** The sign system supplier shall provide three sets of operating manuals, service manuals, and maintenance instructions for all components of the sign system.



**Experience.** The manufacturer shall provide the names, addresses, and telephone numbers of at least three transportation agencies in the U.S. currently using the manufacturer's LED lane use control signal system.

- 1) The agencies so named must confirm that the manufacturer's sign system has operated as specified in their contract documents and any applicable revisions for a period of at least one year.
- 2) The signs used in the systems shall have a character height of at least 18 in.
- 3) Manufacturers who meet the above requirements but whose systems have been installed in other North American locations will be considered on a case-by-case basis.

Manufacturers will be required to submit complete documentation, including catalog cuts, shop drawings, and references prior to approval.

The Administration reserves the right to examine and conduct tests on modules and other sign components prior to approval of the sign and manufacturer.

**Warranty.** LED Lane Use Control Signals and its components shall be warranted against failure for a period of two years after installation. The warranty shall cover all malfunctions related to materials or workmanship.

**MEASUREMENT AND PAYMENT.** LED Lane Use Control Signals will be measured and paid for at the contract unit price each. The payment will be full compensation for furnishing and installing the sign, necessary mounting hardware, drive rack, control equipment, photocell, visor, message display assembly, power supply, enclosure, lens, terminal blocks, connectors, message driver, cabling, electrical wiring, all electronics, labor, tools, materials, and all other incidentals necessary to complete the work.

**CATEGORY 800**  
**TRAFFIC**

**LED BLANK-OUT SIGNS**

**DESCRIPTION.** Furnish and install Light Emitting Diode (LED) Blank-out Signs as specified in the Contract Documents or as directed by the Engineer. Within the face, the blank-out sign shall contain single, double or up to three types of LED message displays. Each sign and symbol shall be to the latest MD Sign Standard and or as indicated in the Contract Documents. The physical appearance of the blank-out sign shall be 30 in. wide and 36 in. high. Each display shall create the appropriate symbol by a single stroked row of clustered LED pixels per color specified in the contract documents. The symbols shall be clearly visible in normal daylight and nighttime conditions.

**MATERIALS.** All materials and equipment forming part of the LED blank-out sign shall be new and approved by the Engineer.

**LED Pixel Requirements.**

Each pixel shall meet the following physical and performance characteristics:

- 1) A pixel shall consist of 7 LED's soldered into a printed circuit board, a brass housing and a polycarbonate UL94-VO rated lens and shall be watertight to NEMA 4X and IP 66 requirements. The pixel shall have a minimum diameter of 1 in. and a maximum diameter of 1.25 in.
- 2) Each pixel shall be rated for 100,000 hours continuous operation with no more that 50 percent lumen depreciation.
- 3) The LED's shall be TS-AllnGap or InGan type.
- 4) Each LED shall provide a minimum of 500 millicandelas on the optical axis and have a dominant light wavelength between 620 and 660 NM.
- 5) Internal circuitry for each pixel shall have an operating voltage of 125 VAC at 60 Hz. External power supplies are not allowed.
- 6) The pixel housing for the printed circuit board shall be made from brass and shall have a nickel plated finish.
- 7) A flat, impact resistant polycarbonate lens shall be required to cover the LED cluster. The lens shall meet UL 94-VO ratings.

- 8) The lens and housing shall be sealed to create a watertight enclosure per NEMA 4X and IP 66 standards.
- 9) Electrical connection to the indicator is made through 8-32 screws in the rear of product.
- 10) The light output from the pixel shall meet ITE requirements for chromaticity (i.e. the color of the light emitted by the module, specified as x-y chromaticity coordinates on the chromaticity diagram according to the 1931 Commission Internationale d'Eclairage (CIE) standard observer and coordinate system).
- 11) The pixels shall consume 1.5 watts typical at 125 VAC at 25 C. Operating current shall be 11 ma.
- 12) The LEDs used in the blank-out sign shall be capable of being dimmed.

## **CONSTRUCTION.**

### **Blank-out Sign Enclosure.**

Each enclosure shall meet the following physical characteristics:

- 1) The enclosure shall be fabricated from 0.125 in. aluminum, 5052-H32 series.
- 2) The enclosure shall have all corners and seams welded to provide a weatherproof seal around the entire case.
- 3) The sign face shall be aluminum, 5052-H32 series. The sign face shall be attached to the enclosure with stainless steel lift-off hinges. A hand operated stainless steel latch shall secure the sign face to the enclosure. The sign face shall be removable and replaceable in the field without need for tools to allow for easy replacement without removing the entire enclosure. The sign face shall have a quick disconnect plug for easy door removal.
- 4) The sign face visor shall be aluminum, 5032-H32 series, welded securely to the sign enclosure. The visor shall not impede the removal of the sign face.
- 5) A waterproof seal shall be created between the sign face and sign housing by use of a 3/16 in. x 1 in. neoprene gasket.
- 6) The enclosure for the multiple display signals shall include a terminal block for termination of the 120 volt supply for the first (1<sup>st</sup>) message display/symbol, the 120 volt supply for the second (2<sup>nd</sup>) message display/symbol, the 120 volt supply for the third (3<sup>rd</sup>) message display/symbol and for the NEUTRAL. The enclosure for the Single and Dual message display/symbol signs shall include a terminal block for termination of the 120 volt supply for the first (1<sup>st</sup>) symbol and a terminal block for termination of the 120 volt supply for the second (2<sup>nd</sup>) symbol and for the NEUTRAL. Each termination point will be labeled to correspond to the appropriate function.

- 7) The bottom of the housing shall contain four holes to allow proper drainage, each of which shall be fitted with a dense screen to filter against insects or foreign matter entering the sign housing.
- 8) The Housing shall be designed to be securely mounted on a signal mast arm, a 1½-in. hub shall be installed on top and bottom of the housing, and connected to the internal stiffeners. Mounting hardware assembly shall be as detailed for rigid mount signal heads on Standard Plate MD 814.01.
- 9) The enclosure sign face shall be acid etched, primed with zinc chromate primer and painted flat black with two coats of exterior enamel.

**Equipment Approval.** All LED blankout signs to be installed under this contract must be tested and pre-approved for proper operation with the Malfunction Management Unit (MMU) used in SHA signal cabinets. The testing and approval must have been completed before the date of advertisement of this contract.

- 1) The Contractor must provide written evidence from the manufacturer with their catalog cuts that their product has passed the testing and approval process.
- 2) Catalog cuts that do not include this evidence will be rejected without further review.

**Warranty.** LED Blank-Out Sign and its components shall be warranted against failure for a period of two years after installation. The warranty shall cover all malfunctions related to materials or workmanship.

**MEASUREMENT AND PAYMENT.** LED Blank-out Signs will be measured and paid for at the contract unit price each for each type of display as noted in the Contract Documents or as directed by the Engineer. The payment will be full compensation for the Furnish and Installation of sign, labor, tools, materials, and incidentals necessary to complete the work.

**CATEGORY 800**  
**TRAFFIC**

**LED COUNTDOWN PEDESTRIAN SIGNALS**

**DESCRIPTION.** Furnish and install self-contained LED pedestrian countdown signals, as specified in the Contract Documents or as directed by the Engineer.

**MATERIALS.** Provide LED pedestrian signals and all component parts that meet the latest edition of the National Electrical Manufacturers Association (NEMA) Standards and Underwriters Laboratory (UL), as applicable. In addition, LED pedestrian countdown signals shall meet the requirements set forth in the most recent, formally-adopted version of the specification titled "Pedestrian Traffic Control Signal Indications (PTCSI) – Part 2: Light Emitting Diode (LED) Pedestrian Traffic Signal Modules," published by the Institute for Transportation Engineers (ITE). All LED pedestrian countdown signals shall be certified by the manufacturer to meet or exceed all requirements of that specification over their entire 5 year warranty period. If available, permanently engrave serial numbers and model numbers, on all removable components and hardware. The serial number and model number shall be etched, stamped, molded, or attached using metallic self-adhesive labels. The use of adhesive backed paper labels is not acceptable.

**CONSTRUCTION.**

**LED Countdown Signal Modules.**

- (a) LED countdown modules shall fit into existing 16 in. traffic signal housings built to PTCSI standards without modification to the housing.
- (b) The LED countdown module shall be a single, self-contained device, not requiring on-site assembly for installation into existing traffic signal housing.
- (c) Design the assembly of the LED countdown module to assure all internal components are adequately supported to withstand mechanical shock and vibration from high winds and other sources.
- (d) The signal module shall be protected by a ¼ in. thick non-glare UV treated polycarbonate face lens.
- (e) The signal shall have 2 individual sets of wires for electrical connections. One set for the hand/man section and another for the countdown section. Each set shall be made of three secured, color coded (blue, red, white), 36 in. long, 600V, 16 AWG jacketed wires, rated for service at +105°C.

**Environmental.**

- (a) The LED countdown module shall be rated for use in the ambient operating temperature range of -40°C (-40°F) to +74°C (+165°F).
- (b) Completely seal the LED countdown module against dust and moisture intrusion per the requirements of NEMA Standard 250 – 1991 sections 4.7.2.1 and 4.7.3.2 for type 4 enclosures to protect all internal components.

**Chromaticity.**

- (a) The measured chromaticity coordinates for the white walking Person and the Portland Orange Hand and Digits shall conform to the chromaticity requirements of section 8.04 and figure 1 of the PTCSI standard.
- (b) The chromaticity measurements shall remain unchanged over the input line voltage range of 80 VAC to 135 VAC.

**Display.**

- (a) The LED countdown signal module shall consist of a double overlay message combining the symbols of a Hand and walking Person and two “7 segment” digits forming the time display.
- (b) Arrange the Pedestrian icon LEDs to form solid icon symbols. The shape of the symbols shall conform to the standard symbols for pedestrian signals.
- (c) Distribute the LED's evenly in each Pedestrian icon. The distance between each LED shall be evenly spaced.
- (d) The Hand/Person symbols shall be at least 10 in. high and 6.5 in. wide and shall incorporate sufficient LED's to assure adequate luminous intensity.
- (e) The countdown digits shall be at least 9 in. high and shall be made of 2 rows of at least 144 LED's.
- (f) Provide Portland Orange LED's shall be of the latest AlIn GaP technology and the white LED's of the latest In GaN technology.
- (g) Interconnect the individual LED light sources so that a catastrophic failure of a single LED will result in a total loss of not more than 3 LED's or 5 percent of the signal light output.

**Drive circuitry.**

- (a) The LED drive current shall be regulated to compensate for line voltage fluctuations over the range of 80VAC to 135 VAC. The luminous output shall not vary more than 1 percent over

the voltage range and shall not be perceptible to the human eye.

- (b) The drive circuitry shall include voltage surge protection to withstand high-repetition noise transients and low-repetition high-energy transients as stated in section 2.1.6, NEMA Standard TS-2, 1992.
- (c) The on-board circuitry shall meet FCC title 47, Sub-Part B, Section 15 regulations concerning the emission of electronic noise.
- (d) The circuitry shall ensure compatibility and proper triggering and operation of load switches and conflict monitors in signal controllers currently in use by the procuring traffic authority.
- (e) The countdown signal shall not be activated by input signals under 80 VAC.
- (f) The “countdown” portion of the signal shall have a high “off state” input impedance to ensure it does not prevent the conflict monitor from detecting an open load failure on the pedestrian signals. The input impedance of the countdown signal shall be such as to produce a load switch leakage voltage above 25 VAC to the conflict monitor for up to 4 units per channel.
- (g) The countdown signal drive circuitry shall not suffer any damage when subjected to defective load switches providing a half wave signal output.
- (h) Typical power consumption of the countdown display shall not exceed 5 watts with a power factor greater than 90 percent.

**Countdown Function.**

- (a) The countdown module shall be compatible with all types of traffic controllers.
- (b) The countdown timer module shall have a micro-processor capable of recording its own time when connected to a traffic controller.
- (c) When connected, the module shall blank out the display during the initial cycle while it records the countdown time using the Walk & D/Walk signal indications.
- (d) The display of the number of remaining seconds shall begin only at the beginning of the pedestrian change interval.
  - (1) After the countdown displays “zero,” the display shall remain dark until the beginning of the next countdown.
  - (2) The countdown pedestrian signal shall display the number of seconds remaining until the termination of the pedestrian change interval.
  - (3) Countdown displays shall not be used during the walk interval, nor during the yellow

change interval of a concurrent vehicular phase.

- (e) The countdown timer module shall continuously monitor the traffic controller for any changes to the pedestrian phase time and re-program itself automatically if needed.
- (f) The countdown module shall register the time for the walk and clearance intervals individually and shall begin counting down from the start of the clearance time or the sum of both interval times if selected.
- (g) If the walk interval is pre-empted (emergency vehicle), the countdown module shall skip the remaining walk time and begin the clearance interval countdown to reach 0 at the same time as the flashing hand becomes solid.
- (h) If the clearance interval is pre-empted (train), the countdown module shall skip the remaining clearance time and reach 0 at the same time as the flashing hand becomes solid.
- (i) In the cycle following a pre-emption call, the signal shall display the correct time and not be affected by the reduced previous cycle. The countdown shall always reach 0 at the same time as the flashing hand becomes solid.
- (j) When the flashing hand becomes solid, the module will display "0" for one second and then blank-out.
- (k) The countdown timer shall be capable of timing 2 consecutive complete pedestrian cycles outputted by the traffic controller (no steady hand signal between cycles).
- (l) The countdown module shall have an internal conflict monitor preventing any possible conflicts between the Hand/Person signal indications and the time display. It shall be impossible for the countdown to display any time during a solid hand indication.
- (m) The countdown module shall have accessible dip-switches for the following user selectable options:
  - (1) Display 0 during stand-by.
  - (2) Turn on all LEDs for testing
  - (3) "Coordinated" mode, (displays clearance time only)
  - (4) Disable countdown display.
- (n) The LED module shall have a removable plug on the rear of the unit to allow for easy access to dip switches.
- (o) If the pedestrian change interval is interrupted or shortened as a part of a transition into a



preemption sequence, the countdown pedestrian signal display shall be discontinued and go dark immediately upon activation of the preemption transition.

**Housing.** Countdown Pedestrian Signals shall have a single piece cast aluminum case housing, a lens, and a single piece cast aluminum swing down door frame.

(a) The maximum overall dimension of the signal shall be 18.5 in. W x 18.75 in. H x 9 in. D. (470 x 476 x 229 mm), including the visor and hinges. The distance between the mounting surfaces of the upper and the lower openings shall be 15.75" (400 mm).

(b) The case shall be one piece corrosion resistant aluminum alloy die casting, complete with integrally cast top, bottom, sides and back.

(1) Four integrally cast hinge lug pairs, two at the top and two at the bottom of each case, shall be provided for operation of the swing down door.

(2) When properly mated to other pedestrian signal components and mounting hardware, the case shall provide a dustproof and weatherproof enclosure and shall provide for easy access to and replacement of all components.

(3) The case shall be mounted via upper and lower openings, suitable for either post top or bracket mounting. The openings shall accommodate standard 1.5" (39 mm) pipe brackets. The bottom opening of the case shall have a shurlock boss integrally molded into the case. The dimension of the shurlock boss shall be:

Outside diameter 2.625 in. (667 mm)

Inside diameter 1.969 in. (50 mm)

Number of teeth 72

Angle of teeth 90°

Depth of teeth 5/64 in. (2 mm)

A shurlock boss of the same dimensions shall be an option for the top opening of the case. The radial angular grooves of the shurlock boss when used with the shurlock fittings shall provide positive positioning of the entire signal to eliminate rotation or misalignment of the signal.

(c) The door frame shall be a one piece corrosion resistant aluminum alloy die casting, complete with two hinge lugs cast at the bottom and two latch slots cast at the top of each door.

(1) The door shall be attached to the case by means of two Type 304 stainless steel spring pins.

(2) Two stainless steel hinged bolts with captive stainless steel wingnuts and washers shall be attached to the case with the use of stainless steel spring pins.

(3) Latching or unlatching of the door shall require no tools.

**SPECIAL PROVISIONS**  
**LED COUNTDOWN PEDESTRIAN SIGNALS**

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**Warranty.** Manufacturers shall provide a written warranty with the following minimum provisions:

- (a) LED countdown signal modules shall be replaced, repaired or purchase value refunded if the module fails to function as intended due to workmanship or material defects within the first 60 months from the date of delivery.
- (b) LED countdown signal modules which exhibit luminous intensities less than the minimum specified values within the first 60 months of the date of delivery shall be replaced, repaired or purchase value refunded.

**Compatibility Testing:** The LED Pedestrian Countdown Signal manufacturer shall certify that their equipment meets the Load Switch and Signal Conflict Monitor Compatibility testing requirements found in the most recent, formally-adopted version of the specification titled “Pedestrian Traffic Control Signal Indications – Part 2: Light Emitting Diode (LED) Pedestrian Traffic Signal Modules,” published by the Institute for Transportation Engineers (ITE).

**MEASUREMENT AND PAYMENT.** LED Pedestrian Countdown Pedestrian Signals will be measured and paid for at the contract unit price each. The payment will be full compensation for furnishing and installing the signals, LED modules, equipment specified, all mounting hardware, labor, and incidentals necessary to complete this work.

**CATEGORY 800**  
**TRAFFIC**

**LED DYNAMIC MESSAGE SIGN (DMS)**

**DESCRIPTION.** Furnish and install dynamic message signs that utilize Light Emitting Diodes (LED's), as shown in the Contract Documents or as directed by the Engineer.

**MATERIALS.**

Sign Supports and Hardware                      909.07

All materials furnished and or installed shall be new, corrosion resistant, and approved by the Engineer.

**CONSTRUCTION.** All DMS shall have three lines of text. All characters shall be separated by continuous horizontal and vertical sheet metal dividers of the same color as the sign face. (Discrete Matrix array). All signs shall have 18-inch high characters, measured from pixel edge to pixel edge, unless stated otherwise in the Contract Documents or approved in writing by the Engineer. The number of characters per line shall be as shown on the Plans, or as stated in the Contract Documents.

The sign face shall present a clean, uniform appearance to the motoring public. Sign faces with visible rivets, bolts, or poor quality welds will be rejected.

**Text.** The LED DMS shall enable the display of pre-fonted text consisting of alphanumeric characters over each line, using rectangular character modules.

- (a) The horizontal separation between adjacent character modules shall be one-half (1/2) of the character module width, measured from edge-of-pixel to edge-of-pixel.
- (b) The vertical separation between adjacent character modules shall be one-half (1/2) of the character module height, measured from edge-of-pixel to edge-of-pixel.
- (c) This separation shall be created by the sheet metal sign face.
- (d) All characters and symbols shall be clearly visible and legible from 1200 ft minimum, along the optical axis, under all normal weather and lighting conditions by an observer with 20/20 vision.

There will be no exceptions granted to the above. Catalog cuts submitted with a request for exceptions will be rejected without further review.

**Character Modules.**

- (a) Each character module shall be composed of a dot matrix system formed from uniformly shaped and sized circular pixels with identical vertical and horizontal edge-to-edge spacing between pixels.
- (b) The matrix shall be rectangular, and shall consist of 35 pixels, with 5 columns and 7 rows.
- (c) Each character formed by the LED pixels shall have a height-to-width ratio (aspect ratio) of 1:1. There will be no exceptions granted to this requirement.

**Pixels.** Each pixel shall be composed of a grouping of LED's.

- (a) Each group in a pixel shall be comprised of two or more strings
- (b) In the event one of the strings fails, the other string(s) shall remain operational to reduce the possibility of a total loss of light output from that pixel.
- (c) The failure of a single LED in a string shall not result in the loss of output of the remainder of that pixel.
- (d) Each pixel shall have an initial luminous intensity of 42 candelas, or greater, on the optical axis, when operated at 20 mA per LED drive current. The manufacturer shall provide proof that this requirement has been met, through:
  - (1) A demonstration at the CHART test bed, using industry-standard photometric test equipment supplied by the Contractor, or
  - (2) Test results from an independent testing laboratory, certifying that this requirement has been met.
  - (3) Providing pixels with LED clusters whose calculated intensity exceeds the 42 candela requirement by 10 percent or more (eight or more high-intensity LEDs with a published intensity of 6 candelas at 20 mA drive current, etc.)

If option 1 is chosen, the test may be conducted using sample modules, or a completed sign. For all options, if the test is performed with a completed sign and the output does NOT meet the 42 candela requirement, and the problem cannot be corrected without raising the drive current above 20 mA per LED, the Engineer may, at his discretion, reject the entire sign at no cost to the ADMINISTRATION.

**Display.** The signs shall be capable of displaying at every character module:

- (a) All upper case and lower case letters.
- (b) All digits from 0 to 9.
- (c) Up to 32 user-defined graphics characters.
- (d) All standard ASCII punctuation symbols.
- (e) Upper case alphanumeric characters over the complete height of the matrix.

**Sign Message.** The signs shall be capable of displaying:

- (a) A static message.
- (b) A flashing message.
- (c) Two or more alternated messages formed by two static or flashing messages.
- (d) Flashing messages by separately varying the flashing and cycling frequency between 1 and 10 seconds in 1 second intervals.

**Light Emitting Diodes:** LED's shall be Aluminum Indium Gallium Phosphide type.

- (a) The LED shall be rated for 100000 hours continuous operation, at 30 mA drive current, with less than 30% lumen depreciation.
- (b) Each LED shall have 30 degree total cone of vision, or greater, as shown in the Contract Documents.
- (c) All LEDs used in the pixel clusters shall have dominant wavelengths between 585 and 595 NM. All LED pixels in a sign shall have the same dominant wavelength.

**Front Panel.** Each column of three characters shall be protected by individual 3/16 in. thick, non-breakaway, UV stabilized, high-impact resistant, Lexan panels.

- (a) The panels shall absorb greater than 80% of UVA and UVB.
- (b) The panels shall be replaceable from inside the sign housing without the need for closing the traveled portion of the roadway under any part of the sign.
- (c) The panel mounting system shall not permit moisture or other contaminants to enter the enclosure, nor shall it obstruct the motorists view of the sign modules.

**Housing.** The sign housing shall be as specified in the Contract Documents. All housings shall be of the walk-in type (See DYNAMIC MESSAGE SIGN WALK-IN ENCLOSURES).

**Component Access.** Inspection and all sign maintenance shall be entirely from within the walk-in enclosure. No maintenance, including changing the LED signal modules, or replacing or cleaning the Lexan panels, shall require working or reaching outside of the enclosure or closing any portion of the roadway below the sign. There will be no exceptions granted to this requirement. Catalog cuts submitted to the Engineer with a request for an exception to this requirement will be rejected without further review.

**Electrical Distribution.** The sign shall have a metal-encased, split-phase (120/240V) commercial-grade load center, located on the rear wall of the sign enclosure.

**Surge Suppression.** A split-phase surge protector with a capacity of 160 kA (8/20 $\mu$ s) shall be furnished and installed at the load centers in the controller cabinet and sign housing. (See SURGE SUPPRESSION). The maximum length of wire between the surge suppressor and the load center input lugs shall not exceed 6-inches.

**Internal Power Supplies.** The LED display and associated electronics shall be powered by dual, redundant power supplies, located in the sign housing.

- (a) Each power supply shall be capable of providing power to the entire sign in the event that the other supply fails.
- (b) The distribution system from these power supplies to the sign display and electronics shall be designed so that if one power supply fails the other one will assume the entire load from the sign. This changeover shall be “transparent,” without the need for manual switching circuitry.

**LED Current Controller** The controller shall isolate the LED’s from line voltage, and control the current to the LED’s.

- (a) The maximum current supplied to any LED shall not exceed 30 milliamps under any circumstances.
- (b) The current controlling dimming circuitry shall automatically compensate for variations in the AC line voltage to maintain the light output constant at the selected brightness level.

**Dimming.** Luminous output shall be controlled using photocells on the top of the sign housing oriented for North, the front of the sign and the back of the sign.

- (a) The photocells shall be mounted so that they may be serviced from inside the sign enclosure.
- (b) A brightness override shall be possible via the CHART network center computer in the SOC.

**Equipment Ground.** A system earth ground shall be provided at each sign location. This system shall establish an earth ground to the individual components of the sign system (controller cabinet, sign structure and walk-in housing) of 5 ohms or less. A minimum of 3 ground rods shall be used, regardless of the resistance reading obtained with the first 2 ground rods. In addition, the provide a #2 AWG or larger ground connection between the foundation reinforcing steel and the sign structure. These g systems shall be in addition to those required by the utility company.

- (a) The ground rods shall be a minimum of 6 ft apart.
- (b) One ground rod shall be within 5 feet of the point where the structure meets the ground.
- (c) Suitable connection shall be provided between the sign support structure, foundation rebar pigtail, controller cabinet and the ground rods using #2 AWG stranded copper wire. (See LIGHTNING GROUND FOR ITS DEVICES)

**Design.** The equipment design and construction shall utilize the latest available techniques, with a minimum number of different parts, subassemblies, circuits, cards, and modules to maximize standardization and commonality.

- (a) The equipment shall be designed for ease of maintenance.
- (b) All component parts shall be readily accessible from inside the walk-in enclosure for inspection and maintenance, including the Lexan front panels.
- (c) Test points shall be provided for checking essential voltages.
- (d) All circuit boards containing exposed copper traces shall be conformal coated to resist fungus growth and moisture deterioration. This includes all circuit boards in the controller cabinet, and the sign enclosure.

**Environmental.** The signs shall be capable of operating without any decrease in performance over an ambient temperature range of -13 F to +113 F (-25 C to +45 C) and up to 100 percent relative humidity (internal to the sign housing and control cabinet), without the necessity of automatic fans or heaters. Fans and heaters shall be used in an auxiliary capacity.

**Fasteners.** All screws, nuts, and lock washers shall be stainless steel

- (a) No self-tapping screws shall be used unless specifically approved by the Engineer.
- (b) All parts shall be made of corrosion resistant materials, such as plastic, stainless steel, aluminum, or brass.
- (c) All materials used in the construction of the sign shall be resistant to fungus and corrosion.
- (d) An inert dielectric material shall be used to separate dissimilar metals.

**DMS Control Cabinet.** The control cabinet shall be a Type 332/334, configured for base mounting, and shall meet the requirements specified in the Contract Documents.

- (a) The cabinets shall be supplied as part of the sign package with the controller and other related internals pre-wired by the DMS manufacturer or supplier.
- (b) Controller cabinets shall be mounted adjacent to the sign foundation, as shown on the Plans or as directed by the Engineer.
- (c) Controller cabinets shall be electrically bonded to the sign and structure (see "Equipment Ground.")

**Controller to Sign Communications.** The sign system shall use 50-micron, 12-strand multi-mode fiber optic cable with a rodent-protected outer covering for communications between the sign controller and the sign. The multi-mode transceivers used in the system shall be field-replaceable (I.e: plug in cards). All components for this system, including the transceivers, fiber cable, and connectors, shall be provided by the sign manufacturer.

**DMS Controller.** The DMS controller shall fit into a standard 19-inch rack, and shall be mounted in the upper half of the Type 332 controller cabinet. If the controller is a card-cage assembly, all plug-in cards shall be field-replaceable without the need for tools. The controller shall have:

- (a) A built-in power supply
- (b) A clearly marked DB-9 laptop control port for local mode.
- (c) A minimum of two (2) RS-232 communications ports
- (d) A minimum of one (1) RS-485 communications port
- (e) A dual-line fiberoptic communications card or ports in ST format for controller-to-sign communications and control.
- (f) A card or port for remote sign control and monitoring.
- (g) A keypad and LCD display and a Local/Test mode switch. The keypad/display shall allow technicians to perform basic configuration, control and monitor functions (device status) when the controller is in local mode.
- (h) A password option, entered from the keypad, when operating in local mode.
- (i) If the controller cabinet requires an auxiliary board that is outside the controller, it shall have a conformal coating and a clear impact-resistant plastic cover to protect it from direct moisture or other damage.
- (j) The option of using the Transmission Control Protocol (TCP) or the User Datagram Protocol (UDP). The option shall be user-selectable from the keypad on the front panel of the controller.
- (k) The ability to change the Port Address from the front panel keypad.

**Controller Communications Protocols.** All DMS furnished and installed under this contract shall be 100 percent compatible with the CHART system software currently in use at the Administration's Statewide Operations Center (SOC). The CHART software currently supports the NTCIP for DMS Control protocol.

- (a) This compatibility shall have been demonstrated and certified by the Administration's Communications Division prior to the advertisement date of this contract.
- (b) The first step to demonstrating that compatibility is for the Manufacturer to download the CHART NTCIP DMS Compliance Tester software, install it on a laptop or PC, and use it to test their sign controller. The tester software may be downloaded at <http://www.cattlab.umd.edu/chartsoftware/index.php>. The tester will generate a printout of the results of the test.
- (d) After the manufacturer has tested their controller with the CHART tester software and the results indicate that it is compatible, the Controller shall be delivered or shipped to the SHA Communications Division. (See "EQUIPMENT APPROVAL")
  - (1) The controller will be lab tested by the SHA Communications Division.
  - (2) It is recommended that the manufacturer have a field engineer or other representative present during the testing.



**Experience.** The manufacturer shall provide the names, addresses, and telephone numbers of at least three transportation agencies in the U.S. currently using the manufacturer's DMS system.

- (a) The agencies so named must confirm that the manufacturer's sign system has operated as specified in their contract documents and any applicable revisions for a period of at least five years, and that all maintenance agreements and/or warranties have been honored.
- (b) The signs used in the systems shall be of the type described herein.
- (c) The sign systems used to fulfill this experience section shall be NTCIP compliant.

**North American-based Support Network.** The manufacturer shall provide the names, addresses, and telephone numbers of their maintenance, repair, and parts network facilities that are located on the North American continent. At least one such facility shall be located in a time zone whose time offset is within 3 hours of Eastern Standard Time.

**Equipment Approval.** All manufacturers who wish to bid on ITS projects in the State of Maryland shall have their equipment tested and pre-approved before the date of advertisement of this contract. If the manufacturer does not meet the Experience and Support Network requirements stated above, the approval process cannot advance to this stage.

- (a) The Manufacturer must submit an actual sample of the DMS sign controller that will be used to the Administration's CHART System Test Bed for compliance testing and approval. Bidders shall contact the Chief of SHA's Communications Division, by phone at 410-747-8590 or via email at [DManley@sha.state.md.us](mailto:DManley@sha.state.md.us) to make the necessary arrangements.
- (b) The testing shall demonstrate the capability of their DMS to operate within the CHART control system environment, including line spacing, fonts, etc.
  - (1) The testing shall take place at the Administration's CHART system test bed, located at the Office of Communications, at 5901 Baltimore National Pike (the SHA Radio Shop, located I-695 outer loop at US 40).
  - (2) The controller submitted shall respond to all CHART system commands, and the provide all prescribed error messages and feedback to the CHART system.
  - (3) A complete list of requirements for these tests may be obtained by contacting the Office of Communications at the addresses shown above.
- (c) Once a manufacturer has passed the test, they may proceed with the construction of a sign or signs.
  - (1) The Administration shall not be held liable, financially or otherwise, in the event that a DMS passes the testing specified above, but a full-size sign fails to receive approval for installation in Maryland.
  - (2) Any sign that arrives for final approval whose sign face does not comply with the requirements found in the Administration's DMS Signface Details and housing specifications will be rejected, unless the disparities have received the written approval of the Design Engineer.

- (3) All costs associated with the testing process, including commissioning, acceptance testing, and any necessary Maintenance Of Traffic, shall be borne by the Contractor.
- (4) Each sign and its respective controller cabinet shall be energized by the Contractor and tested by SHA Communications Division personnel prior to installation on a structure. There shall be no exceptions to this requirement. Failure to comply with this requirement may result in non-payment of the entire sign package.
  - (a) The testing shall take place at the Contractor's facility.
  - (b) The testing shall be scheduled in advance with the Administration's Communications Division. The testing shall be scheduled during normal daylight work hours, and the times shall be agreeable to the SHA Communications Division.
  - (c) The signs and controller cabinets shall be energized and ready for testing by the time the Communications Division personnel arrives. There shall be no exceptions to this requirement.
  - (d) The Contractor may be forced to remove, at his expense, any sign or signs installed without the above testing that exhibit CHART system compatibility issues.

**Field Equipment Testing Messages.** The following three-page message shall be used for sign testing and commissioning after installation:

- (a) **Page One:** Full diagnostic display (All LED's and modules lit)
- (b) **Page Two:** BLANK
- (c) **Page Three:** SIGN UNDER TEST (center line)

The "SIGN UNDER TEST" message shall be included in every other iteration of the test sequence without exception.

**Commissioning Components.** Each DMS furnished shall contain the following:

- (a) Three (3) LED driver boards,
- (b) Three (3) repeater boards

**Laptop Control and Diagnostic Software.** The sign manufacturer shall supply control and diagnostic software for installation on existing server, desktop and laptop computers in use at the SHA Communications Division. The software shall support the installation on multiple systems. The sign manufacturer shall provide three (3) sets of software on CD-ROM, and installation/operation manuals with each sign contract.

**Technical Assistance.** The manufacturer shall provide the Contractor with technical personnel to assist the Contractor at each sign installation site and to assist with the installation of the controller cabinet and equipment.

The sign(s) shall not be powered up without the permission of the SHA Radio Shop.

**Training.** Operational and Maintenance training for the entire system shall be provided by a manufacturer authorized representative to designated Administration personnel through the means of practical demonstrations, seminars, and other related technical teaching procedures. Up to 24 total hours of training shall be provided if requested. The training shall take place at the SHA Radio Shop, located at 5901 Baltimore National Pike (US 40, adjacent to the Baltimore Beltway).

The training shall include the following:

- (a) "Hands on" operation of all system hardware.
- (b) Explanation of the complete repertoire of system commands.
- (c) Instruction on the insertion or manipulation of data.
- (d) Instruction on required preventative maintenance procedures, and service procedures (unit disassembly, changing circuit boards, etc).
- (e) Diagnostic and control software installation and use.

The Contractor shall contact the Administration's Office of Maintenance Radio Shop to make the required arrangements for the training. Their phone number is 410-747-8590.

**Documentation.** The sign system supplier shall provide three sets of operating manuals, service manuals, wiring diagrams, schematics, and maintenance instructions for all components of the sign system. In addition, the sign supplier shall provide a fourth set of schematics and wiring diagrams which shall be furnished in the wiring diagram holder in the controller cabinet.

**Miscellaneous (Overhead DMS).**

The Contractor shall be responsible for any adapters necessary to mount the DMS on their respective overhead structure as shown on the Plans. Once mounted, the back of the DMS must the truss splice plates without requiring modification of the truss splice plates.

**MEASUREMENT AND PAYMENT.** LED DMS will be measured and paid for at the contract unit price each, which shall include the sign, the walk-in housing of the type specified in the Contract Documents, the controller with the appropriate software and firmware, the controller cabinet with all sign control equipment, electrical panels, and surge suppression devices, control and power cables from the controller cabinet to the sign, concrete cabinet foundation, installation, electrical work, system grounding, and all other incidentals. The payment shall be full compensation for all materials, labor, equipment and all other incidentals necessary to complete this work.

**CATEGORY 800**  
**TRAFFIC**

**LED TRAFFIC SIGNAL MODULES**

**DESCRIPTION.** Furnish and install self-contained LED signal head modules to be used in place of the incandescent lamp, reflector, socket, gasket, and lens assembly of standard vehicle signal sections, as specified in the Contract Documents or as directed by the Engineer.

**MATERIALS.** Manufacturers of red and green 8 in. and 12 in. LED traffic signal modules are required to file a statement with the Maryland Energy Administration, certifying that each signal to be sold or offered for sale in Maryland is in compliance with the State's energy efficiency standard. Information on this requirement can be found at the Maryland Energy Administration's website.

The modules shall employ a lens assembly that presents an appearance that is similar to those found on standard incandescent signals.

Provide LED signal heads, and all component parts that meet the latest edition of the National Electrical Manufacturers Association (NEMA). In addition, LED signals shall meet the requirements set forth in the most recent, formally-adopted version of the specification titled "Vehicle Traffic Control Signal Heads - Part 2: Light Emitting Diode (LED) Vehicle Traffic Signal Modules," published by the Institute for Transportation Engineers (ITE).

- (a) The manufacturer must certify all signals meet or exceed all requirements of that specification over their entire 5-year warranty period.
- (b) Permanently identify serial numbers and model numbers, if available, on all removable components and hardware. The serial number and model number shall be etched, stamped, molded, or attached using metallic self-adhesive labels. The use of adhesive backed paper labels is not acceptable.

**CONSTRUCTION.** LED modules shall fit in standard, incandescent vehicle traffic signal housings without modifications or the need for special tools, and shall be complete with a one-piece, integral lens assembly that is tinted for the appropriate color.

**Design.** LED traffic signal modules shall have:

- (a) A printed circuit board inclusive of all of the LEDs and required circuit components.
- (b) Minimum 39 in. wire leads, minimum # 20 AWG, 600 volt, 105 C, with strain relief and spade terminals. Screw-type terminals shall not be allowed.
- (c) A rigid housing for protection in shipping, handling and installation.

- (d) A one piece neoprene gasket shall be used to seal out water and contaminants.

**Assembly Techniques.**

- (a) The LEDs within the modules shall be mounted and soldered to a printed circuit board.
- (b) LED signal modules shall be watertight when properly installed in traffic signal housings.
- (c) LED signal modules shall utilize the same mounting hardware used to secure a standard incandescent lens and gasket assembly, and shall only require a screwdriver or basic installation tools to complete the mounting.
- (d) LED signal module assemblies shall weigh less than 5 lb.
- (e) LED signal modules may not protrude into the signal visor area more than two and three-quarters of an in. in depth.
- (f) LED signal modules shall be marked 'TOP' or have an up arrow to designate the proper orientation of the signal module in the traffic signal housing.
- (g) LED signal module housings shall utilize an integral metal layer in their design and construction.
- (h) LED signal modules shall utilize the latest technology in thermal management.

**Lenses.** Make lenses for ball type modules of ultraviolet stabilized polycarbonate, and incorporate facets that serve to enhance the optical efficiency of the LED traffic signal module. Individual lenses or external lens facets shall not be permitted.

- (a) The ball type signals shall incorporate a diffuser-type lens system that serves to collimate the light emitted by the LEDs. The lens and diffuser system shall focus the collimated light, to meet ITE intensity and distribution standards.
- (b) LED signals shall almost perfectly approximate the appearance of an incandescent traffic signal to the motorist.
  - (1) The face of the ball LED lamps shall appear to the motorist as uniform in illumination, and have a wide viewing angle that makes it suitable for installation on wide boulevards.
  - (2) 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 contaminants, and to facilitate periodic cleaning.
  - (3) 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.

- (4) Hard coat external lenses to prevent an accumulation of dust and dirt.
- (5) For LED turn arrow signals, the LED arrow lens may be a replaceable part without the need to replace the complete LED arrow.

**Optical.** The light intensity, chromaticity, and distribution from eight and twelve-in. red and green, and eight-in. yellow LED traffic signal modules shall meet all photometric values stated in the most recent, formally-adopted version of the specification titled “Vehicle Traffic Control Signal heads – Part 2: Light Emitting Diode (LED) Vehicle Traffic Signal Modules,” published by the Institute for Transportation Engineers (ITE). Twelve-in. Yellow LED traffic signal modules shall meet the chromaticity requirements of the most recently-adopted ITE specification, with a minimum intensity of 1,500 candelas.

- (a) Red and Green LED signals shall be certified by the manufacturer to meet or exceed all requirements of that specification over their entire 5-year warranty period.
- (b) The light output from twelve-in. Yellow LED signals shall be the peak instantaneous intensity, measured at instant-on and at the highest intensity point.

**Design.**

- (a) Connect the LEDs in series-parallel strings.
  - (1) No more than 1 percent of the total luminosity of the entire signal module may be lost in the event of a single string failure.
  - (2) The failure of a single LED shall cause loss of light from only that LED.
  - (3) No loss of light output from the complete module assembly shall occur as a result of a single LED failure.
- (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.
  - (1) The LED traffic signal module shall be operationally compatible with NEMA TS – 1 and NEMA TS – 2 conflict monitoring parameters.
  - (2) The intensity of the LED signal module shall not vary by more than 10 percent over the allowable voltage range as specified in the electrical section below.

**Electrical.**

- (a) The Power factor shall be 0.90 or greater, at nominal rated voltage, at 25°C, after 60 minutes of operation.
- (b) Total harmonic distortion (THD) shall be less than 20 percent at rated voltage, at 25°C.
- (c) 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.
- (d) The LED junction technology used in all signal modules shall not exhibit degradation of more than 30 percent of the modules' initial light intensity following accelerated life testing (operating at 85 degrees C and 85 percent humidity, for 1000 hours). Under no circumstances shall AlGaAs technology be acceptable.
- (e) 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.
- (f) Red and Green LED traffic signal modules shall consume no more than a nominal 15 watts for either the 8 in. or 12 in. signal. Yellow signal modules shall consume no more than 24 watts.
- (g) 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.
- (h) Low Voltage Turn OFF: There shall be no visible illumination from the LED signal module when the applied voltage is less than 50 VAC.
- (i) Turn-ON and Turn-OFF Time: A module shall reach 90 percent of full illumination (turn-ON) within 75 msec of the application of the nominal operating voltage. The signal shall cease emitting visible illumination (turn-OFF) within 75 msec of the removal of the nominal operating voltage.

**Compatibility Testing.** The LED module manufacturer shall certify that their modules meet the Load Switch and Signal Conflict Monitor Compatibility testing requirements found in the most recent, formally-adopted version of the specification titled "Vehicle Traffic Control Signal heads - Part 2: Light Emitting Diode (LED) Vehicle Traffic Signal Modules," published by the Institute for Transportation Engineers (ITE).

**Electronic Failure Protection.** To assure compatibility with NEMA TS1/TS2 controllers for both conflict monitoring and Red Fail, all signal colors (Red, Yellow, and Green) once energized, must turn off prior to 50 VAC, and if the signal fails it shall present a high impedance on the input side of the signal.

**Warranty.** Manufacturers shall provide a written with the following minimum provisions:

- (a) Modules shall be replaced, repaired or purchase value refunded if the module fails to function as intended due to workmanship or material defects within the first 60 months from the date of delivery.
- (b) Modules which exhibit luminous intensities less than the minimum specified values within the first 60 months of the date of delivery shall be replaced, repaired or purchase value refunded.

**Miscellaneous.** The manufacturers part number, date code, and electrical characteristics of the LED signal module shall be visible on the rear of the assembly.

**MEASUREMENT AND PAYMENT.** LED Traffic Signal Modules will be measured and paid for at the contract unit price per each. The payment will be full compensation for the LED module, hardware, assembly, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.



**CATEGORY 800**  
**TRAFFIC**

**LIGHTNING GROUNDING FOR ITS DEVICES**

**DESCRIPTION.** Furnish and install additional lightning grounding for Dynamic Message Signs (DMS), Closed-Circuit Television (CCTV), pole-mounted radar detectors, or other ITS equipment as specified in the Contract Documents or as directed by the Engineer. Lightning grounds consist of a heavy copper conductor which is exothermically welded to the uncoated reinforcing steel within the device foundation to electrically connect the metal structure to the foundation reinforcing steel. This grounding method allows the energy from a lightning strike to be transferred to the earth more effectively than ground rods alone because concrete absorbs moisture from the surrounding soil quickly, making a large concrete foundation a good conductor of electricity.

**MATERIALS.** Section 804, 950.

**CONSTRUCTION.** The conductor between the reinforcing steel and the ITS device structure shall be as straight as possible.

- (a) The conductor shall be #2 AWG or larger bare copper. The conductor shall be exothermically welded to the reinforcing steel cage as follows.
  - (1) For DMS spread footing foundations, the pigtail shall be welded to one of the horizontal, longitudinal rebar's at the bottom of the foundation. Overhead DMS foundations require a total of two pigtails one at each upright location.
  - (2) For CCTV or other vertical foundations, the pigtail shall be exothermically welded to the midpoint of one of the long vertical rebar's making up the reinforcing cage.
- (b) The conductor shall exit the top of the foundation as a pigtail within the area of the anchorbolt pattern. The length of the pigtail above the foundation surface shall be at least two (2) ft. long to permit connection to the device structure without splicing.
- (c) The pigtail shall be properly bonded to the inside surface of the upright(s) of the overhead sign structure, or the camera/detector pole.

**MEASUREMENT AND PAYMENT.** Lightning grounds shall not be measured separately, but the cost shall be incidental to each individual foundation installed. The payment will be full compensation for the copper wire pigtail, connectors, labor, tools, materials, testing and incidentals necessary to complete this work.

**CATEGORY 800**  
**TRAFFIC**

**MAINTAIN EXISTING ROADWAY LIGHTING**

**DESCRIPTION.** Maintain existing roadway and sign lighting during construction.

**MATERIALS.** Not applicable.

**CONSTRUCTION.** Maintain all roadway and sign lighting at all times except as indicated in the Contract Documents, or as directed by the Engineer. Contact the Traffic Control device Inspection Section prior to beginning any work to inventory the working condition of the existing lights.

The roadway shall continue to be illuminated at the levels existing on the first day of construction throughout the project, unless approved otherwise, in writing, by the Engineer. Upon notification of inadequate illumination by the Engineer, provide lighting up to the minimum levels as specified in the Contract Documents, within 48 hours. Failure to correct the noted problems will result in a \$500 per day penalty.

The electrical circuits, either existing or new, which are to be affected by construction activities, shall have replacement circuits in operation before the existing circuits are disconnected. If unable to install the ultimate circuits and maintain them in working order, temporary bypasses shall be provided. All temporary wiring shall conform to NEC, and the policies of the Administration. No overhead wiring shall be connected to breakaway poles unless the poles are protected from traffic and from construction activities.

Install a temporary lighting system with written approval by the Engineer. The temporary lighting system may include relocation of existing lighting poles or installation of final lighting poles.

At the conclusion of construction, all temporary cables shall be disconnected and made safe. Temporary underground cables may be abandoned, but shall be disconnected from the power supply system, and isolated so that there is no possibility of their becoming re-energized.

**MEASUREMENT AND PAYMENT.** Maintain Existing Roadway Lighting will be not be measured but the cost will be paid for at the contract lump sum price. Payment of the contract lump sum price will be prorated and paid in equal amounts on each monthly estimate. The number of months used for prorating will be the number estimated to complete the work. Payment will be full compensation for all manholes, duct cable, cable, conduit, connector kits, wood poles, luminaires, lighting arms, labor and incidentals needed to complete the work.

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**CATEGORY 800**  
**TRAFFIC**

**NEMA SIZE 3 CABINET**

**DESCRIPTION.** Furnish and install base-mounted, NEMA size 3 cabinets and concrete foundations for electronic equipment. This work shall include all necessary hardware and electrical connections. Cabinets may be natural aluminum finish, or painted National Park Service Brown, as specified in the Contract Documents or as directed by the Engineer.

**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.

Anchor bolts/Bolts/Nuts/Washers  
Cabinets and doors  
Mounting hardware  
Conduit  
Environmental control equipment

**CONSTRUCTION.** Electronic equipment to be installed in Nema Size 3 cabinets shall be as specified in the Contract Documents or as directed by the Engineer.

Provide cabinets that have dual fans for improved cooling, one moveable shelf, and a grounded aluminum backplane for mounting electronic equipment.

**Cabinets: General.**

- (a) Serial numbers and model numbers, if available, shall be permanently engraved on all removable components and hardware. The serial number and model number shall be etched, stamped, or molded.
  - (1) The use of adhesive backed labels is not acceptable.
  - (2) 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.
- (b) All cabinets shall meet or exceed the requirements of a NEMA 3R rating and shall be UL listed.
- (c) 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.
  - (1) All mounting hardware and cabinet bracing shall also be made from aluminum.

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

**Cabinet Equipment.** All cabinets shall include the following components.

- (a) Metal-encased load center, configured for 120/240 Volt operation.
- (b) Power Surge Suppression module configured for 120/240 Volt operation (See SURGE SUPPRESSION).
- (c) T1 phone Line Surge Suppressor.
- (d) Front overhead white LED interior lighting.
- (e) Thermostatically-controlled dual fans for cooling and cabinet heater.
- (f) Stainless-Steel Disconnect Switch rated at 60 amperes. The switch shall be wired between the line and the load center. The switch may be mounted on the back or either side of the cabinet, as shown on the Plans or as directed by the Engineer.

**Cabinets: Electrical.**

- (a) All power conductor wire runs shall be continuous with no splices.
- (b) 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.
- (c) All cabinet back and panel harness wiring shall be soldered at its destination point as specified.
- (d) 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.
- (e) All conductors used in the controller cabinet wiring shall conform to the following color code requirements.
  - (1) AC Neutral conductors shall be identified by a continuous white color.
  - (2) AC Ground conductors shall be identified by a continuous green color.
  - (3) AC Phase (hot) conductors shall be identified by a continuous black color.
  - (4) All other conductors shall be identified by any color not previously specified.

- (f) All bolts used for electrical connections shall be fabricated from stainless steel.
- (g) All hardware used for electrical connections and terminal facilities shall be fabricated using cadmium plated brass.
- (h) All fuse holders shall be of the encased type.
- (i) The housing shall be equipped with a heating element installed in the bottom front of the cabinet, and conforming to the following requirements:
  - (1) The heating element shall be rated at 500 watts and have a minimum output of 1700 BTU/hr.
  - (2) The heating element shall have a built-in quick response thermostat with sealed contacts with a temperature control range of 40 F to 100 F, and a built-in thermal cut-off to automatically turn off the heater in case of overheating.
  - (3) The heating element shall have a protective cover with vent holes to prevent damage to adjacent wires or burns to service personnel.
- (j) 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.

**Power Distribution.** NEMA Size 3 cabinets shall be equipped with a metal-encased, split-phase load center, equipped with main breakers rated at 60 amperes. The panel shall be mounted on a 0.125 in thk aluminum plate and shall be located on the lower right-hand side of the cabinet.

- (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.
  - (1) One double-pole 40-ampere breaker, and four 15-ampere single-pole breakers (two per phase).
  - (2) One convenience Ground Fault Interrupter dual electrical outlet, mounted on the cabinet wall adjacent to the load center.

**Service Panel.** All cabinets shall have an aluminum service panel, containing electrical outlets and other associated equipment.

- (a) Viewed from the front door, the Service Panel shall be mounted on a 0.125 in. thick aluminum plate that is mounted at the upper left-hand side of the cabinet.

**SPECIAL PROVISIONS**  
**NEMA SIZE 3 CABINET**

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- (b) The service panel shall be equipped with a metal-encased box with two, grounded, duplex outlets.
- (c) The outlet box shall be wired to one of the 15-ampere circuit breakers specified above.

**Interior Lighting.** Modular LED traffic cabinet-rated light assemblies, located vertically on both sides of the door frame(s) to provide uniform illumination of the cabinet interior.

- (a) Cool White: 5000K
- (b) Operating Temperature: -10C to +40C Free air or cabinet mounted.
- (c) 24 Volt
- (d) 280 lumens per single module.
- (e) Class 2 Power supply included.
- (f) Switched to activate whenever either door is opened.
- (g) UL-2108 Approved

**Cabinets: Mechanical.**

- (a) **Size.** Cabinets shall be NEMA TS-2, size 3, unless shown otherwise on the Plans. Size 3 cabinets shall be forty inches in height by twenty-four inches in width by fifteen inches in depth (40 in. H x 24 in. W x 15 in. D).
- (b) **Foundation.** See Foundation Detail.
- (c) **Shelving.** One moveable shelf shall be supplied and installed in the cabinet.
- (d) **Natural Ventilation.** The cabinets shall be designed for continuous operation over an outside temperature range of -13 F to +113 F (-25 C to +45 C) without requiring fans, in the event the cabinet cooling system fails.
- (e) **Fan-Forced Ventilation.** Cabinets shall be equipped with dual electric fans with ball or roller bearings and a capacity of at least 100 cubic feet each free air delivery per minute. Each fan shall have a finger guard.
  - (1) The fans shall be thermostatically controlled and shall be manually adjustable to turn on between 33° C and 65° C with a differential of not more than 6° C between automatic turn on and off.
  - (2) The fan circuit shall be protected at 125 percent of the fan motor ampacity.
  - (3) The manual adjustment shall be graded in 10° C increments.
- (f) **Venting and Air Filtration.** 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.



- (1) Three extra filters shall be supplied for each cabinet installed.
  - (2) The filter shall cover the vents and be held firmly in place with top and bottom brackets and a spring loaded upper clamp.
  - (3) Exhaust air shall be vented out of the cabinet between the top of cabinet and the main access door.
  - (4) The exhaust area shall be screened with a material having a maximum hole diameter of 1/8 in.
- (g) Access Door.** All cabinets shall have a single access door located on the front of the cabinet.
- (1) The door opening shall be a minimum of eighty percent of the front surface area of the cabinet.
  - (2) All doors shall be provided with a gasket conforming to the physical properties listing in UL508 Table 2(1)1 and be such that the gasket forms a weather tight seal between the door and the cabinet.
  - (3) All doors shall be hinged on the right side as viewed facing the cabinet.
  - (4) Hinges shall be of a single, continuous design utilizing a fixed hinge pin.  
  
All hinging shall be bolted to the cabinet and door utilizing 1/4-20 stainless steel carriage bolts and nylon lock nuts.  
  
All hinge pins shall be capped at the top and bottom by weld to render the pin tamper proof.  
  
All cabinets shall have hinges fabricated from 0.093 in. stainless steel using a 0.250 in. diameter stainless steel hinge pin and shall provide a three inch open width.
- (h)** All cabinets shall include a door restraint to restrict the door to a maximum one hundred and thirty-five degrees of swing.
- (1) The restraint mechanism shall provide latching positions at ninety degrees and at one hundred and thirty-five degrees.
  - (2) 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 2 key. The Contractor shall provide the State with a minimum of one key each per cabinet.
  - (3) All cabinets shall have a weather-resistant, 12" x 16" or larger, clear Plastic folder on the inside of the door for schematic and wiring diagrams, and other maintenance information.

**Finish.**

- (a) All welds shall be neatly formed and free of cracks, blow holes and other irregularities.
- (b) All inside and outside edges of the cabinet shall be free of burrs.
- (c) All access door openings shall have a double flange on all four sides.
- (d) All cabinets shall have a sloped top surface to prevent the accumulation of water on the cabinet.
- (e) All outside surfaces of the cabinets shall have a smooth, uniform, natural aluminum finish, unless shown otherwise on the Plans.

**Cabinet Installation.**

- (a) **Mounting.** The Contractor shall securely fasten the cabinet on a new aluminum pedestal base or concrete foundation, as shown on the Plans, or as directed by the Engineer.
  - (1) Bolted stainless steel connections shall be provided with lockwashers, locking nuts, or other approved means to prevent the connection nuts from loosening.
  - (2) Dissimilar materials shall be isolated from one another by stainless steel fittings.
  - (3) If a pedestal base is specified for the cabinet, it shall be an enclosed rectangular aluminum base, fabricated specifically for use with NEMA size 3 cabinets.

The pedestal shall not be supplied with any internal equipment, such as ATR input files or terminal strips.

The pedestal base shall be the same color as the Size 3 cabinet.

The pedestal height shall be 18 inches, unless shown otherwise on the Plans.

If any portion of the pedestal base or cabinet is exposed due to overhang or unusual mounting circumstances, the exposed area shall be covered with a 0.125 in. thick aluminum plate.

- (4) Cabinets shall have a continuous neoprene gasket between the cabinet and the pedestal base or the cabinet and the foundation to prevent the ingress of water and other contaminants.

- (b) **Power Connections.** The Contractor shall make all power connections to the cabinet.
  - (1) The neutral bus shall be isolated from the cabinet and equipment ground.
  - (2) The bus shall terminate at the neutral lug ultimately attached to the meter pedestal.
- (c) **Equipment Connections.** The Contractor shall make all equipment connections cabinet to provide the required operation, unless directed otherwise by the Engineer.

**Testing.** After the equipment specified in the Contract Documents has been installed, and all and connecting cabling has been installed, a field test shall be conducted for each cabinet.

- (a) The test is designed to demonstrate that all hardware, cable, and connections furnished and installed by the Contractor operate correctly and that all functions are in conformance with the Specifications.
- (b) The field test will begin within 48 hours after the Engineer is advised by the Contractor that he is ready to begin the test.
- (c) The test may begin when the Contractor is satisfied that all work has been completed at each cabinet location. After the cabinet and equipment has been placed in operation, the Contractor shall demonstrate that all equipment furnished and installed operates as specified herein.
- (d) Each cabinet and its associated equipment shall be tested for proper operation for 30 consecutive days.
  - (1) During the testing period, all Contractor-provided equipment in the cabinet shall operate without failures of any type.
  - (2) If any component malfunctions or fails to provide the capabilities specified herein, during the 30-day test period, the Contractor shall replace or repair the defective equipment within 48 hours or notification by the Engineer.
  - (3) The cost of correcting component malfunctions shall be borne by the Contractor.
  - (4) After a component malfunction has been corrected to the satisfaction of the Engineer, a new 30-day test period shall be started.

The 30-day test applies only to Contractor-furnished hardware.

In the event of a failure of hardware furnished by others that prevents the 30-day test from continuing, the test shall be suspended until the non-Contractor furnished hardware has been repaired or replaced.

The cost of correcting malfunctions in Contractor-furnished equipment shall be borne by the Contractor.

- (e) After a component malfunction has been corrected to the satisfaction of the Engineer, a new 30-day test period shall be started.
  - (1) The 30-day test applies only to Contractor-furnished hardware.
  - (2) In the event of a failure of hardware furnished by others, or failure of detector hardware, that prevents the 30-day test from continuing, the 30-day test will be suspended until the other hardware failures are corrected, at which time the test will resume.
- (f) **Documentation.** The equipment supplier shall provide three sets of operating manuals, service manuals, and maintenance instructions for all components of the system.

**MEASUREMENT AND PAYMENT.** Furnishing and installing NEMA Size 3 electronic control equipment cabinets will be measured and paid for at the contract unit price each. The payment will be full compensation for the cabinets, concrete foundation, neoprene gasket(s), shelf, cable sheathing, material, labor, and other related equipment specified for each cabinet, including all incidentals necessary to complete the work.

**CATEGORY 800  
TRAFFIC****NON INVASIVE, MAGNETO-INDUCTIVE MICROLOOP DETECTOR**

**DESCRIPTION.** Furnish and install non-invasive, magneto-inductive microloop vehicle detection sensors/probes. Install the sensors/probes as a set or assembly of 3 per traveled lane.

**MATERIALS.** All materials and equipment furnished and installed shall be new corrosion resistant, and approved by the Engineer. Furnish manufacturers certifications or certified copies of reports of tests, as directed by the Engineer.

**CONSTRUCTION.****(a) Vehicle data collection requirements.**

- (1) Each non-invasive sensor shall have an inductance change that will allow an appropriately designed, matched inductive loop vehicle detector to detect all licensable vehicles that contain ferromagnetic material. The sensor will detect these vehicles when they are within a travel distance less than one half the height of the ferromagnetic material of the vehicle.
- (2) The non-invasive vehicle sensing assemblies shall consist of three sensors connected in series to a common lead in wire.
- (3) Connect each non-invasive, magneto-inductive vehicle sensing assembly to an appropriately designed, matched inductive loop vehicle detector.
- (4) Optimize traffic data collection or traffic flow parameter measurements across diverse roadway geometry by installing, triple non-invasive sensor assemblies.

**(b) Electrical and magnetic requirements.**

- (1) The non-invasive sensor shall convert changes in the ambient magnetic field to changes in its inductance. An increase in the ambient magnetic field shall result in a decrease in the inductance of the non-invasive sensor, and the inductance change of the non-invasive sensor shall be directly proportional to the changes in the earth's magnetic field.
- (2) The nominal magnitude of the vertical magnetic field over which the non-invasive sensor shall function to specified requirements shall be 200 millioerstads to 800 millioerstads. The non-invasive sensor shall detect reliably and consistently changes in the ambient magnetic field of seven (7) millioerstad or greater when the earth's magnetic field is  $\geq 200$  millioerstad ( $H_{DC}=200$  mOe) and the peak-to-peak amplitude of the applied inductive current is 40 mAmp<sub>p-p</sub> ( $I_{AC} = 40$  mAmp<sub>p-p</sub>). This requirement

## SPECIAL PROVISIONS

NON INVASIVE, MAGNETO-INDUCTIVE MICROLOOP DETECTOR

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defines the sensitivity to be  $\geq 2$  nanohenries/millioerstad at  $H_{DC}=200$  mOe and  $I_{AC} = 40$  mAmp<sub>p-p</sub>.

- (3) The sensor/probe inductance shall be between 50  $\mu$ H to 80  $\mu$ H. The nominal operating frequency of the probe shall be between 20 kHz and 60 kHz. The non-invasive sensor shall operate with drive currents of 2.5 mAmp<sub>p-p</sub> to 175 mAmp<sub>p-p</sub>. The specified electrical and operating requirements shall be maintained over temperatures ranging from -29.9 F to 162.5 F
- (c) **Sensor physical requirements.** The non-invasive sensor shall have a maximum outer diameter of 0.8125 in. and a maximum height of 2.25 in. and shall be suitably sealed for use in 100 percent humidity environments within a conduit. Equipment shall be included to secure the probes in the conduit, ensure proper orientation during installation, and maintain proper orientation through life of the device. The sensors shall have pull chords to facilitate installation and removal from the conduit. The probes shall be designed to be easily assembled on-site without the use of special tools and equipment. The sensors shall be serviceable from adjacent handholes. Installation of sensors shall not disturb roadway surface.
- (d) **Conduit installation requirements.**
- (1) For detection locations that shall require new conduit installation, the conduit shall be a 3 in. conduit consisting of schedule 80 PVC with an inner diameter of 2.9 in. and an outer diameter of 3.5 in. The conduit shall be installed at a nominal centerline depth of 20 in. from the road surface following the roadway crownline. The depth of the conduit centerline from the road surface shall be maintained between 18 and 22 in. over its entire length. The centerline of the conduit shall not deviate horizontally more than required by the application, however, any deviation in conduit alignment shall be less than 0.25 in. per foot. At least one end of the conduit shall terminate at a standard size handhole with a nominal 24 in. diameter and extend three in into the handhole, and the conduit shall have a grade to permit drainage.
  - (2) The non-invasive probes shall function in 3 in. conduits that have been previously installed at greater than the optimum operational depth stated above. Non-invasive probe installation and alignment for non-optimum pavement depths shall be performed as directed by the Engineer or described in the contract plans.
- (e) **Probe lead-in cable.** The cable leading from each probe set or assembly to the controller shall be included with the probes.
- (f) **Requirement of verification of proper installation.**
- (1) Provide a log of the boring depth measured every 2 ft in boring distance.

**SPECIAL PROVISIONS**

NON INVASIVE, MAGNETO-INDUCTIVE MICROLOOP DETECTOR

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- (2) Verify that the non-invasive sensor set or assembly and lead-in cable installation meets requirements by measuring the inductance of the non-invasive sensor assembly with a properly designed, matched vehicle detector. The installer shall verify that the installation meets requirements by measuring the DC resistance of the non-invasive sensor assembly with a properly calibrated ohm meter. The installer shall measure the change in inductance of the installed non-invasive sensor assembly using a properly designed, matched vehicle detector when a standard, midsize vehicle is driven directly over the sensor.

Provide a log of the measured inductance, DC resistance and the change in inductance for each installed non-invasive sensor assembly.

- (3) The inductance shall be the sum of probe inductance, inductance of lead-in cable (16.5  $\mu\text{H}$  per 100 ft) and home-run cable (23  $\mu\text{H}$  per 100 ft ) and shall be within  $\pm 20$  percent of the calculated inductance. The measured DC resistance shall be the sum of 1.5 ohms per probe, 3.0 ohms per 100 ft of lead-in wire and 2.0 ohms per 100 ft of home-run cable and shall be within  $\pm 20$  percent of the calculated DC resistance. The measured change in inductance for a standard midsize vehicle shall be in the range from 120 nH to 1200 nH.

**MEASUREMENT OF PAYMENT.** Non-Invasive Magneto Inductive Vehicle Detectors shall be measured and paid for at the contract unit price per each in the cable length specified. The payment will be full compensation for furnishing and installing one probe set, lead-in cable from the probe set to the field cabinet, probe carrier system, pull rope and all other incidentals. The payment shall be full compensation for all materials, labor, equipment and all other incidentals necessary to complete this work.

Conduit will be measured and paid for as specified in section 805.

**CATEGORY 800**  
**TRAFFIC**

**NON-INVASIVE ROAD WEATHER SENSORS**

**DESCRIPTION.** Furnish and install non-invasive road weather sensors, as specified in the Contract Documents, or as directed by the Engineer. The weather sensors shall consist of the sensor unit and connection cables, and all necessary connectors.

**MATERIALS.** Non-invasive road weather sensors, connection cable assemblies and all component parts shall meet the latest edition of the National Electrical Manufacturers Association (NEMA) Standards, Underwriters Laboratory (UL), and Military Standards (MIL), as applicable. The advertising date of this Contract shall be used to determine the date of the applicable standards.

**CONSTRUCTION.** Furnish and install all non-invasive weather sensors, power supplies, cables, connectors, materials, supplies, and manufactured articles, and perform all operations and equipment testing necessary to connect non-invasive road weather sensors to their respective field equipment cabinets to create fully operational sites.

**Electrical.**

- (a) Power supply
  - (1) Voltage: 12 – 24 VDC +/- 10%
  - (2) Power input: 40 VA, 15 VA in Energy Saving Mode
  - (3) Current consumption:
    - Approx. 1.65 A at 24 VDC
    - Approx. 1.75 A with 15 meter cable
  - (4) Inrush current: approx. 32 A (50 $\mu$ s) at 24 VDC.
- (b) Data Interface: RS485, 2 wire, half-duplex
- (c) Data bits: 8 (SDI-12 Mode: 7) Stop bit: 1 Parity: No (SDI-12 Mode: even)
  - (1) Tri-state: 2 bits after stop bit edge
  - (2) Adjustable baud rates: 1200, 2400, 4800, 9600, 14400, 19200, 28800, 57600
  - (3) Factory setting and baud rate for firmware update (SDI-12 Mode: 1200 fixed)

**Measurements: Sensors.**

- (a) Road Surface Temperature
  - (1) Measurement process: Pyrometer
  - (2) Measuring range: -40 C to +70 C
  - (3) Resolution: 0.1 $^{\circ}$ C
  - (4) Accuracy: +/- 0.8 $^{\circ}$ C
  - (5) Sampling rate: 1 minute Units:  $^{\circ}$ C;  $^{\circ}$ F
- (b) Water Film Height



**SPECIAL PROVISIONS**  
**NON-INVASIVE ROAD WEATHER SENSORS**

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- (1) Measurement process: Spectroscopic
  - (2) Measuring range: 0 to 2000  $\mu\text{m}$
  - (3) Resolution: 0.01  $\mu\text{m}$
  - (4) Accuracy: +/- 0.1 mm +/- 20% of measurement
  - (5) Sampling rate: <1 minute Units:  $\mu\text{m}$ , mil
- (c) Ice Layer Thickness
- (1) Measurement process: Spectroscopic
  - (2) Measuring range: 0 to 2000  $\mu\text{m}$
  - (3) Resolution: 0.01  $\mu\text{m}$
  - (4) Sampling rate: <1 minute Units:  $\mu\text{m}$ , mil
- (d) Freezing Temperature
- (1) Measurement process: Spectroscopic
  - (2) Measuring range: -40°C to 0°C
  - (3) Resolution: 0.1°C
  - (4) Sampling rate: <1 minute Units: °C; °F
- (e) Ice Percentage
- (1) Measurement process: Spectroscopic
  - (2) Measuring range: 0% to 100%
  - (3) Resolution: 0.1%
  - (4) Sampling rate: <1 minute Units: %
- (f) Saline Concentration
- (1) Measurement process: Spectroscopic
  - (2) Measuring range: 0% to 100%
  - (3) Resolution: 0.1%
  - (4) Sampling rate: <1 minute Units: %
- (g) Snow Height
- (1) Measurement process: Spectroscopic
  - (2) Measuring range: 0 to 10mm
  - (3) Resolution: 0.01mm
  - (4) Sampling rate: <1 minute Units: mm
- (h) Friction
- (1) Measurement process: Spectroscopic
  - (2) Measuring range: 0 to 1
  - (3) Resolution: 0.01
  - (4) Sampling rate: <1 minute

**SPECIAL PROVISIONS**  
**NON-INVASIVE ROAD WEATHER SENSORS**

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**Sensor Housing:**

- (a) Dimensions
  - (1) Height 425 mm
  - (2) Width 225 mm
  - (3) Depth 285 mm
- (b) Sensor Body Weight: approx. 9.9 kg
- (c) Mast bracket weight: approx. 1.0 kg
- (d) Attachment Type: Mast bracket: 60 - 76mm

**Environmental.**

- (a) Protection class: III (SELV)
- (b) Protection type: IP 65
- (c) Storage conditions
  - (1) Permissible storage temperature: -40°C to +70°C
  - (2) Permissible relative humidity: 0 to 95% R.H. non-condensing
- (d) Operating conditions
  - (1) Permissible ambient temperature: -40°C to +60°C
  - (2) Permissible relative humidity: 0 to 100% R.H.
  - (3) Permissible altitude above sea level: N/A

**MEASUREMENT AND PAYMENT.** Non-invasive road weather sensors will be measured and paid for at the contract unit price bid per each. The payment will be full compensation for the sensor, cable, connectors, materials, labor, testing and test equipment rental fees (if applicable), and all other incidentals necessary to complete the work.

**CATEGORY 800**  
**TRAFFIC**

**PAINTING WEATHERED GALVANIZED STRUCTURES**

**DESCRIPTION.** Paint weathered galvanized steel structures including exposed anchor bolts, flange bolts, nuts, and washers as specified in the Contract Documents or as directed by the Engineer. Provide colors as specified in the Contract Documents.

**MATERIALS.** Materials shall conform to the requirements described below. All coatings in the system shall come from the same manufacturer. The Manufacturer shall be on the “Approved List of Manufacturers” maintained by the Office of Materials and Technology, Metals, Coatings and Structural Materials Team.

Organic Zinc Rich Primer	Section 912.02.03.
Polyamide Epoxy	Section 912.03.02.
Aliphatic Polyurethane	Section 912.04.02.

Colors shall conform to the following federal standards or as specified in the Contract Documents.

Brown	Federal Standard Number 595a-20040
Black	Federal Standard Number 595a-27038
Green	Federal Standard Number 595a-24108

**CONSTRUCTION.**

**Surface Preparation.** Inspect each structure prior to the application of any coating to ascertain the condition and thickness of the weathered zinc coating. This inspection shall determine the required surface preparation. Any or all of the following may exist on any given structure. The following are the possible surface conditions and their required surface preparation:

- (a) When a structure exhibits only bright galvanizing, thickness readings are required to insure that 2.5 mils minimum galvanizing remains. Surface preparation shall be SSPC SP-1 (Solvent Cleaning), followed by either SSPC SP-2 (Hand Tool Cleaning) or SSPC SP-7 (Brush Off Blast Cleaning). A minimum of 1 mil. surface profile shall be obtained.
- (b) When a structure exhibits a dull gray finish, take thickness readings in the dull gray areas to insure a minimum of 2.5 mils galvanizing remains. Surface preparation shall be SSPC SP-1 (Solvent Cleaning), followed by Power Washing using a pressure washer with the pressure not to exceed 1450 psi at the nozzle.
- (c) When a structure exhibits areas of white powder coating, surface preparation shall be SSPC SP-1 (Solvent Cleaning) followed by SSPC SP-2 (Hand Tool Cleaning). After the white powder has been removed, take thickness readings to insure a minimum 2.5 mils galvanizing remains. A minimum of 1 mil surface profile must be obtained.

**SPECIAL PROVISIONS**  
**PAINTING WEATHERED GALVANIZED STRUCTURES**

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- (d) When a structure exhibits areas of red rust, take thickness readings to see if any galvanizing remains. Surface preparation shall be SSPC SP-1 (Solvent Cleaning), followed by SSPC SP-11 (Power Tool Cleaning to Near White). A minimum surface profile of 1 mil shall be obtained.

**Painting.** Paint the structures using the following materials.

- (a) Spot prime areas where there is less than 2.5 mils of galvanizing using Organic Zinc Primer at the manufacturers recommended thickness.
- (b) Apply a full coat of Polyamide Epoxy to the entire structure at the manufacturer's recommended thickness. There may be a recoat window for this material.
- (c) Apply a finish coat of Aliphatic Polyurethane to the entire structure at the manufacturers recommended thickness.

The finished painted surface must be holiday free when tested with a low voltage holiday detector (minimum 30 volts) similar to a K-D Bird Dog, using regular tap water. If holidays are detected, the coatings could be repaired with additional coatings or they may be stripped and repainted at the coaters' expense.

Apply all coatings in accordance with manufacturers recommendations.

Paint all structures within 24 hours after surface preparation. If this time is exceeded, re-inspection will be necessary to insure no contamination of the cleaned surface has occurred prior to painting. Additional surface preparation may then be necessary.

**MEASUREMENT AND PAYMENT.** Painting of Weathered Galvanized Structures will be measured and paid for at the Contract unit price per structure. The payment will be full compensation for all material, labor, equipment, tools and incidentals necessary to complete the work.

**CATEGORY 800  
TRAFFIC**

**PICK UP, TRANSPORT, AND INSTALL STATE-SUPPLIED DMS**

**DESCRIPTION.** Pick up, transport, and install SHA-supplied LED Dynamic Message Signs (DMS) with walk-in enclosures at new locations within 200 miles of the pick-up location, as specified in the Contract Documents, or as directed by the Engineer.

**MATERIALS.** All materials, such as sign hangers and mounting hardware, shall be new and approved by the Engineer.

**CONSTRUCTION.** Pick up SHA-supplied overhead or pedestal-style Dynamic Message Signs with walk-in enclosures from SHA facilities, storage sites, or construction sites, transport the DMS by truck to new locations, and install the DMS on new Contractor-supplied sign structures or pedestal posts:

- (1) The distance between the pick-up location and the installation site will not exceed 200 miles.
- (2) The SHA-supplied DMS will be mounted on new overhead or pedestal sign structures, provided by the Contractor under existing Contract bid items.
- (3) All sign mounting hardware, such as sign hangers and U-Bolts shall be supplied by the Contractor.
- (4) The maximum dimensions for the DMS will be approx. 36 ft. wide, 10 ft. high, and 4 ft. deep, with a maximum weight of 6,000 lbs.
- (5) If new signs are provided by SHA, any packing and shipping materials that must be removed by the Contractor shall be properly disposed of at the Contractor's expense.
- (6) If used signs are provided by SHA, any existing mounting materials (sign hangers, U-Bolts, etc) that are still attached to the sign will become the property of the Contractor. All costs associated with the removal and disposal of these materials shall be borne by the Contractor.

**MEASUREMENT AND PAYMENT.** Picking up, transporting, and installing SHA-supplied DMS will be measured and paid for at the pertinent contract unit price bid for each type DMS (Overhead or Pedestal). The payment will be full compensation for moving equipment such as cranes or lift trucks to and from the pick-up and installation sites, transportation and rental charges, including those for special equipment such as "lowboy" trailers, materials, labor, bucket truck and operator costs, disposal of shipping or mounting materials, and all other incidentals necessary to complete the work and create a fully-functional, CHART-system compatible LED DMS site.

**CATEGORY 800**  
**TRAFFIC**

**PIEZO SENSORS CLASS II**

**DESCRIPTION.** Furnish and install Piezo Sensors Class II, as specified in the Contract Documents or as directed by Engineer.

**MATERIALS.** Provide Piezo Sensors that are Class II and meet the following.

Minimum resistance between core and shield	500 Meg Ohm
Capacitance	7.75 to 13.75 nF (+/- 5 nF) per 11 ft of sensor per 100 ft lead (supplied with each sensor).

The epoxy used for installation of piezo sensors in the roadway shall be suitable for all pavements, and shall be of a type recommended and approved by the manufacturer, with a cure time of:

- (a) 2 hr. at 40 degree F.
- (b) 1 hr. at 70 degree F.

**CONSTRUCTION.**

**Installation.** Install piezo sensors as specified in the manufacturers recommendations for site selection, site testing, and site preparation. Provide a copy of the sensor maintenance manual to the Engineer.

**Length.** Supply Piezo sensors in 11 ft lengths, with pre-installed lead lengths of 100, 200 or 300 ft. Piezo leads may be cut to length, but they shall not be spliced.

**Testing.** Test as specified by the manufacturer, and per Section 820 of the Maryland Specifications.

**MEASUREMENT AND PAYMENT.** Piezo Sensors Class II will be measured and paid for per each. The payment will be full compensation for furnishing, installing and calibrating the sensor, lead-in cable, all materials, including labor, equipment, sawcutting for the sensor, and all incidentals necessary to complete the work.

**CATEGORY 800**  
**TRAFFIC**

**POLE MOUNTED SPLICE BOXES**

**DESCRIPTION.** Furnish and install pole mounted splice boxes as specified in the Contract Documents, or as directed by the Engineer.

**MATERIALS.** Not applicable.

**CONSTRUCTION.**

**General.** Design splice boxes to be used as a pole mounted or pedestal mounted splice cabinet for metallic communication cables. Shelves, back panels, or mounting rails are not required. Provide splice boxes equivalent to a Chatham model SM161412. Provide two sets of mounting hardware equivalent to Chatham Technologies part No. 231638.

**Dimensions.** Splice boxes shall be 16 in. high, 14 in. wide and 12 in. deep.

**Supports.** Provide internal supports at the rear top and bottom to affix the pole mounting hardware. Drill the supports to accept the mounting hardware.

**Finish.** The splice boxes shall be of natural unpainted aluminum, and all external hardware shall match this appearance. All hardware shall be rust proof.

**Vents.** Provide a screened vent in the bottom of the splice box. Offset the vent from the center of the cabinet to allow for mounting on a pedestal pole.

**Doors.** Doors shall be a single piece design with a single continuous hinge on the right side, when viewed from the front. Reinforce doors with runners to prevent flexing.

**Latches.** The door shall have a slam type latch.

**Locks.** Each door shall have lock constructed of brass with a swing away cover. The door shall lock automatically, without use of a key, when closed. Two standard Maryland keys shall be provided with each splice cabinet. Keys shall be compatible with those used by Montgomery County, Maryland.

**Gasketing.** Provide a weather tight, permanent gasket around the door opening. The gasket shall be closed cell neoprene, and attached with contact cement. The mating surface of the gasket shall be lubricated with silicone spray to prevent sticking.

**Hinges.** Bolt hinges to the cabinet. Hinges, pins, and bolts shall be made from stainless steel. The hinge shall have a fixed pin, 1/4 in. in diameter. Hinges shall be on the right side.

**SPECIAL PROVISIONS**  
POLE MOUNTED SPLICE BOXES

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**MEASUREMENT AND PAYMENT.** Pole Mounted Splice Boxes shall be measured and paid for at the contract unit price per each. The payment will be full compensation for the box, doors, mounting hardware, locks, drilling of mounting hole, and for all hardware, material, labor, and incidentals necessary to complete the work.



**CATEGORY 800**  
**TRAFFIC**

**POWER DRIVE UNIT**

**DESCRIPTION.** Furnish and install handheld power drive units for raising and lowering hinged CCTV poles, as shown in the Contract Documents, or as directed by the Engineer. Power drives shall be complete handheld units with an 8 in., 1 in. square-drive crank hub/pole chuck assembly that fits into the hand crank winch tube socket in the pole housing.

**MATERIALS.** The power drive housing shall be made of fiberglass-reinforced plastic and die-cast aluminum.

**CONSTRUCTION.** The power drive chuck shall be 100 percent compatible with the Administration's hinged CCTV camera poles. The equipment shall satisfy the following requirements.

**(a) Mechanical.**

- (1) Spindle Speed (no load): 32 RPM.
- (2) Crank Hub/Pole Chuck: 8 in. length x 1 in. square drive.
- (3) Weight: Less than 15 lbs.
- (4) Overall Length: Less than 24 in.
- (5) Gear Head: Ball and needle bearings.
- (6) Gear Housing: Die Cast Aluminum.
- (7) Carry Case: Polystyrene, molded to fit drive unit.

**(b) Electrical.**

- (1) Motor: 1/2 HP Reversible, 115 or 220 VAC, 50/60 Hz.
- (2) Switch: Heavy-duty paddle-type switch with safety lock off switch.  
Separate FORWARD/REVERSE switch.
- (3) Certifications: UL/CSA/RoHS/WEEE.

**(c) Warranty.** Standard manufacturer's lifetime warranty.

**SPECIAL PROVISIONS**  
**POWER DRIVE UNIT**

CONTRACT NO. BA0065172  
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**MEASUREMENT AND PAYMENT.** Furnishing and installing power drive units for hinged CCTV camera poles will be measured and paid for at the Contract unit price each. The payment will be full compensation for the power drive units, crank hub/pole chuck assemblies, carry case, tools, materials, labor, testing and incidentals necessary to complete this work.

**CATEGORY 800**  
**TRAFFIC**

**RED SIGNAL AHEAD LED SIGNS**

**DESCRIPTION.** Furnish and install signs with all or part of their legend formed by Light Emitting Diodes (LEDs).

**MATERIALS.**

Sign Supports and Hardware	909.07
Reflective and Non Reflective Sheeting	950.03
Sign Materials	950.08

**General.** Design the signs to function in an outdoor environment, be fully weather tight, and function at an ambient temperature of -37 C to 48 C.

Provide signs that are in full compliance with the MUTCD.

The legend formed by LEDs must be clearly legible at 400 ft, and visible at 1000 ft, along the optical axis of the LED sign, when the LEDs are energized and the sign is viewed against a clear daylight sky. When the LEDs are not energized the LEDs shall not be evident.

**Light Emitting Diodes.** Provide LEDs that are Aluminum Indium Gallium Phosphide type. The LED shall be rated for 100,000 hours continuous operation with no more than 50 percent lumen depreciation. Each LED shall provide at least 500 millicandelas on the optical axis with a 20 degree or greater beam angle, at 20 milliamps. Red LEDs shall have a dominant wavelength of the emitted light between 620 and 660 NM.

**CONSTRUCTION.**

**Light Emitting Diodes.** The LEDs shall be securely soldered into a printed circuit board. The boards shall be arranged so that the failure of any one LED will not deactivate any other LED. The current supplied to each LED shall not vary more than 5 percent from any other LED.

**Pixels.** The LEDs shall be grouped to form individual pixels. Each pixel shall be between 1 in. and 1.25 in. diameter. Each pixel shall have a luminance greater than 35 candela along the optical axis, at 20 milliamps operating current per LED. The pixel, and associated circuit board, shall be mounted into the module in such a manner as to allow easy access for repair. The pixel shall be watertight when properly installed.

Each pixel shall contain internal circuitry for 125 VAC operating voltage. External Power supplies are not allowed. The pixel shall have 6 in. 18 AWG wire leads that are color coded to indicate the color output of the pixel.

Each pixel housing shall be made from brass, and shall be nickel plated. The pixel shall be front mounted through a 1 in. mounting hole where the product is water sealed. Each Pixel shall have a flat, impact resistant polycarbonate lens and shall meet UL94VO ratings. The external lens surface shall be smooth with no raised features. External Facets are not allowed. The complete pixel shall meet NEMA 4X and IP 66.

**Modules.** Each word using LEDs will be formed by one independent weather tight module, which is fastened, into the sign face. The module shall protect and support the LED pixel. The modules shall be removable from the sign face using only a screwdriver. A wiring harness shall be installed behind each module to allow the wiring to be easily disconnected when the module is removed. A visor shall be provided for each module to shade it from illumination by sunlight. The face of the module shall not project from the sign face more than 0.32 in. exclusive of the Visors.

**Sign Face Legend, Border and Background.** The sign face shall be diamond shaped, 60 in. on each side. The entire legend shall use the FHWA series 'D' standard alphabet. The words "RED" "SIGNAL" and "AHEAD" shall be in 10" all upper case lettering.

"RED" shall be formed by red LED's on a matte black panel, which shall also form the face of the module. The face shall be a 29 in. by 15 in. More than 0.5 in shall not separate the pixels. The LEDs and word "RED" shall not be visible when the LEDs are not energized.

"SIGNAL" and "AHEAD" shall be formed of black non-reflective letters sheeting on a fluorescent yellow, High Performance Wide Angle Retroreflective (ASTM Type IX) sheeting background. LED pixels shall be inset into the letters so as not to be visible when not energized. The pixels shall not be separated by more than 0.5 in. A black Border 1.5 in. thick shall be placed 1 in. in from the edge of the sign. At the corners, the border will have a 4 in. radius.

**Sign Enclosure.** The sign enclosure shall be constructed of aluminum alloy a minimum of 0.125 in. thick. Sides of the structure shall be formed of extrusions, while front and back will be formed from plate. All seams shall be welded and made smooth.

The sign enclosure shall be 60 in. (56 in. internal) on a side and at least 3.25 in. deep.

A reinforcing framework of 1 x 2 in. aluminum extrusions shall installed to stiffen the structure, and provide bracing for the mounting hardware. The framework shall consist of two vertical members, and two horizontal members arranged in a symmetrical pattern. All bracing members shall be welded to each other, and to the enclosure sides and back.

Appropriate holes will be drilled and tapped into the enclosure back and bracing for mast arm mounting hardware. The mounting hardware shall consist of a series of three tubular vertical mounting brackets as approved by the Administration.

Weep holes shall be drilled on either side, 2.6 in. from the bottom corner. Each weep hole shall be 0.75 in. diameter. Screening shall be fitted over the weep holes to prevent the entrance of insects.

**SPECIAL PROVISIONS**  
**RED SIGNAL AHEAD LED SIGNS**

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The sign enclosure shall house only the terminal blocks necessary to connect the field wires from the control cabinet.

**Electrical.** The field wires shall operate as follows.

- (a) There shall be one terminal labeled RED, by applying 120 volts to this terminal the word RED will light.
- (b) There shall be one terminal labeled Signal Ahead, by applying 120 volts to this terminal the word SIGNAL AHEAD shall light
- (c) There shall also be a terminal labeled NEUTRAL to terminate the neutral to the control cabinet.

The entire sign and sub-controller shall be warranted by its manufacturer for a period of 6 months.

**Environmental.** The sign shall be capable of operating between -30 C to +85 C.

**MEASUREMENT AND PAYMENT.** Red Signal Ahead LED Signs will be measured and paid for at the contract unit price per each installed. The payment will be full compensation for the sign, LEDs, relays, transformers, photocells, mounting hardware, electrical connections, and for all material, labor, tools, equipment, and incidentals necessary to complete the work.

**CATEGORY 800  
TRAFFIC**

**RELOCATE EXISTING SIGNAL OR SIGN ON SIGNAL STRUCTURE**

**DESCRIPTION.** Relocate Existing Signal Head Assemblies and or Signs on Signal Structures as specified in the Contract Documents or as directed. Replace existing mounting hardware.

**MATERIALS.** Not applicable

**CONSTRUCTION.** Maintain the existing signals and signs by relocating equipment during phases of the Maintenance of Traffic.

Relocate Signal Head Assembly shall consist of relocating all signal head indications connected in one assembly, rerouting and resealing all cables connected to the signal head assembly; and insuring the signal heads are aimed and working correctly. Replace all mounting hardware.

Relocate Signs on Signal Structures shall consist of relocating one sign to different location on the same signal structure or span wire. Replace all mounting hardware.

The Contractor along with the Engineer shall coordinate the equipment locations in accordance to the Contract Documents or as directed.

Plan the work to minimize interference with any existing traffic control device.

**MEASUREMENT AND PAYMENT.** The payment shall include replacement of mounting hardware and shall be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

Relocate Traffic Signal Head Assemblies will be measured and paid for at the contract unit price per each.

Relocate Signs on Signal Structures shall be measured and paid for at the contract unit price per square foot.

Relocation of signs not mounted on signal structures will be measured and paid for as specified in the contract documents under Section 822.

**CATEGORY 800**  
**TRAFFIC**

**RELOCATE EXISTING VIDEO DETECTION CAMERA**

**DESCRIPTION.** Relocate Existing Video Detection Cameras as specified in the Contract Documents or as directed. Replace existing mounting hardware. Disconnect, pull back and reroute or replace video detection lead-in cable as necessary.

**MATERIALS.**

**18-Gauge Camera-to-Cabinet Cable.** The cable between the video detection camera and the cabinet interface shall consist of three conductors 18 AWG, with an overall UV-resistant low density polyethylene jacket. Provide connector in accordance with manufacturers recommendations.

**(a) Conductors.**

- (1) Three, 18 AWG, 19 strands of 30 gauge tin-plated copper conductor diameter .046”/.052”.
- (2) Extruded polyethylene 200 conductor insulation, with nominal .030” wall thickness.
- (3) Black, green, and white colors.

**(b) Construction.**

- (1) Extruded black polyethylene jacket .040”/.050” wall thickness, UV-resistant.
- (2) 0 .330” - .354” maximum outside diameter.
- (3) 600 volt (rms) rated.
- (4) The cable shall be imprinted with the manufacturer’s part number, number of conductors, conductor size, voltage rating, jacket material, and an indication that it is conduit rated.

**Mounting Hardware. 950.15**

Supply mounting hardware capable of securely mounting the camera to the camera support and mounting the camera support securely to the structure. Provide mounting hardware capable of mounting the camera to a vertical, horizontal or angled structure in accordance with Administration Typical details and Administration Standards MD 814.01. Provide up to 60” vertical extension pipe where required by Contract Documents or as directed by the Engineer.

**SPECIAL PROVISIONS**  
**RELOCATE EXISTING VIDEO DETECTION CAMERA**

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**CONSTRUCTION.**

Notify the Engineer and Traffic Operations Division representatives at least five (5) working days before intended work is to be completed. Plan the work to minimize interference and/or down time of any existing traffic control device.

Relocate video detection camera shall consist of relocating the camera; rerouting and resecuring all cables connected to the video detection camera; replacing lead-in cable, if necessary; replacing cable connector, if necessary; replacing mounting hardware; and insuring the signal heads are aimed and working correctly.

Replacement of mounting hardware will include installation of up to 60" vertical extension pipe where required by Contract Documents or as directed by the Engineer.

The Contractor along with the Engineer shall coordinate the equipment locations in accordance to the Contract Documents or as directed.

Coordinate with Traffic Operation Division to adjust the aim and programming of the existing video detection camera as necessary.

**MEASUREMENT AND PAYMENT.** The payment shall include replacement of mounting hardware including up to 60" vertical extension pipe, replacement of lead-in cable between camera and cabinet, replacement of cable connector and shall be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

Relocate Video Detection Camera Including New Mounting Hardware will be measured and paid for at the Contract unit price per Each.



**SPECIAL PROVISIONS**

CONTRACT NO. BA0065172

REMOVE AND DISPOSE OF EXISTING LIGHTING INFRASTRUCTURE

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**CATEGORY 800  
TRAFFIC****REMOVE AND DISPOSE OF EXISTING LIGHTING INFRASTRUCTURE**

**DESCRIPTION.** Remove and dispose of existing lighting infrastructure including but not limited to existing lighting structures, bridge mounted sign mountings, manholes, handholes, traffic control device cabinets and equipment, foundations, cables, conduits, duct cables, electrical service equipment, breakaway base support system, ground wire, roadway luminaires, connector kits and ground rods as shown in the contract documents and/or as directed by the field engineer within the project limits.

**MATERIALS.** Not applicable.

**CONSTRUCTION.** Remove concrete foundations and place backfill as specified in 822.03.01.

Make all existing cable safe in conformance with the appropriate electrical codes. If removing duct cable, underground conduit, ground wire, etc., backfill as specified in 809.03.

Remove existing manholes and handhole as specified in 207.03.01. Place backfill as specified in 822.03.01.

**MEASUREMENT AND PAYMENT.** Remove and Dispose of Existing Lighting Infrastructure will not be measured but will be paid for at the Contract lump sum price. The payment will be full compensation for the removal and disposal of existing lighting infrastructure including but not limited to existing lighting structures, bridge mounted sign mountings, manholes, handholes, traffic control device cabinets and equipment, foundations, cables, conduits, duct cables, electrical service equipment, breakaway base support system, ground wire, roadway luminaires, connector kits, ground rods, excavation, backfill, transportation and all materials, labor, equipment and incidentals necessary to complete the work as indicated on contract documents and/or as directed by the field engineer within the project limits.

**CATEGORY 800**  
**TRAFFIC**

**REPAINTING PREVIOUSLY PAINTED GALVANIZED STRUCTURES**

**DESCRIPTION.** Re-paint previously painted galvanized steel structures including exposed anchor bolts, flange bolts, nuts, and washers as specified in the Contract Documents or as directed by the Engineer. Colors shall be as specified in the contract documents.

**MATERIALS:** Provide materials that conform to the requirements described below. All coatings in the system shall come from the same manufacturer. The Manufacturer shall be on the "Approved List of Manufacturers" maintained by the Office of Materials and Technology, Metals, Coatings and Structural Materials Team.

Organic Zinc Rich Primer	912.02.03.
Polyamide Epoxy	912.03.02.
Aliphatic Polyurethane	912.04.02.

Colors shall conform to the following Federal Standards, or as specified in the Contract Documents.

Brown	Federal Standard Number 595a-20040
Black	Federal Standard Number 595a-27038
Green	Federal Standard Number 595a-24108

**CONSTRUCTION.**

**Surface Preparation.** Clean all existing painted structures to insure that all paint is removed to either galvanized surface or bare metal. All cleaned surfaces shall be approved by the Office of Materials and Technology. Prior to the application of any coating, inspect each structure to ascertain the condition and thickness of the weathered zinc coating. This inspection shall determine the required surface preparation. Any or all of the following may exist on any given structure. The following are the possible surface conditions and their required surface preparation.

- (a) When a structure exhibits only bright galvanizing, thickness readings are required to insure that 2.5 mils minimum galvanizing remains. Surface preparation shall be SSPC SP-1 (Solvent Cleaning), followed by either SSPC SP-2 (Hand Tool Cleaning) or SSPC SP-7 (Brush Off Blast Cleaning). A minimum of 1 mil surface profile shall be obtained.
- (b) When a structure exhibits a dull gray finish, take thickness readings in the dull gray areas to insure a minimum of 2.5 mils galvanizing remains. Surface preparation shall be SSPC SP-1 (Solvent Cleaning), followed by Power Washing using a pressure washer with the pressure not to exceed 1450 psi at the nozzle.

**SPECIAL PROVISIONS**

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**REPAINTING PREVIOUSLY PAINTED GALVANIZED STRUCTURES**

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- (c) When a structure exhibits areas of white powder coating, surface preparation shall be SSPC SP-1 (Solvent Cleaning) followed by SSPC SP-2 (Hand Tool Cleaning). After the white powder has been removed, take thickness readings to insure a minimum 2.5 mils galvanizing remains. A minimum 1 mil surface profile must be obtained.
- (d) When a structure exhibits areas of red rust, take thickness readings to see if any galvanizing remains. Surface preparation shall be SSPC SP-1 (Solvent Cleaning), followed by SSPC SP-11 (Power Tool Cleaning to Near White). A minimum surface profile of 1 mil shall be obtained.

**Painting.** Paint the structures using the following materials.

- (a) Spot prime areas where there is less than 2.5 mils of galvanizing using Organic Zinc Primer at the manufacturers recommended thickness.
- (b) Apply a full coat of Polyamide Epoxy to the entire structure at the manufacturers recommended thickness. There may be a recoat window for this material.
- (c) Apply a finish coat of Aliphatic Polyurethane to the entire structure at the manufacturers recommended thickness.

The finished painted surface shall be holiday free when tested with a low voltage holiday detector (minimum 30 volts) similar to a K – D Bird Dog, using regular tap water. If holidays are detected, the coatings could be repaired with additional coatings or they may be stripped and repainted at the coaters' expense.

Apply all coatings in accordance with manufacturers recommendations.

Paint all structures within twenty-four (24) hours after surface preparation. If this time is exceeded, re-inspection will be necessary to ensure no contamination of the cleaned surface has occurred prior to painting. Additional surface preparation may then be necessary.

**MEASUREMENT AND PAYMENT.** Re-Painting Previously Painted Galvanized Structures will be measured and paid for at the Contract unit price per structure. The payment will be full compensation for all material, labor, equipment, tools and incidentals necessary to complete the work.

**CATEGORY 800**  
**TRAFFIC**

**REPLACE JUNCTION BOX COVER**

**DESCRIPTION.** Furnish and install junction box covers for existing junction boxes installed in concrete barrier wall and bridge parapets. Remove and dispose of the existing junction box covers. Drill and re-tap existing bolts holes in existing junction boxes to accept new bolts. Furnish and install gasket to prevent water intrusion.

**MATERIALS**

Steel	A 709
Galvanized for Steel	A 123
Stainless Steel Hardware	A 167, Type 302 or 304

**CONSTRUCTION.** Provide galvanized steel junction box covers.

Use stainless steel hardware. Use hex head style bolts to secure junction box cover to junction box with a standard socket wrench.

Measure existing junction box cover dimensions and bolt pattern prior to ordering replacement junction box covers. If existing junction box cover is missing, measure the dimensions of the opening of the existing junction box to allow for a new junction box cover, make dimension deductions as necessary to account for expansion and contraction of junction box covers due to different outdoor temperatures.

Drill out and re-tap existing junction boxes to allow for secure attachment of proposed junction box cover to junction box.

Etch, stamp or mold junction box covers for junction boxes which will house cables larger than #6 AWG with "Additional Cables Cannot Be Installed". Provide this message on the side of the cover that is not exposed. Adhesive backed stickers are not acceptable.

Supply junction box covers with tamper resistant bolt heads.

**MEASUREMENT AND PAYMENT.** Junction Box Cover Replacement will be measured and paid for at the Contract unit price per each. The payment will be full compensation for existing cover removal, drilling and re-tapping, new cover, etching, stamping, molding, hardware, materials, labor, equipment and incidentals necessary to complete the work.

**CATEGORY 800**  
**TRAFFIC**

**SIDE-FIRED VEHICLE DETECTORS**

**DESCRIPTION.** Furnish and install side-fired vehicle detectors (SFVD), including all necessary hardware and electrical connections, as specified in the Contract Documents or as directed by the Engineer. The SFVD shall be non-Doppler radar based vehicle detectors with options for integral IP video cameras for remote surveillance and 900 MHz/2.4 GHz DSS Radio modems.

**MATERIALS.** All component parts shall be designed, manufactured, tested, and installed in conformance with the following codes and standards:

- (a) Federal Communications Commission (FCC)
- (b) National Fire Protection Association (NFPA 70, 75, & 780).
- (c) IEC 68-2-30 (Test Fc), IEC 68-2-27, and NEMA TS-1
- (d) International Standards Organization (ISO) - The manufacturer shall be certified ISO 9001 for manufacturing design and service.

**CONSTRUCTION.** Side-fired radar based vehicle detectors shall be fully programmable to support a variety of applications. Both software and hardware shall be upgradeable.

**General.**

- (a) Side-fired radar detectors shall be capable of automatic recalibration.
- (b) Field integration shall not be necessary.
- (c) The detector's design shall prevent reversed assembly or improper installation of connectors, fasteners, etc.
- (d) The detector shall have a rainproof, NEMA 4X, Polycarbonate enclosure.
- (e) The advertised design Mean Time Between Failures (MTBF) of the SFVD unit, operating continuously in their application, shall be 13 years (114,000 hours).

**Communications Protocol.**

- (a) The communications protocols used by the SFVD shall be compatible with the current protocols used by the data analysis computers employed by Administration’s CHART system. The protocols may be obtained by contacting Maryland’s Statewide Operations Center at (410)-582-5650.
- (b) If the SFVD is an upgrade or new version of an existing model that is in use by CHART, the protocols used by the new model shall be 100 percent backward-compatible with those used by the previous model.
- (c) SFVD’s shall have the option of using the NTCIP 1209 protocol.

All SFVD’s not currently approved and in use by the Administration’s CHART system shall have been tested at the Administration’s CHART system Test Bed and approved prior to the advertisement date of this contract (See “Equipment Approval” section, below). This includes new models or upgrades to existing models used by CHART.

**Equipment Approval.** All manufacturers who wish to bid on ITS projects in the State of Maryland must have their equipment tested and pre-approved before the date of advertisement of this contract.

- (a) Manufacturers must submit a sample of the equipment to the Administration’s CHART System Test Bed for compliance testing and approval.
- (b) Bidders shall contact the Chief of SHA’s Communications Division, by phone at 410-747-8590 or via email at [prunion@sha.state.md.us](mailto:prunion@sha.state.md.us) to obtain a list of testing dates.
- (c) The sample submitted shall represent the actual equipment that will be supplied under this contract.

**Area of Coverage.** The SFVD's field of view shall cover an area defined by an oval shaped beam and its detection range shall be as follows:

<b>PROPERTY</b>	<b>LIMIT</b>
Elevation Beam Width, degrees, max	50
Azimuth Beam Width, degrees, max	12
Range, ft	0 to 250

**Capabilities.** The SFVD shall be a true presence detector that can provide presence, volume, lane occupancy, speed, and classification information on up to twelve discreet detection zones.

- (a) A minimum of twelve (12) detection zones shall be defined. The range limits of each zone shall be user defined in 1.3 ft resolution.
  - (1) The zone width shall be 7 ft. to 20 ft.
  - (2) The detector shall identify vehicle presence within each detection zone with a 95 percent accuracy or greater, independent of the vehicle's direction of travel through the detection zone.
  - (2) The maximum permissible error shall be 5 percent in the detection of the direction and magnitude of radial speed and 10 percent in the case of transverse speed.
- (b) The zones shall be configurable using software on a notebook PC, with verification via an optional built-in video camera.

**Electrical.**

**(a) Input Power.**

- (1) 12 - 24 VAC/DC
- (2) 95 - 135 VAC at 60 Hz. (not used for solar installations)
- (3) Power Consumption – 3.5 watts maximum, without optional built-in video camera.

**(b) Surge Suppression.** IEC 1000-4-5 and EN 61000-4-5 on all external connectors.

**Interface.** The interface at the SFVD shall consist of a single MS connector. The MS connector pins shall be crimped to the cable conductors and assembled and tested prior to installation and pulling of cable on site. The connector shall provide:

- (1) Power to the unit
- (2) Output contact closure wire pairs for each of the required detection zones
- (3) Isolated Serial RS-232/RS-485 port to provide per-vehicle measurement data, presence event data, or statistical data.
- (4) 8 MB built-in memory for data collection.
- (5) Built-in wireless option for contact pairs or data transmission using either DSS Frequency Hopping Spread Spectrum or Cellular (GPRS or CDMA).

**SPECIAL PROVISIONS**  
**SIDE-FIRED VEHICLE DETECTORS**

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SFVD's shall have the option of a second port, and NTCIP 1209 protocol.

**Cable.** A manufacturer-recommended cable shall be used to provide a connection between the SFVD and the cabinet equipment.

- (a) UV-resistant
- (b) overall shielded (individual pairs are not shielded).
- (c) No more than six (6) twisted-pairs
- (d) Stranded cables
- (e) #18 to #22 AWG.

**Environmental.** Except as stated otherwise herein, the equipment shall conform to all its specified requirements during and after subjecting to any of the following environmental conditions:

- (a) Ambient temperature range of -40 to +75 C.
- (b) Relative humidity from 5 to 95 percent, non-condensing.
- (c) Vibration: 0.5g up to 300 Hz.
- (d) Wind: Up to 100 mph.
- (e) Shock: 10g, 11 mSec, half sine wave

**Installation.** The SFVD shall be mounted in a side-fired configuration.

- (a) SFVD units shall be mounted on poles at the specified locations using the factory-supplied mounting brackets. The brackets shall permit rapid attachment to poles using approved 3/4 in. wide, 0.025 in. thick, stainless steel bands.
- (b) The Contractor shall install the detector unit on a pole at a height of 17 to 25 ft above the road surface so that the masking of vehicles is minimized, and that all detection zones are contained within the specified elevation angle as suggested by the manufacturer.
- (c) The SFVD detection zones shall be set up using the provided software and a laptop computer.



**Setup and Testing.** After field installation is complete, each detector shall be set up and tested in conformance with the manufacturer's User Manual. The tests shall be conducted at each field equipment cabinet, and shall consist of measuring the output of each detector with a laptop computer and the appropriate software package furnished with each unit.

- (a) The Contractor shall verify the accuracy of the output from the RS232 serial port and the closure contacts.
- (b) The Contractor shall provide the necessary laptop computer equipment, software, and all other equipment necessary for the testing procedure.
- (c) The Contractor is advised to obtain and review a copy of the manufacturer's user manual prior to establishing a bid price for furnishing and installing these units.

**Mechanical.** The microwave radar detector shall be enclosed in a rugged, watertight, polycarbonate box and sealed to protect the unit from wind up to 100 mph, dust and airborne particles (NEMA 4X enclosure).

- (a) The overall wind load presented by the detector shall not exceed 100 square inches.
- (b) The total weight of the microwave radar detector assembly shall not exceed 5 lb.
- (c) The mounting shall be a universal bracket that permits mounting the SFVD to poles, tilting in both axes, with quick locking.
- (d) The microwave radar detector shall be resistant to vibration in conformance with IEC 68-2-30 (Test Fc), NEMA TS-1 (Section 2.1.12), or as approved by the Engineer.
- (e) The microwave detector shall be resistant to shock in conformance with IEC 68-2-27 (Test Ea), NEMA TS-1 (Section 2.1.13).

**Transmission.**

- (a) Each microwave radar detector shall transmit on either the X or K frequency band.
- (c) The detector shall conform to the limits for a Class A digital device, pursuant to Part 15 of the FCC rules or the appropriate Spectrum Management Authority. The SFVD shall not interfere with any known equipment.
- (d) Transmitter power shall not exceed 10 milliwatts

**SPECIAL PROVISIONS**  
**SIDE-FIRED VEHICLE DETECTORS**

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**Maintenance.** Side-fired radar detectors shall be shop-repairable and expandable, with an average field replacement time of 15 minutes. They shall feature self-diagnostic software, and user field level firmware upgradeability.

**MEASUREMENT AND PAYMENT.** Furnishing and installing Side-Fired Vehicle Detectors (SFVD) will be measured and paid for at the contract unit price each. The payment will be full compensation for the SFVD, mounting bracket and associated equipment, any necessary conduit between the SFVD and the equipment cabinet, testing, and for all materials, labor, equipment, tools, and incidentals necessary to complete the work.

**SPECIAL PROVISIONS**  
**SIGNAL EQUIPMENT TURN ON, PICK UP, REMOVAL**  
**AND MAINTENANCE**

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**CATEGORY 800**  
**TRAFFIC**

**SIGNAL EQUIPMENT TURN ON, PICK UP, REMOVAL AND MAINTENANCE**

**DESCRIPTION.** Pick up of Administration furnished materials, remove existing equipment, and maintain existing equipment as specified in the Contract Documents or as directed by the Engineer.

**MATERIALS.** Not applicable

**CONSTRUCTION.**

**Equipment Turn On.** Notify the Engineer and Traffic Operations Division representatives within 10 working days prior to completion of the project to allow the Administration to install any additional traffic control device.

Notify the Engineer and Traffic Operations Division representative five working days prior to the completion of the project to schedule a final inspection and turn-on.

Stakeout, with the Engineer present, the proposed construction as indicated on the plan.

**Pick-Up of Administration Furnished Materials.** Notify the appropriate OOTS warehouse a minimum of 72 hours in advance of the anticipated pick up or delivery of materials. The OOTS signal and sign warehouses are located at:

7491 Connelley Drive  
Hanover, Maryland 21076  
Signal Phone 410-787-7667  
Sign Phone 410-787-7670

The Contractor shall be responsible for the transportation, labor, equipment, tools and incidentals necessary to obtain and load any Administration furnished materials.

Materials not furnished by the Administration shall be furnished by the Contractor.

**Removal and Disposal of Existing Material and Equipment.** Remove concrete foundations specified in 207.03.01. All holes caused by this removal shall be backfilled, compacted and restored to surrounding conditions.

Remove all existing hard rubber detectors and handholes not shown on the Plans. The holes shall be backfilled, compacted and restored to surrounding conditions. The sidewalk where handholes are removed shall be reconstructed to the nearest tooled joint or expansion joint. The roadway where hard rubber detectors are removed shall be reconstructed in conformance with

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**SPECIAL PROVISIONS**  
SIGNAL EQUIPMENT TURN ON, PICK UP, REMOVAL  
AND MAINTENANCE

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Administration utility patch repair standards.

Disconnect existing inductive loop detectors and magnetic detectors not shown on the plans.

Dispose of all material not salvaged. Non-galvanized green painted structures may contain lead and the contractor will be responsible for proper disposal of such material.

**Storage of Materials.** Materials shall be bundled, stored, and protected in conformance with the manufacturers recommendations or as approved by the Engineer.

**Maintenance of Materials and Equipment.** The maintaining agency will continue maintenance of any existing signals until the Contractor places new equipment into operation.

When the work requires adjustments to the traffic control devices to maintain the minimum Administration standards, the adjustments to the traffic control devices shall be made within 4 hours of verbal notification by the Engineer. Failure to comply with this time period will result in the Administration performing adjustment and deducting the cost of the adjustment from the Contractor's payment.

Existing signals shall remain in their original condition until the new signals have been completed, satisfactorily tested and its operation accepted by the Engineer.

Maintain the continuous operation of all vehicular and pedestrian detectors. If any detector is damaged by the Contractor, it shall be repaired within 72 hours after notification by the Engineer.

All traffic signals and existing interconnect cable shall be operational and actuated as specified in the Contract Documents.

Plan the work to minimize interference with any existing traffic control device.

**MEASUREMENT AND PAYMENT.** The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work for one or more of the items specified in the Contract Documents.

**Equipment Turn On.** Equipment Turn On will not be measured but the cost will be incidental to other pertinent items specified in the Contract Documents.

**Pick-Up of Administration Furnished Materials.** Pick-up of Administration Furnished Materials will not be measured but the cost will be incidental to other pertinent items specified in the Contract Documents.

**Removal and Disposal of Existing Signal Material and Equipment.** Removal and Disposal of Existing Signal Material and Equipment will be measured and paid for at the Contract unit lump sum price.

**SPECIAL PROVISIONS**  
SIGNAL EQUIPMENT TURN ON, PICK UP, REMOVAL  
AND MAINTENANCE

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**Maintenance of Existing Signal Equipment.** Materials storage, cable sealing and handling, adjustments to maintain minimum Administration standards on existing signals made necessary by new signal or geometric modifications and Contractor repair of any damaged detector caused as a result of Contractors error will not be measured but the cost will be incidental to other pertinent items specified in the Contract Documents.

**CATEGORY 800**  
**TRAFFIC**

**SIGNAL HEAD BACKPLATES**

**DESCRIPTION.** Furnish and install signal head backplates, as specified in the Contract Documents or as directed by the Engineer.

**MATERIALS.** Signal Head backplates shall be vacuum formed with Acrylonitrile Butadiene Styrene (ABS) or High Density Polyethylene (HDPE). Provide U.V. stabilized backplates that are black in color, unless otherwise specified. The black color shall be consistent throughout the entire piece without varying shades and tones. Provide backplates that meet the applicable Underwriters Laboratory (UL) standards.

The backplates shall have a thickness of 0.125 in. with 3 in. corner radius and 5/8 in. flanges. It shall have a plastic sheet hair cell finish on the front side and a smooth finish on the backside. All hardware shall be stainless steel and shall include nuts, washers and screws, per manufacturer's recommendations. For installation on existing signal heads, provide split backplates.

For enhanced visibility, place an ASTM Type XI yellow retroreflective tape with a min. width of 1 in. and a max. width of 3 in. along the perimeter of the signal backplate.

**CONSTRUCTION.** Install signal head backplates as recommended by the manufacturer and as approved by the engineer. When installing signal head backplates, adjust the signal head mounting elevation as necessary to provide acceptable vertical clearance from the top of roadway to the bottom of the signal head backplate.

**MEASUREMENT AND PAYMENT.** Signal head backplates will be measured and paid for at the contract unit price each. The payment will be full compensation for furnishing, and installing the backplates, adjustments to signal head mounting heights, hardware, labor, equipment, tools, and incidentals necessary to complete this work.

**CATEGORY 800**  
**TRAFFIC**

**SIGN LIGHTING MAINTENANCE SYSTEM**

**DESCRIPTION.** Furnish and install sign lighting maintenance systems as specified in the Contract Documents, or as directed by the Engineer. Provide a system that eliminates or reduces the need for lane closures for sign lighting maintenance.

**MATERIALS.**

Metallic conduit and Fittings	921.07.01
Nonmetallic Conduit and Fittings	921.07.02
Flexible Conduit and Fittings	921.07.02
Electrical Cable and Wire	950.06
Cable and Wire Connectors	950.14

**CONSTRUCTION.** Sign lighting maintenance systems shall allow all luminaires, ballasts, power regulation systems, and electrical connections to be maintained from the shoulder, or right lane if no shoulder is present, without additional lane closures.

Provide a disconnect switch and electrical supply system for each sign lighting system. The electrical supply system shall provide electrical cable from the disconnect switch to each luminaire on the sign.

Arrange the electrical connections for the luminaires to allow each luminaire to be powered and tested while over the roadway shoulder. The electrical supply system shall use all circuits designated in the Contract Documents, and allow adjacent luminaires to operate on different circuits.

Sign lighting maintenance systems shall make use of the sign structures and luminaire supports as specified in the Contract Documents. Provide additional, or alternative structural supports as required to support the systems.

Sign lighting maintenance systems shall not obstruct the view of the sign faces, shall not require modification of the sign placement on the structure, and shall not require modification of the sign faces.

**MEASUREMENT AND PAYMENT.** Sign Lighting Maintenance Systems for sign structures will be measured and paid for at the contract unit price per each sign structure. The payment will be full compensation for the mounting hardware, supports, wiring, conduits, disconnect switch, cable supports, luminaires carriages, and all material, labor, equipment, tools, and incidentals necessary to complete the work.

**CATEGORY 800**  
**TRAFFIC**

**SIGN LUMINAIRES**

**DESCRIPTION.** Furnish and install LED sign luminaires as specified in the contract documents or as directed by the Engineer.

**MATERIALS.** Sign luminaire shall have a color temperature of 3900 degrees Kelvin or higher and a Color Rendering Index (CRI) value greater than 65. Each sign luminaire shall be designed for a useful life of at least 11 years with a minimum L70 value of 50,000 hours of operation based on a 12 hour on, 12 hour off duty cycle.

All components of the luminaire must be rated for the full service life without maintenance.

Sign luminaires shall use no more than 135 watts and be designed to operate at the voltage specified in the contract documents. For 480 volt operation, an integral transformer may be provided to reduce the voltage. The power factor of the sign luminaire must be 0.9 or higher.

All components of the sign luminaire shall be UL approved and the complete luminaire assembly shall be compliant to UL 1598 for wet locations.

The sign luminaire shall be designed to mount on a standard mounting plate as detailed in the book of standards and on the standard carriage of a sign lighting maintenance system.

The sign luminaire lens/refractor shall be sealed to prevent intrusion of moisture for the full service life. Luminaire housings that have the potential to retain water shall be equipped with factory installed drain holes to meet the requirements of UL 1598. The lens/refractor must be constructed of a material that will not show visible yellowing due to UV exposure, or exposure to hydrocarbon emission, for the full service life.

**CONSTRUCTION.** Photometric calculations shall be provided with the catalog cuts for the sign luminaire verifying the sign illumination for each individual sign including both existing and proposed signs based on actual sign size, support offset below and in front of sign. Calculations shall be provided for a grid with vertical and horizontal spacing of 1 ft. The bottom of the grid will be 0.5 foot above the bottom edge of the sign and left edge 0.5 ft from the left side. A light loss factor (LLF) value of 0.7 shall be used for the calculation.

To be acceptable, the average initial illumination shall be 20 foot candles or greater with a maximum to minimum uniformity ratio no greater than 6 to 1.

**MEASUREMENT AND PAYMENT.** Sign Luminaires shall be measured and paid for at the contract unit price each for Sign Luminaires. The payment will be full compensation for the sign



**SPECIAL PROVISIONS**  
SIGN LUMINAIRES

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luminaire and drivers, mounting hardware, wiring, step down transformer, photometric calculations, and all material, labor, equipment, tools, and incidentals necessary to complete the work.

**CATEGORY 800**  
**TRAFFIC**

**SQUARE PERFORATED TUBULAR STEEL POSTS**

**DESCRIPTION.** Furnish and install square perforated tubular steel posts and square perforated tubular steel anchor bases for mounting traffic signs as specified in the contract documents, or as directed by the Engineer.

**MATERIALS.**

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

Square tubular steel posts 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 1 in. centers along their entire length.

The tubular steel posts shall be 2 in. square tubes 12 ft long.

Square tubular steel anchor bases shall be comprised of two telescoping tubes. The first shall be 2 -1/4 in. square, three ft long, formed from 12 gauge steel and shall snugly fit over the sign post. The second section shall be a 2-1/2 in. square, 18 in. long, formed from 12 gauge steel, and shall snugly fit over the 2-1/4 in. section.

**CONSTRUCTION.** Construct the square tubular steel anchor base assembly 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. Drive the entire unit into the ground so that one or two rows of holes in the square perforated tubular steel base are exposed. Drive the base so that it remains plumb and provides the final sign assembly with the correct orientation.

Determine the finished length of the tubular steel posts by adding the total height of the signs to 8 ft, 2 in. Cut the sign post to the correct length, and apply cold spray galvanizing to the cut end. Bolt the signs to the top of the post, using tamper proof bolts or drive rivets. Lower the square tubular steel posts 8 in. into the base, and secure the post to the base using two corner bolts designed for this purpose.

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

**SPECIAL PROVISIONS**  
**SQUARE PERFORATED TUBULAR STEEL POSTS**

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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, and for all materials, labor, equipment, tools, and incidentals necessary to complete the work.

**CATEGORY 800**  
**TRAFFIC**

**SURGE SUPPRESSION**

**DESCRIPTION.** Furnish and install power and telecommunications line surge suppression and transient noise reduction equipment in pad-mounted and pole-mounted field equipment cabinets, as specified in the Contract Documents or as directed by the Engineer. This work shall include all necessary hardware and electrical connections.

**MATERIALS.** All component parts shall be designed, manufactured, tested, and installed in compliance with the latest versions of the following codes and standards:

National Electrical Manufacturers Association (NEMA LS-1, 1992)  
National Fire Protection Association (NFPA 20, 70, 75, & 780)  
Underwriters Laboratories (UL 1449, Rev. 2)  
International Standards Organization (ISO) - The manufacturer must be certified  
ISO 9001 for manufacturing design and service  
Institute of Electrical and Electronic Engineers (ANSI/IEEE C62.11, C62.41  
and C62.45)

**CONSTRUCTION.**

**Power Surge Suppressors.** Transient noise reduction and surge suppression filters shall be mounted as close to the load center as possible. The lead length between the unit and the load center connection point shall be 6 in.,  $\pm$  1 in.. The surge unit may be mounted against the load center at a right angle and the leads fed through a close nipple to minimize this lead length. If this lead length cannot be achieved, the Contractor shall notify the Engineer and await further instructions.

- (a) The surge protectors shall be parallel-wired in a split-phase configuration directly to the main bus terminals in the load center to protect all equipment inside the cabinet.
- (b) Surge protectors shall be contained within a single compact NEMA 4X/IP66 Rated enclosure, suitable for mounting inside or outside a cabinet.
- (c) Power surge units shall be equipped with red and green LED diagnostic indicators, and built-in audible alarm, as described below.
- (d) Leads shall be as short and direct as possible, with a minimum of bends. "Slack loops" will not be permitted.

**Locations.** Split-phase power surge suppressors shall be provided for the Type 332/334 load center, and the load center inside the walk-in DMS housing.

**Electrical.** All figures typical at 77 F (25 C) unless otherwise stated.

**(a) Split-Phase protection.** L-N, L-G, L-L, N-G.

**(b) Capacities.**

**(1)** Surge Capacity: 160 kA (8/20 $\mu$ s).

**(2)** Current: Suitable for use on a circuit capable of delivering not more than 200,000 rms symmetrical amperes, 480 V maximum.

**(3)** Voltage: 140 volts AC.

**(c) Standard Warranty.** The unit shall carry a 10 year standard warranty, providing for the unlimited replacement of damaged units.

**(d) EMI/RFI Attenuation.** -75 dB maximum, 100 kHz to 100 MHz.

**(e) Duty Cycle Performance (8/20 $\mu$ s).**

**(1)** Rated 1 impulse @ 10,000 A >6,500 Impulses.

**(2)** 100 A infinite.

**(3)** Long duration current pulse (10/1,000 $\mu$ s) capability 3,600 A (tested).

**(f) Unit Status Indicators.** Green and Red indicators shall indicate the operating status of each unit.

**(1)** Green LED on, Red LED off: Power and Ground present, full protection in all modes, and all phases.

**(3)** Green LED off, Red LED off: Loss of Power or loss of ground.

**(3)** Green LED off, Red LED on: Protection fault (remote indication alarm via contacts & audible alarm).

**(g) Audible Alarm.** 90 dB.

**(h) Ringwave.** @ 200 A, 50 V.

**(i) Remote Contacts.** Form C (NC, NO, C) 125Vac, 3A rated.

**SPECIAL PROVISIONS**  
**SURGE SUPPRESSION**

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(j) **Thermal Protection.** Thermal fusing shall be incorporated into each unit. Short circuit protection with 200kA AIC rating shall be included.

**Miscellaneous.**

(a) **Operating frequency range.** US standard power frequencies of 50 to 60 Hertz.

(b) **Ambient environmental limits.**

(1) **Temperature:** -40F to +185F – working.

(2) **Humidity:** 95% RH (non-condensing).

(c) **Dimensions.** The surge unit shall be housed in a compact NEMA 4x enclosure, with dimensions of 9.30 in. x 3.00 in. x 4.93 in. (236mm x 76mm x 125mm).

(d) **Supplied Leads.** #8 AWG for power, #22 for No/Nc contacts.

**Certification.** Catalog cuts submitted for power surge protectors shall certify that the devices are fully compliant with UL 1449, Rev. 2. The Engineer reviewing the catalog cuts will verify that the device is UL listed via the UL listing website.

**Telephone Line Protection.** One solid-state surge and transient noise suppressor shall be furnished and installed for each type of communications line (ISDN, T1, or DTMF) provided under this contract. The filter(s) shall utilize screw terminals for connecting the line to the suppressor. Units supplied shall meet all requirements of Article 800-32 of the NEC, and shall be UL 1283 listed.

**Electrical Characteristics.**

<b>APPLICATION</b>	<b>T1</b>	<b>ISDN</b>	<b>ADSL</b>
Nominal Line Voltage	6v	48v	150v
Maximum Line Volt.	8v	53v	170v
Min. Clamping Volt.	15v	60v	190v
Protection Level 8x20us impulse – 5kA	25v	70v	220v
Nominal Discharge Current 8x20us impulse – 10x	5kA	5kA	5kA
Max. Discharge Current 8x20us impulse – 1x	20kA	20kA	20kA
Lightning Current 10x350us – 2x	5kA	5kA	5kA
End of Life	Short Circuit	Short Circuit	Short Circuit

**SPECIAL PROVISIONS**  
**SURGE SUPPRESSION**

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**Standard Warranty.** Two years, from the date of manufacture.

**Documentation.** The following must accompany all surge suppressors supplied:

- (a) Instruction manuals.
- (b) Maintenance manuals.
- (c) Descriptive parts list with industry standard part numbers where applicable.

**MEASUREMENT AND PAYMENT.** Furnishing and installing surge suppressors will be not be measured but the cost will be incidental to the unit price for each pertinent contract item for field equipment cabinets or communications huts. The payment will be full compensation for the surge suppressor, interconnect cables, material, labor, and equipment, including all incidentals necessary to complete the work.

**CATEGORY 800**  
**TRAFFIC**

**TELECOMMUNICATIONS SERVICE PEDESTAL**

**DESCRIPTION.** Furnish and install tubular, 10 in. diameter, 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.

**MATERIALS.** Pedestals shall be constructed of green Polyvinyl Chloride (PVC).

All mounting hardware shall be aluminum or stainless steel  
Security Locking bolt shall be 216 tool steel

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

- (a) 360 degrees access to cables and apparatus.
- (b) 42 in. 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 in. conduits with elbows for communications wires.
- (f) All mounting hardware.
- (g) Shroud option included for conductor protection.
- (h) Service wire channel option included.

**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**

**THIRD PARTY CONCRETE TESTING**

**DESCRIPTION.** Procure a certified independent third party to perform concrete tests and break cylinders on projects using the parameters in section 902 of the Standard Specifications for Construction and Materials. Technicians performing quality assurance/quality control sampling and testing shall be qualified through the certification program provided by the Administration. Private laboratories performing testing shall be in the AASHTO Accreditation Program or approved by the Office of Material Technology. Submit a source of supply for the concrete testing facility. Contact Woody Hood, Division Chief, Materials Management Division to verify the testing facility is AMRL certified for concrete testing.

**Technician Certification.** All technicians performing concrete testing shall be certified through the Administrations Technician Certification Program. The technician shall provide a photocopy of their credentials to the Administrations inspector at the time of the test. Contact Woody Hood, Division Chief, Materials Management Division for information on the requirements for obtaining the Mid-Atlantic Region Technician Certification Card (MARTCP).

**MATERIALS.** Furnish and maintain sampling devices and testing equipment with all accessories that are required to sample and test concrete on the project. All sampling and testing equipment shall be approved by the Office of Traffic and Safety and/or the Office of Materials Technology. Furnish all applicable sampling devices and containers required by the Administration's Materials Manual, including all inserts, sample testing and frequency guide, and this specification. Record the test results on OMT form 85 in the presence of an Administrations inspector. Provide a copy of the concrete ticket to the Administrations inspector at the pour.

**Testing Equipment Requirements.** Maintain all equipment in good working condition and submit a written certification to the Administration stating when the equipment was last calibrated or inspected by an authorized Contractors Quality Control Technician. All equipment must be calibrated and/or inspected a minimum of once yearly or when repaired and/or replaced.

**Sampling Devices and Testing Equipment with Accessories.** The following is a general list of sampling devices and testing equipment to be furnished by the Contractor for the specified testing. Contact the Office of Materials Technology, Materials Management Division with any questions concerning the requirements for Sampling Devices, Testing Equipment, and Accessories. The devices, testing equipment, and accessories will be randomly inspected during Independent Assurance Audits.

**Concrete Tests.**

- (a) Temperature test.

**SPECIAL PROVISIONS**  
THIRD PARTY CONCRETE TESTING

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- (b) Slump Test per AASHTO T119.
- (c) Slump cone with rod.
- (d) Non absorbent 18 in. square flat plate for placing slump cone when running slump test.
- (e) Air Meter Pressure Type per AASHTO T152.
- (f) Air Meter calibration cone.
- (g) Air pump.
- (h) Large Scoop.
- (i) Rubber Mallet.
- (j) 6 x 12 cylinder molds per AASHTO T 309.
- (k) Markers to identify cylinders with pertinent information (cylinder numbers, contract number, date poured, signed by certified technician). The contractor will be responsible for the handling, curing, storage, and transportation of the cylinders.

**CONSTRUCTION.**

**Sampling Frequency.** A minimum of one test shall be performed on the first truck load of each working day at each work location and every 50 CY thereafter, or portion thereof, or as directed by the Engineer. Each test shall consist of a minimum of 6 cylinders.

**Test Results.** The test results shall be recorded on the OMT form 85. Ensure that the form 85 is filled out and returned to the Administration. The concrete must meet the specified compressive strength as outlined in section 902 before structures are set on it.

**MEASUREMENT AND PAYMENT.** Third Party Concrete Testing will not be measured, but the cost will be incidental to the pertinent bid items. Payment for the pertinent bid item will be withheld until the contractor provides the Administration with the completed OMT form 85. Price adjustments will be determined using the procedure outlined in section 902. The contractor shall supply the Administration with documentation showing the cubic yard price for the concrete tested. The adjustment will be deducted from the item requiring the concrete test.

**CATEGORY 800**  
**TRAFFIC**  
**TRAINING**

**DESCRIPTION.** Provide training to Administration appointed personnel to ensure the systems specified in the Contract Documents are properly maintained.

**MATERIALS.** Not Applicable.

**CONSTRUCTION.** Operational and Maintenance training for the entire system shall be provided by a manufacturer authorized representative to designated Administration's Communications Division personnel through the means of practical demonstrations, seminars, and other related technical teaching procedures. Up to 24 hours of instruction shall be provided if requested by the Communications Division.

The training shall include the following.

- (a) "Hands on" operation of all system hardware.
- (b) Explanation of the complete repertoire of system commands.
- (c) Instruction on the insertion or manipulation of data.
- (d) Instruction on required preventative maintenance procedures, and minor service procedures.

Contact the Administration's Communications Division at (410) 747-8590 to establish a training schedule.

**MEASUREMENT AND PAYMENT.** Training will be not be measured and paid for separately, but the cost shall be incidental to the pertinent Contract unit price.

**CATEGORY 800**  
**TRAFFIC**

**BACKUP UPS SYSTEM FOR TRAFFIC SIGNALS**

**DESCRIPTION.** Furnish and install a dual conversion, rack-mounted, microprocessor-controlled battery-backup uninterruptible power supply (UPS) system, complete with cabinet and batteries, for traffic signals as shown in the Contract Documents or as directed by the Engineer.

**MATERIALS.** Provide backup UPS system for traffic signals which meets the following requirements.

- (a) UL 1778, CUL Pending.
- (b) FCC Class A.
- (c) IEEE 587/ANSI C62.41.
- (d) IEC 555 @ 120 VAC.

**CONSTRUCTION.**

**UPS System.** Provide UPS system that is 100% Digital, true sine wave, on-line, solid state, microprocessor controlled power conditioner and controlled high-frequency inverter and Battery Backup System (BBS), utilizing insulated-gate bipolar transistor (IGBT) technology. The system shall continuously regenerate and condition the AC output sine wave to insure that 100 percent of the power supplies all connected loads, whether the system is operating on the public utility or on batteries. The on-board inverter shall digitally generate all power.

- (a) The UPS system shall be capable of operating at its rated power level with all existing equipment on the system, regardless of the composition of the load (incandescent and/or LED signal heads, signal controllers, load switches, and conflict monitors).
- (b) The UPS shall be capable of producing, simultaneously, all digital fully regenerated, conditioned and true sine wave, and continuous AC outputs. The UPS system shall be fully compatible with all traffic signal control equipment, including:
  - (1) Conflict Monitors and Load Switches.
  - (2) LED Signals, including Countdown and Audible Pedestrian Signals.
  - (3) Incandescent Signals.
- (c) The normal operating mode for all signal elements shall be continuous regenerated power. Continuous output shall be provided for all controllers and all other cabinet equipment including modems, conflict monitors, communications, and monitoring equipment, in addition to all signal system elements.

- (d) The UPS system shall be capable of running any combination of signal heads, up to its maximum rating, whether Incandescent, LED or Neon, by any manufacturer, regardless of power factor, without overdriving the lowest power factor LED heads (which may cause early degradation, low luminosity, or early signal failure).
- (e) The UPS system shall utilize the existing Flasher Modules and Flash Transfer relays.
- (f) The UPS system shall be compatible with police panel functions (i.e. "Signals Off" switch must kill power to the field wiring even when on UPS/Battery Power).
- (g) The UPS system shall not duplicate or take over flash operation or flash transfer relay functions.
- (h) The UPS system shall be capable of providing continuous, fully 100 percent real-time, fully conditioned, regulated, sinusoidal (AC) power to selected devices such as signal controllers, modems, communication hubs, NTCIP adapters and video equipment.
- (i) The UPS system shall support load increases to 1,400 watts for ten seconds through the full NEMA temperature range of -40 degrees C to +74 degrees C on continuous battery operation.

**Power Module.** Upon loss of power from the public utility, the UPS system shall utilize its battery power through the Power Interface Module (PIM).

- (a) In the event the UPS system fails or the battery becomes depleted, the PIM shall disconnect the UPS system and, upon return of utility power, the traffic control system shall default to normal operating mode.
- (b) The Power Interface Module shall enable the removal and replacement of the UPS system without shutting down the traffic control system (i.e. "hot swap" capability). The connectors shall be equipped with a "safety interlock" feature.

**Battery System.**

- (a) The battery charging system shall be a 3-stage system designed for extended life of the battery system by temperature compensated as well pulse charging in addition to automatically regulated current levels.
- (b) Battery charging shall be as required regardless whether the UPS is running on utility power or an auxiliary power source.
  - (1) The UPS shall continue to supply clean regulated power even if the batteries are depleted and the system is on utility or auxiliary power.
  - (2) The UPS shall not go to bypass during its charging cycles.

- (c) The battery system shall be certified and field proven to meet or exceed NEMA temperature standards from -40 degrees C to +74 degrees C.
- (d) The battery system shall have a 51 Ampere-Hour rating.
- (e) Hydrogen gas emissions shall meet Mil-Spec #MIL-B-8565J.

**Cabling/Expansion.**

- (a) The UPS System shall utilize dedicated harnesses to connect the Electronics Module to the Power Interface Module and the Battery System. The harnesses shall use keyed, locking quick release connectors, and braided nylon jacketing over all conductors.
- (b) The UPS System shall have the capability of:
  - (1) Accepting an NTCIP-ready adapter, or
  - (2) Accepting a Spread-Spectrum Radio modem.
  - (3) Local and remote communications capabilities.
  - (4) Local or remote UPS control.

**Electrical.**

(a) Input Specifications:

- (1) Nominal Input Voltage: 120 VAC, Single Phase
- (2) Input Voltage Range: 85 VAC to 135 VAC (without drawing energy from batteries)
- (3) Input Frequency: 50 or 60 Hz (+/- 5 percent)
- (4) Input Configuration: Three (3) Wire (Phase, Neutral and Ground)
- (5) Input Current (Max. draw): 16.5 amps, Power factor corrected
- (6) Input Protection: Input Fuse (20 amps)

(b) Output Specifications:

- (1) Nominal Output Voltage: 120 VAC, Single Phase

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**BACKUP UPS SYSTEM FOR TRAFFIC SIGNALS**

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- (2) Power Rating: 2.0KVA/1400W
- (3) Output Voltage Regulation: +/- two (2) percent for 100 percent step load change and from High battery to Low battery condition
- (4) Output Frequency: 50 or 60 Hz (+/- 5 percent)
- (5) Output Configuration: Keyed, locking connectors
- (6) Output Wave Form: True Sine wave
- (7) Overload capability:
  - 110 percent for 10 minutes
  - 150 percent for 10 sec. per 45 sec. interval,
  - 200 percent for .05 second
- (8) Fault clearing: Current limit and automatic shutdown
- (9) Short circuit protection: Current limit and automatic shutdown
- (10) Efficiency: 85 percent at full load
- (11) Load Power Factor: .7 lagging through unity to .7 leading

**Mechanical Rack Mount UPS Electronics Module.**

- (a) Dimensions: Width = 19" rack mount, Height = three (3) rack units
- (b) Weight: UPS: Less than 30 pounds.

**Environmental.**

- (a) The UPS system shall meet or exceed NEMA temperature standards from -40 degrees C to +74 degrees C.
- (b) The UPS shall be certified and field proven to meet or exceed NEMA temperature standards. A certificate of compliance shall be made available upon request.

**Communications, Controls and Diagnostics.**

- (a) Alarm Monitoring: The UPS system shall come standard with alarm monitoring, indicating:

- (1) Loss of Utility Power,
  - (2) Inverter Failure, and
  - (3) Low Battery.
- (b) An RS232 Interface shall be provided via screw terminals or a DB-9F connector allowing full, interactive, remote computer monitoring and control of the UPS functions.
- (c) Front Panel controls: Power ON, Cold (DC) Start, Alarm Silence, Battery Test, Bypass Breaker, and DC/Battery Breaker.

**Reliability.**

- (a) Calculated MTBF is 100,000 hours based on component ratings.
- (b) 150 000 hours, when the Bypass and Power Interface Module are included.

**Options.**

- (a) Service pedestal-mounting option.
- (b) External dial-out modem for wireless or landline communication.
- (c) Enhanced battery charger provides accelerated charging capacity.

**Serviceability and Maintainability.**

- (a) MTTR (Mean-Time-To-Replace or Repair): 15 minutes or less for all system components.

**Warranty.** The UPS system shall carry a one-year guarantee from the date of delivery against any imperfections in workmanship and material.

**Training.** Provide operational and maintenance training for the entire system to designated Administration personnel through the means of practical demonstrations, seminars, and other related technical teaching procedures. Provide a minimum of 8 hours of instruction. Include the following in the training:

- (a) "Hands on" operation of all UPS system hardware.
- (b) Explanation of the complete repertoire of system functions.
- (c) Instruction on required preventative maintenance procedures, and servicing procedures.



**Electrical Design.**

**Software.**

- (a) The State of Maryland shall be given the right and shall have the authority through a non-disclosure agreement, to reproduce any furnished local controller unit, master controller unit, isolated traffic signal surveillance unit and remote reporting device proprietary software without payment of royalties.
- (b) The State of Maryland shall be given the all software revisions for furnished local controller units, master controllers and isolated traffic signal surveillance units throughout the life of the contract.
- (c) No payment from the State of Maryland shall be made for such software added features, enhancements, options, revisions or removal of errors or associated labor.
- (d) The State of Maryland will make payment for any hardware related modifications or changes due to software added features, enhancements, options, revisions or removal of errors.

**Components.**

- (a) All input/output pin connectors shall be fully wired and fabricated from metal. Plastic pin connectors are not acceptable.
- (b) All circuitry and components located on all printed circuit boards shall be intrinsically mildew and fungus growth resistant or be treated with a moisture resistant material to prevent damage from mildew and fungus growth.
- (c) All keypads, indicator lights, displays, input-output connectors, fuse holders, and other components that are pertinent to the operation, adjustment, and maintenance shall be located on the front panel.
  - (1) All of the above shall be labeled in such a manner as to provide easy identification of their appropriate function.
  - (2) All indicators and displays shall have a minimum  $\pm 45$  degree cone of visibility with the axis perpendicular to the front panel.
  - (3) All indicators and displays shall sufficient intensity to be readable up to 4 feet within the cone of visibility in all lighting conditions without the use of additional shading.
- (d) Keypads shall have tactile and audible feedback to indicate that a key press has been registered. Membrane-type keyboards are not acceptable.

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- (e) A listing of all parts used in furnished equipment, containing the following information, shall be supplied upon Notice to Proceed.
  - (1) Commercially Available Part Number.
  - (2) Manufacturer's Part Number.
  - (3) The manufacturer's part number, indicated on the wiring diagrams and schematics.
- (f) The following fasteners SHALL NOT be used in any assembly unless specifically allowed by the specification.
  - (1) Expanding Bushing.
  - (2) Internal Self-Expanding.
  - (3) Plastic Material.
  - (4) Pop Rivets.
  - (5) Self-Tapping Screws.
  - (6) Split Shafts.
- (g) To the highest practical degree, all equipment furnished shall be engineered for simplicity, ease of operation and maintenance.
  - (1) No controls or switches shall be mounted concentrically.
  - (2) Controls or switches shall be separated by 0.5 in. minimum.
  - (3) Knobs shall be 0.5 in. minimum diameter.
  - (4) All fuses shall be enclosed and easily accessible for replacement without the use of tools.
  - (5) Printed circuit boards shall slide smoothly into their guides during installation or removal. Printed circuit boards shall require a force no less than 5 pounds or greater than 50 pounds for installation or removal. Printed circuit boards shall fit snugly into the printed circuit board connectors.
- (h) The following practices shall be incorporated into the design of solid state equipment circuitry.

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- (1) The design shall be inherently temperature compensated to prevent abnormal operation.
- (2) The circuit design shall include compensation necessary to overcome adverse temperature effects in the NEMA TS 2-1992 specified environmental range.
- (3) All equipment with electrical potential greater than 25 volts to ground shall be protected from human contact.
- (4) All equipment shall be designed to prevent reversed assembly or installation of connectors and assemblies where a possible malfunction could create a shock hazard to service personnel.
- (5) Any equipment furnished which has special or unique characteristics (except temperature variation of value) that would limit the supply of such equipment to a single manufacturer or supply source shall be stocked by the successful bidder in sufficient quantities for the maintenance of all equipment furnished under this contract.
- (6) No furnished equipment shall emit an audible noise greater than 55 db (A).
- (7) Capacitors shall be insulated and marked with their capacitance value and working voltage.
- (8) Capacitor encasements shall be resistant to cracking, peeling and discoloration.
- (9) Capacitors shall be of the best commercial grade with high stability, low dissipation and linear temperature coefficients.
- (10) The alternating current ratings, direct current ratings and dissipation factor shall exceed the worst case design of the circuitry by 150 percent.
- (11) Electrolytic capacitors may be used for  $\geq 1.0$  microfarad capacitance values and shall have the polarity indicated.
- (12) Capacitors less than 1/10 ounce weight may be secured by their leads if the total lead length in 2 in. maximum.
- (13) Resistors shall be insulated and marked with their resistance value as specified by EIA color codes.

Resistors shall have a tolerance value of 10 percent maximum.

Completed resistor installations shall be rated and placed to not exceed the maximum service condition under the highest altitude for the State of Maryland at any point on the resistor.

Resistor rated wattage shall be 5 watts maximum.

Resistors rated greater than 2 watts shall only be used with special ventilation or heat sinking.

Resistors rated greater than 2 watts shall be insulated from printed circuit boards. Resistors less than 1/2 ounce weight may be secured by their leads if the total lead length in 2 in. maximum.

**(14)** Two or more discrete components shall be individually replaceable, easily accessible for testing and maintenance and shall not be encapsulated except for the following.

**(a)** Diode Arrays.

**(b)** Optical Isolators.

**(1)** Resistor Networks.

**(c)** Solid State Switches.

**(d)** Transient Suppression Circuits.

**(e)** Transistor Arrays.

**(15)** Germanium diodes will be permitted only when a low forward voltage drop is required in logic circuits.

**(16)** All transistors, integrated circuits and diodes shall be listed EIA standard type.

**(17)** All LSI device pin "1" locations shall be marked on both printed circuit board sides adjacent to the each pin.

**(18)** All solid state devices shall be of silicon type.

**(19)** All power as well as forward and reverse current and voltage ratings of semiconductor devices shall be  $\geq 20$  percent greater than the maximum design requirements of the circuit.

**(20)** Jumper wires shall not be routinely used.

Jumper wires shall be no longer than one (1) in. in length.

Jumper wires shall not cross a bare conductor.

Jumper wires shall be insulated if longer than 1/2 in.

Jumper wires shall be on the component side only.

Sleeves shall not be used as insulation on jumper wires.

**(21)** The following defects shall be cause for rejection of a printed circuit board:

Abraded, Scratched or Scraped Finish effecting the Electrical Resistance

Base Material Delaminating.

Conductor Pattern Blisters.

Conductor Pattern Separation from the Base Material.

Conductor Pattern Wrinkles.

Dirt or Foreign Matter on the Printed Circuit Board.

Flow Soldering more than two times.

Pinholes, Pits, Scratches or Undercutting that will reduce Conductor Cross Sectional Area by More than 25 percent.

**(22)** The following defects shall be cause for rejection of a printed circuit board solder connection:

Burning, Charing, Wicking or Other Insulation Damage.

Cold Solder Connection.

Cut, Nicked, Scraped or Scratched Leads or Wires.

Disturbed Solder Connection.

Dewetted Transmission.

Excessive Solder Obscuring the Connection.

Excessive Wicking.

Holes, Pits or Scars.

Insufficient Solder.

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Leads Cinched Together.

Loose Leads or Wires.

Rosin Solder Connection.

Solder or Flux Spatter on Adjacent Components or Connections.

Solder Peaks.

Unclean Solder Connection (Dirt, Grease, Residue or Solder Splash).

Visible Bare Copper.

Soldered joints shall not be subjected to mechanical loads.

**UPS Field Equipment Cabinet.** Furnish and install a NEMA Size five field equipment cabinet with each UPS system. The Contractor may provide the cabinet, or it may be supplied by the UPS manufacturer with or without the equipment pre-installed in it.

**MATERIALS.** Provide electrical/electronic equipment, cabinets, and all component parts that meet the requirements as specified in Section 820.02 and the standards as set forth in these special provisions:

- (a) Anchor bolts/Bolts/Nuts/Washers.
- (b) Cabinets and doors.
- (c) Mounting hardware.
- (d) Electrical wires, harnesses and connectors.

**CONSTRUCTION.**

**Cabinets.**

**General.**

- (a) Serial numbers, model numbers, the manufacturer's name and production date shall be clearly legible and permanently placed on all cabinets, battery back-up device mainframes and all removable printed circuit boards from the aforementioned equipment.
  - (1) The use of adhesive backed labels is not acceptable.

- (2) The serial number and model number shall be etched, stamped, or molded on all printed circuit boards.
  - (3) Printed circuit board serial numbers, model numbers, the manufacturer's name and production date shall be marked by the same process used in making the conductor pattern.
  - (4) Printed circuit marking shall not be affected by any soldering or cleaning process solvents.
- (b) Cabinet and mainframe labels shall be 0.008 in. anodized aluminum and riveted by 0.125 in. stainless steel rivets onto the cabinet or mainframe.
- (c) Cabinet and mainframe labels shall be a minimum of two and one half in. width and 0.75 in. height.
- (d) The label shall incorporate a bar code with a State of Maryland defined code number.
- (1) This bar code number may be different for each device furnished.
  - (2) 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) Cabinet serial numbers, model numbers, the manufacturer's name and production date shall be readable without disassembly or removal of any part of the cabinet or components and shall be located on the right upper cabinet interior side.
- (e) All cabinets shall be provided with a vinyl print holder or approved equivalent, mounted on the inside of the cabinet door, suitable for holding a copy of the complete cabinet wiring diagram and other circuit diagrams that might be necessary to troubleshoot the entire cabinet assembly.

**Cabinets.**

**Mechanical.** Cabinets shall be NEMA Size five (5) with dimension of thirty inches in width by fifty inches in height by eighteen inches in depth (30" W x 50" H x 18" D). The top of the cabinet shall have a depth of twenty (20) in. to provide the necessary ventilation opening) and have a anchor bolt pattern of twenty-five and three quarters inches in width by twelve and three eights inches in depth (25-3/4" W x 12-3/8" D).

- (a) All cabinets shall meet or exceed the requirements of a NEMA 3R rating and shall be UL listed as a unit.

- (b) All cabinets and doors shall be fabricated from 5052-H32 sheet aluminum alloy with a minimum 1/8 in. thickness.
- (c) All mounting hardware and cabinet bracing shall also be made from aluminum.
- (d) All external welds shall be made using the Tungsten Inert Gas (TIG) welding method.
- (e) All main cabinet doors shall be provided with a dust tight gasket. The gasket shall be 0.25 in. minimum thickness closed cell neoprene or silicone and shall be permanently bonded to the metal.
- (f) If neoprene is used the mating surface of the gasket shall be coated with a silicone lubricant to prevent sticking to the metal mating surface.
- (g) A gasket top channel shall be provided to support the top gasket on the main door.
- (h) All cabinet doors shall be hinged on the right side as viewed facing the cabinet.
- (i) Batteries shall be installed on shelves, at least 6 in. above the cabinet foundation. Batteries shall not be installed directly on concrete foundations.
  - (1) Each battery shelf shall be capable of withstanding the aggregate weight of the batteries on that shelf with a Factor of Safety of 2.00, minimum.
  - (2) If the standard cabinet shelves cannot provide this capability, additional bracing or reinforcement shall be provided to bring them into compliance with this specification at no extra cost to the Administration.
  - (3) Shop drawings and calculations for any required shelf reinforcement shall be reviewed and approved by the Office of Traffic & Safety's structural engineering department prior to fabricating the cabinets.

**Cabinets.**

**Electrical.**

- (a) All conductor wire runs shall be continuous with no splices.
- (b) 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.
- (c) All cabinet back and panel harness wiring shall be soldered at its destination point as specified.



- (d) 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.
- (e) All conductors used in the controller cabinet wiring shall conform to the following color code requirements.
  - (1) AC Neutral conductors shall be identified by a continuous white color.
  - (2) AC Ground conductors shall be identified by a continuous green color.
  - (3) AC Positive conductors shall be identified by a continuous black color.
  - (4) All other conductors shall be identified by any color not previously specified.
- (f) All bolts used for electrical connections shall be fabricated from stainless steel.
- (g) All hardware used for electrical connections and terminal facilities shall be fabricated using cadmium plated brass.
- (h) All fuse holders shall be of the encased type.
- (i) 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
- (j) All welds shall be neatly formed and free of cracks, blow holes and other irregularities.
- (k) All inside and outside edges of the cabinet shall be free of burrs.
- (l) All access door openings shall have a double flange on all four sides.
- (m) All cabinet door hinging shall be of a single, continuous design utilizing a fixed hinge pin.
- (n) All cabinet door hinge pins shall be capped at the top and bottom by weld to render the pin tamper proof.
- (o) All cabinets shall have a rear sloped top surface to prevent the accumulation of water on the top surface of the cabinet.
- (p) Cabinets shall have a three (3) inches width flange inside the cabinet for anchor bolt and/or bottom plate mounting.

- (q) Cabinets shall have four (4) open end slotted anchor bolt openings one (1) in. diameter into the cabinet conduit entrance area in lieu of NEMA TS 2-1992 figure 7.7.3-1.
- (r) Cabinets shall be furnished with four (4) anchor bolts sized as per NEMA TS 2-1992 Section 7.8.4.
- (s) Cabinets shall be furnished with a one (1) inch thickness neoprene gasket so that the gasket forms a weather tight seal between the cabinet base mounting and in-field concrete base.
- (t) Cabinets shall have a three point latching mechanism of the draw roller type.
  - (1) The pushrods shall be turned edgewise at the outward supports.
  - (2) The pushrods shall have a cross section of 0.25 in. by 0.75 in.
  - (3) The locks and handles shall be on the left of the main cabinet door.
  - (4) The center latch cam shall be designed to allow only the door to open when the handle is moved towards the center of the door.
  - (5) The pushrod end rollers shall have a 0.875 in. minimum diameter.
- (u) All cabinets shall include a door restraint to restrict the door to a maximum one hundred and thirty-five degrees (135°) of swing in addition to stop positions specified in NEMA TS 2-1992 section 7.5.3.
- (v) Cabinets shall be furnished with a dead bolt type version of the lock specified in NEMA TS 2-1992 section 7.5.4.3 and a key hole cover. The dead bolt lock shall be keyed for a "Number 2" key.
- (w) Cabinets shall be provided with louvered vents in the front door with a removable air filter.
  - (1) Louvers shall satisfy the NEMA Rod Entry Test for a 3R rated ventilated enclosure.
  - (2) Cabinets shall have a filter sized sixteen inches in width by twelve inches in height by one inch in thickness (16" W x 12" H x 1" T).
  - (3) The filter shall cover the vents and be held firmly in place with top and bottom brackets and a spring loaded upper clamp.
- (x) Exhaust air will be vented out of the cabinet between the top of cabinet and the main access door via an exhaust plenum.

- (1) The exhaust area shall be screened with a material having a 0.125 in. maximum whole diameter.
- (2) Dual fans shall be mounted at the top of the cabinet onto an exhaust plenum in lieu of NEMA TS 2-1992 Section 7.9.2.2 location requirements.
- (3) The fans and thermostat shall be rated for 125 percent of capacity.

The fan bearing mechanism shall be of ball bearing design.

The fan shall have a minimum rated design life of 100 000 hours).

**Documentation.** The UPS system supplier shall provide three sets of operating manuals, service manuals, wiring diagrams, schematics, and maintenance instructions for all components of the UPS system, including the cabinet. In addition, the UPS System supplier shall provide a fourth set of schematics and wiring diagrams which shall be furnished in the wiring diagram holder in the controller cabinet. This documentation shall include:

- (a) General Characteristics and Description.
- (b) Assembly and Installation.
- (c) Logic and Schematic Diagrams including Integrated Circuits. Schematics shall include a list of tests points with the following information provided for each point:
  - (1) Nominal operating voltage.
  - (2) Wave form and all pertinent information regarding the waveform at each test point.
  - (3) Theory of Operation.
  - (4) Detailed Circuit Operation Description.
  - (5) Systems Operation with Block Diagram.
  - (6) Connection and I/O diagrams.
- (d) Illustrated parts list with industry standard part numbers where applicable.
- (e) Maintenance Operations.
  - (1) Alignment Procedures.
  - (2) Preventive Maintenance.

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- (3) Trouble Analysis
- (4) Trouble Shooting Sequence Chart
- (5) Voltage Measurements
- (6) Wave Forms

**Experience.** The manufacturer shall provide the names, addresses, and telephone numbers of at least three transportation agencies in the U.S. currently using the manufacturer's UPS System. The agencies so named shall confirm that the manufacturer's systems have operated as specified in their contract documents and any applicable revisions for a period of at least one year, and that all maintenance agreements and/or warranties have been honored.

**MEASUREMENT AND PAYMENT.** Backup UPS System for Traffic Signals shall be measured and paid for at the contract unit price each, which shall include the complete UPS system, NEMA Size five (5) cabinet, all batteries and harnesses, installation, electrical work, grounding, and all other incidentals. The payment shall be full compensation for all materials, labor, equipment and all other incidentals necessary to complete this work.

**CATEGORY 800**  
**TRAFFIC**

**UTILITY CONNECTIONS AND UTILITY STAKEOUT**

**DESCRIPTION.** Provide utility connections, and utility stakeout, as specified in the Contract Documents or as directed by the Engineer.

**MATERIALS.**

Disconnect Switches and Utility Connections                      950.13.10

**CONSTRUCTION.** Arrange a meeting with the utility company representatives, Traffic Operations Division 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.

Do 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.

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. Report difficulties in securing utility company services to the Engineer, at the earliest possible time.

**Utility Stakeout.** 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 Contractors anticipated beginning of any underground work.

- (a) In Montgomery County, request Montgomery County (240-777-2100) to stakeout their ITS and signal facilities.
- (b) Request the Statewide Operations Center (800-543-2515) to stake out SHA fibreoptic and communication cables.
- (c) Request the Communications Division (410-747-8590) to stake out ITS devices.
- (d) Request appropriate RME to stake out lighting.
- (e) Notify the Hanover Complex Signal Shop (410-787-7652) of all requests for signal and ITS stakeouts.

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Plan the work to minimize interference with any existing traffic control devices.

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

**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**

**WARRANTIES**

**DESCRIPTION.** Provide equipment and system warranties on a per work assignment basis as specified in the Contract Documents. The Administration reserves the right to accept for maintenance self-standing subsystems in advance of a total systems-wide acceptance.

**MATERIALS.** Not Applicable.

**CONSTRUCTION.**

**Contractor's Warranty.** The Contractor shall provide a system performance assurance warranty program for all equipment furnished for a period of one year from the end of the system startup period.

Acceptance for maintenance will be predicated upon the completion of the Contractor's Warranty period.

This warranty shall apply to the entire system, and shall include the following.

- (a) Two scheduled preventative maintenance checkups (at 6 months and the end of the warranty period).
- (b) Emergency on-site maintenance or repair, completed within 24 hours of notification by Administration personnel.
- (c) In the event the defective equipment cannot be repaired within 24 hours, the Contractor shall install "loaner" equipment to restore system operation until repairs are complete to the defective equipment.
- (d) Any defective parts identified during the performance assurance warranty program shall be replaced at no cost to the Administration.

**Manufacturers' Warranties.** Manufacturers' standard warranties that extend beyond the Contractor's Warranty period shall automatically transfer to the Administration.

The Contractor shall inform the manufacturer of this requirement prior to purchase of the equipment, and provide a written agreement of compliance from the manufacturer to the Engineer.

**MEASUREMENT AND PAYMENT.** Warranties will not be measured, but the cost will be incidental to the contract unit price for the components of each pertinent system furnished and installed. The payment shall be full compensation for all testing, labor, tools, materials, and incidentals necessary to complete this work.

**CATEGORY 800**  
**TRAFFIC**

**WOOD POLES - CLASS II**

**DESCRIPTION.** Furnish and install Class II wood poles as specified in the contract documents or as directed by the Engineer.

**MATERIALS.**

**General.**

Wood Poles	ANSI 05.1 Latest Revisions
Poles Conditioning	AWPA (American Wood-Preservers Association) C1-79, latest Revision
Pole Preservatives	AWPA P8 or AWPA P9. Latest Revisions
Pole Branding	AWPA M6, latest revision
Steel Span Wire	950.09
Steel Guy Rod (Single Thimble Eye)	Diameter min. 1/2 in. - 5/8 in. 3 Bolt Clamp

Provide wood poles that are Southern Pine, Treatment Group C (steam conditioned) or treatment Group D (kiln-drying).

Provide flat roofed poles.

Perform surfacing and trimming prior to treatment.

Season the poles by air-seasoning, kiln-drying, steaming, heating in the preservative, or a combination of methods. Boulton drying is not permitted.

Shaving of all poles shall be full-length machine-shaved. The depth of cut shall not be more than necessary to remove inner bark.

There shall be no abrupt changes in the contour of the pole surface between the groundline and above the ground sections.

The lower 2 ft of poles may be trimmed to remove wood fibers causing butt flare, provided sufficient sapwood remains to obtain the minimum penetration requirements.

The following defects are prohibited:

- (a) Cross Breaks (cracks).
- (b) Decay, except as permitted under "decayed knots".



- (c) Dead streaks.
- (d) Holes, open or plugged, except holes for test purposes, which shall be plugged.
- (e) Hollow butts or tops, except as permitted under hollow pith centers and defective butts.
- (f) Marine borer damage
- (g) Nails, spikes, and other metal not specifically authorized by this specification. All other foreign material is prohibited.
- (h) Ring knots, a ring of knots consisting of four or more knots in a 3 in. section of the pole
- (i) Bark knots, a knot that is undergrown and partially encased with outer bark, in excess of 3 in. diameter.
- (j) Knot cluster, two or more knots grouped together as a unit with the fibers of the wood deflected around the entire unit
- (k) Decayed Knots -Type II "decayed Knots" where depth of decay exceeds 1/2 in.
- (l) Short Crook - A localized deviation from straightness which, within any section 5 ft or less in length, is more than 1/4 the mean diameter of the crooked section.
- (m) Pole Sweep. A straight line joining the surface of the pole at the top and ground line, shall not be separated from the surface of the pole by more than 1 in. for each ten ft of pole length.
- (n) Indentations, attributed to loading or handling slings, that are 1/4 in. or more deep over 20 percent or more of the pole circumference, or indentations which result from careless handling more than 1/2 in. deep at any point.
- (o) Spiral grain (twist grain) exceeds one complete twist in any 20 ft.

**Pole Preservative Treatment.** Poles may be heated in oil-type preservatives at atmospheric pressure to facilitate penetration of preservative.

Poles to be impregnated with the preservative by application of the standard empty cell (Rueping) process shall be performed in accordance with the standard "Poles - Preservative Treatment by Pressure Processes" (AWPA C4, latest revision).

No material other than poles shall be treated with poles.

**SPECIAL PROVISIONS**  
**WOOD POLES – CLASS II**

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The minimum net retention of Pentachlorophenol, as determined from 20 boring samples taken from any charge, shall not be less than the following.

Minimum Retention: (lbs. Penta/cu. ft.)	
Zone Assayed	0.5 - 2.0 in.
Retention	0.45

Retention of Pentachlorophenol shall be determined by AWWA A5, latest revision.

**CONSTRUCTION.** The following marking and code letter information shall be legibly and permanently burn branded with characters not less than 5/8 in. high. The markings shall be placed squarely on the face of the pole at 10 ft above the pole butt end and in the butt end of each pole in the following order:

- (1) Suppliers Brand.
- (2) Plant Designation.
- (3) Month and Year of Treatment.
- (4) Code Letters; "SP" denoting Southern Pine and the preservative code, such as "P" for Pentachlorophenol in Petroleum (AWPA M-6).
- (5) Retention and Assay, such as "45-A".
- (6) Class and Length.

**MEASUREMENT AND PAYMENT.** Class II Wood Poles shall be measured and paid for at the contract unit price per each. The payment will be full compensation for the poles, anchors and guy rods all guy cables and connectors, labor, tools, materials, and incidentals necessary to complete this work.

**SPECIAL PROVISIONS**  
**CAMERA LOWERING SYSTEMS**

**CONTRACT NO. BA0065172**  
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**CATEGORY 800**  
**TRAFFIC**

**CAMERA LOWERING SYSTEM**

**DESCRIPTION.** Furnish, fabricate, transport, and install camera lowering systems for CCTV camera poles in accordance with the details shown in the contract documents. They shall be as manufactured by one of the following manufacturers or approved equivalent. The system should be capable for mounting both dome type cameras as well as telescoping type cameras:

- MG Squared, Inc.  
3301 Oak Hill Drive  
Birmingham, AL 35216  
205-823-6688
- Camera Lowering Systems  
Product Lines of  
North Star Lighting, LLC  
835N. Industrial Drive, Elmhurst, IL 60126  
708-681-4330

**MATERIALS.**

Shall be as per the lowering system manufacturer, unless specified otherwise in the contract documents. The Engineer reserves the right to reject the system if the materials submitted for approval does not meet the industry and or MDOT requirements for the purpose intended.

**FABRICATION.**

It will be the lowering system manufacturer's responsibility to design and furnish at his own cost any special or custom attachments to mount the cameras specified for the contract.

Permanently mark the lowering system with manufacturer name or trademark, model or part number, date of manufacture, and serial number. The lowering system must provide the electrical connection between the control cabinet and the equipment installed on the lowering system without reducing the function or effectiveness of the equipment. The lowering system support arm must be capable of withstanding service tension and shear up to 1 kip minimum.

The lowering system must include a disconnect unit and power, data, and video cables (as applicable) for connecting equipment, a divided support arm, pole attachment provisions, a rotatable pole-top tenon, and a pole-top junction box, unless otherwise shown in the Plans.

All external components are to be made of corrosion-resistant materials that are powder-coated, galvanized, or otherwise protected from the environment. All finished castings must have a smooth finish free from cracks, blow-holes, shrinks, and other flaws. All roller fairlead frames must be

**SPECIAL PROVISIONS**  
**CAMERA LOWERING SYSTEMS**

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corrosion resistant stainless steel or aluminum. All pulleys used in the lowering system and portable lowering tool must have sealed, self-lubricated or oil-tight bearings, or sintered bronze bushings.

Provide a minimum of 100 feet of composite power and signal cable prewired to the lowering system at the factory unless otherwise shown in the Plans. Splices will not be allowed. Use only lowering systems designed to withstand the design wind speeds. All wiring for power and data inside the pole shall be enclosed in a rigid conduit attached to the pole.

**Equipment Connection Box:** Include a 1-1/2 inch National Pipe Thread (NPT) pipe connection point for attaching a camera. Ensure that the equipment connection box has an ingress protection rating of no less than IP55.

**Disconnect Unit:** The disconnect units must have a minimum load capacity of 600 pounds with a 4:1 safety factor and be capable of securely holding the lowering system and any installed equipment. Fixed and movable components of the disconnect unit must have a locking mechanism between them, with at least two mechanical latches for the movable assembly. The fixed unit must have a heavy-duty cast tracking guide that allows latching in the same position each time. The load must be transferred from the lowering cable to the mechanical latches when the system is in the latched position. Interface and locking components must be constructed of stainless steel or aluminum.

**Disconnect Unit Housing:** The disconnect unit housing must be weather-proof with an ingress protection rating of no less than IP55.

**Connector Block:** Provide modular, self-aligning and self-adjusting female and male socket contact halves in the connector block. Equip the lowering system with enough contacts to permit operation of all required functions of the camera, up to a maximum of 20 contacts and include at least two spare contacts. Provide contact connections between the fixed and movable lowering system components that are capable of passing EIA-232, EIA-422, EIA-485, and Ethernet data signals and 1 volt peak to peak (Vp-p) video signals, as well as 120 VAC, 9-24 VAC, and 9-48 VDC power. The lowering system connections must be capable of carrying the signals, voltages, and current required by the devices connected to them under full load conditions.

Use only corrosion-resistant stainless steel hardware. Lubricate all components, including the connector block and contacts, in accordance with the manufacturer's recommendations. Ensure that male contacts used for grounding mate first and break last. All contacts and connectors must be self-aligning and self-adjusting mechanical systems. Provide a spring-assisted contact assembly to maintain constant pressure on the contacts when the system is in the latched position.

Provide connector pins made of brass-or gold-plated nickel, or gold-plated copper.

Ensure that the current-carrying male and female contacts are a minimum of 0.09 inch in diameter and firmly affixed to the connector block. Ensure mated connectors do not allow water penetration.

**SPECIAL PROVISIONS**  
**CAMERA LOWERING SYSTEMS**

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**Lowering Tool:** Provide a portable metal-frame lowering tool manufactured of corrosion-resistant materials with winch assembly and a cable with a combined weight less than 35 lbs that is capable of securely supporting itself and the load. The lowering tool must include a quick release cable connector and a torque limiter that will prevent over-tensioning of the lowering cable and be equipped with gearing that reduces the manual effort required to operate the lifting handle to raise and lower a capacity load. Ensure that the lowering tool can be powered using a 1/2 inch chuck, variable-speed reversible industrial-duty electric drill capable of matching the manufacturer-recommended revolutions per minute. Provide an adapter with a clutch mechanism and torque limiter for use with the drill. The electric drill shall be battery operated using minimum of 18 Volt.

The winch assembly must have a minimum drum size width of 3.75 inches and a positive braking mechanism to secure the cable reel during raising and lowering operations, and to prevent freewheeling. The lowering cable must wind evenly on the winch drum during operation. Provide a manual winch handle that incorporates a non-shear pin type torque limiter that can be used repeatedly and will not damage the lowering system. Provide a minimum of one lowering tool and any additional tools as required in the Plans. Deliver the lowering tool to the Department before final acceptance.

**Lowering Cable:** The lowering cable must be 0.125 inch minimum diameter Type 316 stainless steel aircraft cable (7 strands x 19 gauge) with a minimum breaking strength of 1,760 pounds. Additionally, the lowering cable assembly (as installed with thimble and crimps on one end and a cable clamp inside the latch on the lowering system end), must have a minimum breaking strength of 1,760 lbs.

All lowering cable accessories, such as connecting links, must have a minimum workload rating that meets or exceeds that of the lowering cable. Prefabricated components for the lift unit support system must prevent the lifting cable from contacting the power or video cables.

**Wiring:** All wiring must meet NEC requirements and be installed in accordance with the equipment manufacturers' recommendations for each system connected on the pole, at the lowering system, and in the field cabinet.

**MEASUREMENT AND PAYMENT:**

The Cameral Lowering System will be measured and paid at the bid price per each for the pertinent height pole. Payment will include all compensation for tenon, lowering tool, conduit, and all required equipment to be mounted on the pole for proper functioning of the system and as required by the contract documents.

The cost of the power and signal cable inside the pole will be paid for at contract unit bid price for linear feet of pertinent cabling/wiring item.

**SPECIAL PROVISIONS**  
**CCTV CAMERA POLES**

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**CATEGORY 800**  
**TRAFFIC**

**CCTV CAMERA POLES**

**DESCRIPTION.** Furnish, fabricate, transport, and install galvanized steel CCTV camera poles with camera lowering systems in accordance with the details shown in the contract documents or as directed by the Engineer. Foundations shall be either cast in place caissons or spread footings as indicated in the contract documents.

**MATERIALS.**

**a. CCTV CAMERA POLES:**

Refer to Contract Documents. The cabinets shall be Type 346 ITS Cabinet. Controlling equipment, UPS, and other equipment that are needed for the operation, are not part of this item of work.

**b. FOUNDATIONS:**

Refer to Section 801.02 of the Standard Specifications for both cast in place caissons and spread footings

**FABRICATION.**

The CCTV Camera Poles shall be capable of safely supporting the following accessories in accordance with the details shown in the contract documents:

1. Tenon to mount Camera Lowering Systems
2. Camera Lowering Systems to mount camera.
3. CCTV Cameras, 3 maximum. Each camera shall have its own arm and lowering system.
4. ITS Devices such as Microwave Detector, RWIS Detector, Smart Sensor HD, and Autoscope (all, 1 each).
5. Two 346 ITS Cabinets.

Standard pole heights shall be 50 feet, 70 feet and 90 feet. The tenon supporting camera lowering systems and CCTV cameras shall be mounted on the top of the pole. The ITS devices, if required in the contract documents (not including the cabinets), shall be mounted within 30 feet above the pole base, unless otherwise specified. They shall be served with external conduits (mounted outside of the pole). The bottom of the ITS cabinet shall be mounted at a height of 12" above the top of the base plate.

The pole shall be supported on either cast in place caissons or spread foundation as specified in the contract documents.

**SPECIAL PROVISIONS**  
**CCTV CAMERA POLES**

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Each section of the pole shall be fabricated of one length and shall have one longitudinal weld, parallel to the long axis of the pole, with no transverse weld. The longitudinal weld shall be finished to form a smooth outside surface. The wall of the pole shall be of uniform thickness including welded areas. The pole shall be round or multi-sided ( 16 sides or more) in cross section and be uniformly tapered from butt to tip with a 1 inch reduction in diameter for each 7 feet in length (0.14 inch/ feet).

The pole base plate shall be secured to the lower end of the pole by two continuous electric arc welds. The base plate shall telescope the pole with one weld on the inside of the base plate pole shaft. The remaining weld shall be located on the outside of the base plate, around the circumference of the pole. The weld connection shall develop the full strength of the adjacent pole shaft to resist the bending action. The base plate shall be fabricated with the holes for anchor bolts to the size and location dimensions as shown on the Contract Plans.

Access hole frame shall be welded into the pole as shown on the Contract Plans. A galvanized steel cover shall cover the access hole frame.

A 3/8-inch diameter x 1 inch stud copper servit post for two #6 AWG standard wire shall be furnished into the bottom of the access hole frame.

The pole shall be provided with entrance ways for cable as shown on the contract drawings. These holes shall be factory drilled and a straight tapped coupling, conforming to Underwriter Laboratory's UL-6 Specification, for 3 inch rigid conduits, shall be installed for each hole. A nipple with a unitized hexagonal fitting and integral inside radius on one end shall then be installed and fully seated on the interior side of the coupling. Location and installation of the coupling shall be as shown on the contract drawings.

Fabricate poles, tenon, cabinet connections, and miscellaneous hardware in accordance with the Contract Documents. Cut all material to the final dimensions and complete all welding prior to galvanizing. Obtain all components for individual strain poles from the same fabricator. Obtain the luminaire and the bracket from other sources, when necessary.

Affix an aluminum identification tag as shown on the plans.

Before shipping, assemble tenon including luminaire and bracket, to assure proper fit. The tenon may be separated for shipment.

Ensure all components are protected from damage during shipping and handling by wrapping or other effective methods. Replace any component, which the Engineer determines is damaged beyond repair, at no additional cost to the Department. If components are wrapped for shipment, remove wrapping no later than five days after receipt of components or immediately if the wrappings become saturated. Post these instructions in brightly colored wording on the wrapper. Failure to comply with these instructions may lead to damage of the coating system and will be cause for the rejection of the component.



**SPECIAL PROVISIONS**  
**CCTV CAMERA POLES**

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**COATINGS**

1. **GALVANIZING:** Galvanize all components in accordance with ASTM A123, except galvanize all fastener assemblies in accordance with Section A153. Use galvanizing methods which provide surfaces suitable for painting.
2. **SURFACE PREPARATION:** Prepare all galvanized surfaces to be painted in accordance with ASTM D6386 and the manufacturer of the coating system's specifications. Provide a clean and suitable galvanized surface that maximizes coating system adhesion. Measure the thickness of zinc coating after completion of surface preparation using a magnetic thickness gauge in accordance with ASTM A123. Ensure sufficient galvanizing remains on the substrate to meet the requirements of ASTM A123 and the Contract Documents. Correct any deficient areas to the satisfaction of the Engineer at no additional cost to the Department.

**CONSTRUCTION / INSTALLATION.**

Construct foundations in accordance with Section 801.03. Do not install poles until the foundation has achieved 70% of the specified 28-day concrete strength and verifying test results have been submitted to the Engineer. Determine concrete strength from tests on a minimum of two test cylinders prepared and tested in accordance with Standard Specifications. Before erecting the pole, clean the top of the foundation of any laitance, oils, grease or any other deleterious materials. Install ASTM F1554 Grade 55 anchor bolt with ASTM A563, Grade DH heavy hex nut and washer assemblies. Use bolt, nut and washer assemblies that are free of rust and corrosion and are lubricated properly as demonstrated by being able to easily hand turn the nut on the bolt thread for its entire length.

Base plate installation steps are as follows:

1. Verify that the nuts can be turned onto the bolts past the elevation corresponding to the bottom of each-in-place leveling nut and be backed off by the effort of one person on a 12 inch long wrench, without employing a pipe extension on the wrench handle.
2. Clean and lubricate the exposed threads of all anchor bolts. Clean and lubricate the threads and bearing surfaces of all leveling nuts. Re-lubricate the exposed threads of the anchor bolts and the threads of the leveling nuts if more than 24 hours has elapsed since earlier lubrication, or if the anchor bolts and leveling nuts have become wet since they were first lubricated.
3. Turn the leveling nuts onto the anchor bolts and align the nuts to the same elevation.
4. Place structural plate washers on top of the leveling nuts; one washer corresponding to each anchor bolt.
5. Install the base plate onto the leveling nut washers, place structural plate washers on top of the base plate; one washer corresponding to each anchor bolt, and turn the top nuts onto the anchor bolts.
6. Tighten top nuts to a snug-tight condition in a star pattern. A star tightening pattern is one in which the nuts on opposite or near opposite sides of the bolt circle are successively tightened in a pattern resembling a star. For an 8 bolt circle with bolts sequentially numbered 1 to 8, tighten nuts in the following bolt order: (1, 5, 7, 3, 8, 4, 6, 2).



**SPECIAL PROVISIONS**  
**CCTV CAMERA POLES**

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7. Tighten leveling nuts to a snug-tight condition in a star pattern. The distance from the bottom of the leveling nuts to the top of the concrete must not exceed one anchor bolt diameter.
8. Before final tightening of the top nuts, mark the reference position of each tip nut in a snug-tight condition with a suitable marking on one flat with a corresponding reference mark on the base plate at each bolt. Then incrementally turn the top nuts using a star pattern until achieving the required nut rotation specified in Table A. Turn the nuts at least 2 full tightening cycles (passes). After tightening, verify the nut rotation. Do not exceed the Table A value by more than 20 degrees.
9. Tighten each retainer or jam nut until it is in firm contact with the top surface of the anchor bolt nut; then while preventing the anchor bolt nut from rotating, tighten the jam nut unit it is snug tight.
10. Install a screen over the gap between the base plate and foundation concrete.

TABLE A	
Anchor Bolt Diameter (inches)	Nut Rotation from Snug-Tight Condition
≤ 1-1/2	1/3 turn
> 1-1/2	1/6 turn

**MEASUREMENT AND PAYMENT:**

Refer to Section 801.04 for measurement and payment of footings.

The CCTV Pole including base plate, related hardware, template, etc. will be measured and paid at the bid price per each for the pertinent height pole. The payment will be full compensation for all material, labor, equipment, tools, and incidentals necessary to complete the work.

The cost of the ITS Cabinets will be measured and paid at the bid price per each of the ITS Cabinet.

The cost of the cameras, camera lowering system including tenon, related cabling, wiring inside the pole, etc. will be paid separately and are not part of these pay items.

Compensation for the concrete pads around the pole, if indicated in the Contract Documents, are not part of these pay items. They will be measured and paid using separate pay items established in the contract.

**CATEGORY 800**  
**TRAFFIC**

**HD CCTV CAMERA**

**DESCRIPTION.** Furnish and install network-based unitized High Definition HD CCTV camera with integrated zoom lens, pan, and tilt units. The camera is to be either a single pressurized dome or barrel-style make as specified in the Contract Documents, or as directed by the Engineer.

**MATERIALS.** The unitized HD CCTV camera cabinets, and all component parts shall meet the latest edition of the National Electrical Manufacturers Association (NEMA) Standards, Underwriters Laboratory (UL), and Military Standards (MIL), National Electrical Code (NEC), Building Industry Consulting Service International (BICSI), Electrical and Electronics Engineers Standards Association (IEEE) as applicable. The advertising date of this Contract shall be used to determine the date of the applicable standards.

**Equipment Identification Tag:** Serial numbers and model numbers shall be permanently engraved on all removable components and hardware. The serial number and model number shall be etched, stamped, or molded. The use of adhesive backed paper labels is not acceptable.

**Optical Features.** The camera units shall meet or exceed the following requirements.

- (a) **Image Sensor.** Progressive Scan CMOS
- (b) **Image Resolution.** minimum of 1920 horizontal x 1080 vertical pixels
- (c) **Frame Rate.** minimum of 30 FPS
- (d) **Sensitivity.** Scene Illumination: F1.6 @ 50% Video 0.01 Lux (0.001 fc) @ 1/30 shutter
- (e) **Day/Night Operation.** Adjustable (Auto, Color and Mono Modes) via removable IR cut filter
- (f) **Optical Zoom Range.** minimum of 30x, 4.3mm to 129mm minimum
- (g) **Optical Zoom Speed.** 4.6s or better
- (h) **Maximum Lens Aperture.** f/1.6 (wide) to f/4.7 (tele)
- (i) **Horizontal Angle of View.** Optical minimum range: 63.4° to 2.3°
- (j) **Digital Zoom.** minimum of 12x
- (k) **Minimum Focus Distance.** 0.01m (wide) to 1.2m (tele)
- (l) **Zoom speed.** The camera system will allow for the user to perform optical zoom and digital zoom with a user selected speed in the range of 1 to 8
- (m) **Zoom position.** The camera system shall allow a user to set the camera to a precise zoom position in the range of 1X to at least 360X (including digital zoom)
- (n) **Focus modes.** The camera system shall allow the user to select one of the following:
  - a. Auto mode
  - b. If in manual mode, user shall be capable of adjusting focus near/far settings
- (o) **White Balance modes.** The camera system shall allow the user to select the following WB modes:

- a. Auto
- b. In Manual mode, the user shall be able to adjust the red and blue levels
- (p) Iris:** The camera system shall allow the user to select the following modes:
  - a. Auto Iris: Electronically controlled
  - b. If in manual mode, user shall be capable of adjusting iris open/close settings.
- (q) Shutter Speed.** The camera system shall support shutter speed from 1s to 1/10,000s
- (r) Backlight Compensation.** The camera system shall allow the user to enable/disable the backlight compensation
- (s) Wide Dynamic Range.** The camera system shall allow the user to enable/disable Wide Dynamic Range feature
- (t) Defog.** The camera system shall allow the user to set the defog function to On and Off
- (u) Electronic Image Stabilizer.** The camera system shall have an image stabilizer to improve poor video quality caused by mounting structure vibrations

**H.264/MJPEG Encoding Engine.** The camera units shall meet or exceed the following requirements.

- (a) Encoding.** The video encoding and profile management system shall utilize a dynamic architecture based on its encoding power for determining the video streams available. Use of this technology shall allow the following possible video stream configurations:
  - a. H.264 Streams: up to 1920x1080 @ 30fps
  - b. MJPEG Streams: up to 1920x1080 @ 30fps
- (b) Encoding Properties.** Each video encoder channel shall provide the following configurable properties:
  - a. Codec
    - i. H.264, Baseline, Main, High
    - ii. MJPEG
  - b. Resolution
    - i. HD: up to 1920 x 1080
    - ii. SD: up to D1
    - iii. VGA: up to 640 x 480
  - c. Frame Rate: Video frame rates shall be adjustable from 1 to 30 fps
  - d. Bit Rate Control
    - i. Variable Bit Rate
    - ii. Constant Bit Rate
    - iii. Bit Rate: Selectable from 64kbs to 8Mbs
    - iv. Group of Video (GOV or GOP) Length: system shall support Adjustable GOV
- (c) Connection Types.** Uni-cast, multi-unicast or multi-cast
- (d) Camera Video Latency.** Less than 250ms
- (e) Network Protocol Layers.** Transmission Control Protocol (TCP), User Datagram Protocol (UDP), Internet Control Message Protocol (ICMP), Internet Group Management Protocol (IGMP), Real-Time Transportation Protocol (RTP), Real-Time Streaming Protocol (RTSP), Hypertext Transfer Protocol (HTTP), Hypertext Transfer Protocol Secure (HTTPS) and ONVIF Profile S or T as a minimum.

**Pan/Tilt/Zoom (PTZ) Features.** The camera units shall meet or exceed the following requirements.

- (a) **Pan Movement.** 360 degrees continuous rotation
- (b) **Pan Speed.** Variable from 0.1 to 90 degrees/second
- (c) **Pan Repeatability.** +/- 0.1 degree precision
- (d) **Pan Preset Speed.** 180 degree movement < 2 Seconds
- (e) **Tilt Movement.** Minimum of +10 to -90 degrees
- (f) **Tilt Speed.** Variable from 0.1 to 80 degrees/second.
- (g) **Tilt Repeatability.** +/- 0.1 degree precision
- (h) **Tilt Preset Speed.** 180 degree movement < 2 Seconds
- (i) **Proportional Zoom Control.** Positioning control shall allow variable pan/tilt speeds based on zoom position.
- (j) **Home Position.** Shall be a user defined point where pan and tilt position is reported to be 0. This can be different from the mechanical home position.
- (k) **Wiring.** The system shall not have any exposed wiring from the positioning drive to the camera head enclosure.

**Operational Requirements.** The camera units shall meet or exceed the following requirements.

- (a) **Camera Control Functions.** Required camera control functions shall include the following features and capabilities as a minimum: these functions shall be exposed as part of the HD Camera Positioning System web server.
  - a. **Properties:** Allows user to save and recall a specific user defined configuration camera property settings or return to factory default configuration.
- (b) **Positioning Control Functions.** Required positioning control functions shall include the following features and capabilities as a minimum:
  - a. **Pan/Tilt Positioning**
    - i. **Movements:** The HD Camera Positioning System shall allow continuous 360 degree azimuth (pan) rotation and minimum of +10 to - 90 degree elevation (tilt) movement.
    - ii. **Variable Speed:** The HD Camera Positioning System shall provide variable speed azimuth and elevation capability using a minimum of up to 100 distinct speed settings ranging from 0.1 to 90 degrees/second.
    - iii. **Vector Positioning:** The HD Camera Positioning System shall be capable of simultaneous pan and tilt movements.
    - iv. **Scalable Zoom:** Variable speed pan/tilt ranges based off of zoom position. This adds the capability of limiting the maximum pan/tilt speed, while maintaining variable speed capability, throughout the zoom range of the camera.
  - b. **Presets:** Minimum of 64, with each preset consisting of a pan, tilt, zoom and focus and preset ID label. When a preset position is recalled the corresponding preset ID shall be displayed. The preset ID shall remain displayed until a pan, tilt, zoom or another preset command is received.

- c. Preset Tours: Minimum 8 tours required, each tour shall consist of up to 32 pre-programmed presets, with individual dwell time and preset speed property per preset per tour.
    - i. Tours shall stop upon receipt of any pan/tilt positioning command.
    - ii. Tour data shall be stored in non-volatile memory and shall not be lost if a power failure occurs.
  - d. Auto-Park Mode: Shall allow user to set a park [home] position, where the camera system will return to upon the following conditions:
    - i. Park properties shall consist of pan, tilt, zoom, and focus coordinates, timer value, and enable/disable mode.
    - ii. An auto- park event shall occur when enabled using the following triggers:
      - 1. Power recycles
      - 2. Timer expiration. Timer resets upon each user command.
- (c) Privacy Masks.** The HD Camera Positioning System shall support Privacy Masks to conceal user-defined rectangular areas
- a. Minimum of 16 Individual Masks can be programmed
  - b. The Privacy Mask(s) scale in size relative to the cameras zoom position
  - c. The Privacy Mask(s) move relative to the camera system pan and tilt position
  - d. Each Mask shall be able to be enabled or disabled
- (d) Updates.** The HD Camera Positioning System shall allow updates of firmware for new features via the Ethernet network communication channel.
- a. An internal HD Camera Positioning System web server shall be provided for performing this task.
  - b. A free device management tool shall be provided for performing updates and configuration uploads to simplify the maintenance and servicing of the specified camera system.
- (e) Power loss.** The HD Camera Positioning System shall return to previous position and state of operation upon power loss and restoration.

**Communication Protocols and Formats.** The HD Camera Positioning System shall include integrated video camera system communication drivers for flexibility and system interoperability. The HD Camera Positioning System camera system shall support Ethernet communication channels at a minimum, allowing field selection of the following protocol drivers as required:

- (a) Ethernet Channel (IP)
  - a.NTCIP 1205
  - b.ONVIF Profile S or T

**On-Screen Display (OSD)**

- (a) The HD Camera Positioning System shall provide OSD capabilities on video output as defined below. The camera system shall support a minimum of 2 OSD elements for inclusion in each video stream.
- (b) The available OSD elements shall include a minimum of Camera Title (20 characters) and Preset Title (20 characters)

- (c) The camera system shall be capable of displaying transparent logo overlay (PNG image or bitmap) on each video stream

**Maintenance Functions.**

- (a) The camera system shall support querying of camera parameters via the Ethernet connection. The camera parameters shall consist of the following items:
  - a. Serial number
  - b. Software/firmware revision
  - c. Camera Model Number
  - d. Internal Pressure and Temperature Monitoring and Reporting
  - e. Remote Software Upload/Updates via Ethernet
  - f. Camera Device Auto Discovery of IP address
  - g. Camera System Auto Reconnect
  - h. Camera System Reset
  - i. Save and Restore camera system configuration

**IP/Network Management.**

- (a) The HD Camera Positioning System shall provide at minimum the following network configuration properties:
  - a. IP Configuration: DHCP or Static IP address entry
  - b. Net mask address entry
- (b) Gateway address entry
- (c) Domain name entry

**Power Requirements.** The HD Camera Positioning System shall fully comply with NEMA TS-2 and IEEE standards and include independent laboratory test results confirming compliance with the following electrical operating conditions:

- (a) Power: POE 802.3at or 802.3bt (inclusive of PT Heater Option)
- (b) Camera System shall be powered only by a Manufacturer approved POE switch in the SHA communications cabinet. In the event the cabinet switch cannot power the camera system, it may be powered by a Manufacturer approved POE midspan
- (c) Manufacturer approved POE surge protector shall be installed in the SHA communications cabinet ahead of any switch or POE midspan and properly grounded per SHA standards

**Mechanical Specifications**

- (a) **Connectors.** The camera system shall be equipped with one 10BASE-T/100BASE-TX Fast Ethernet-port for power and Ethernet data using a RJ45 connector, and shall support auto negotiation of network speed
- (b) **Weight.** The total weight of the camera, lens, enclosure, and pan and tilt unit shall not exceed 44 pounds (20 kg) or less
- (c) **Dimensions.** 19½ L x 14 W x 23 D in (495 x 360 x 582 mm) or less
- (d) **Construction.**
  - a. Camera housing shall be constructed of rugged, corrosion resistant materials such as powder coated aluminum and/or stainless steel suitable for use in all outdoor environments
  - b. Shall use only optically corrected lower dome cover or window



- (e) **Camera Mount.** The camera system shall support the following mounting options:
- a. Directly attached to the bottom of a camera lowering system using a pendant mount or base plate. If the camera requires a base plate, the camera shall only be mounted directly to the base plate in inverted position and without the need of a J-shaped adapter
  - b. Pedestal mount (Pole-top mount)
  - c. Directly attached to the side of a pole using a pole mount adapter

**Environmental Requirements.** The HD Camera Positioning System shall fully comply with and include independent laboratory test results confirming compliance with the following environmental operating conditions:

- a) **Pressurized Enclosure.** The HD Camera Positioning System shall provide a sealed and pressurized camera enclosure and camera heater with a minimum of IP66 Ingress Protection
  - a. The enclosure shall be factory pressurized to 5 psi or greater using dry nitrogen.
  - b. The enclosure shall provide standard Schrader valves for maintenance purposes.
  - c. The enclosure shall provide a pressure relief valve to prevent the camera from being over pressurized.
  - d. Low Pressure warning shall be displayed on the video image when the camera housing tube pressure drops below a preset limit.
  - e. The enclosure's heater shall be microprocessor controlled and provide fog free window operation under all environmental conditions.
- b) **Ingress Protection.** Minimum of IP66 Ingress Protection
- c) **Temperature.** The system shall operate correctly at a minimum in the temperature range of -40°C (-40°F) through +74°C (+165°F)
- d) **Vibration.** The camera PTZ functions shall operate nominally during and after vibration Per Nema-TS2 paragraphs 2.1.9, 2.2.3, 5-30Hz sweep @ 0.5g applied in each of 3 mutually perpendicular planes.
- e) **Shock.** Per Nema-TS2 paragraphs 2.1.10, 2.2.4, 10g, 11ms in any axis under non-operating conditions.
- f) **Humidity.** 0-100% Non-Condensing

**Warranty Information.** Manufacturer's Warranty: The warranty period shall be thirty six (36) months from the delivery date of the system under normal use and service.

**Inverted Operation.** A barrel-style HD camera positioning system shall be able to operate normally (meet these specifications) when mounted in an inverted position. Software, provided by the manufacturer, shall compensate for image correction and control when the unit is inverted.

**Camera Power and Communications.** Camera shall communicate with SHA network and be powered over a single CAT5E or better cable per current SHA specifications - Superior Essex Comm F04P24BPN5E Armored Category 5e UV Sunlight and rodent resistant. 24AWG Black polyethylene outer jacket.

**CONSTRUCTION.** Furnish and install all hardware, tools, equipment, materials, supplies, and

manufactured articles. Perform all operations and equipment testing necessary to construct fully operational unitized HD CCTV camera that meet the features, functions, and parameters as shown in the Contract Documents.

**Camera Assemblies.** Mount unitized HD CCTV camera on previously installed steel poles or other structures as shown on the Plans. Connect each camera system to SHA communications cabinet as shown on the Plans.

- (a) The entire camera system shall be assembled and tested in accordance with the Contract Documents prior to delivery to the site.
- (b) The systems shall be delivered to the site as complete units and installed as specified in the Contract Documents.
- (c) Individual components of the camera system shall conform to the requirements specified in the Materials section.

**Technical Assistance.** The equipment supplier shall provide the Contractor with an authorized manufacturer's representative or technical personnel to assist the with the installation of all equipment at each site.

**Training.** See "TRAINING".

**Testing.** All equipment furnished by the Contractor shall be subject to monitoring and testing to determine conformance with all applicable requirements and to ensure proper operation of the equipment and system.

- (a) All equipment required for testing shall be supplied by the Contractor.
- (b) No separate payment will be made for the monitoring, testing, test equipment, and documentation of test results, but shall be included in the amount bid for each camera assembly.
- (c) If any material used in the construction of the system is defective or otherwise unsuitable, or the workmanship does not conform with the accepted standards, replace such defective parts and material at no cost to the Administration.
- (d) Each camera site shall be tested and accepted on-location by a representative of the Office of Maintenance, Communications Division (410-455-8330 or email SHARadioShop@mdot.maryland.gov). The tests shall be conducted at the field equipment cabinets, and shall include, as a minimum:
  - (1) Power and Communications Cable testing and certification: Contractor shall test the Power and Communications Cable and provide cable test results and certifications per ANSI/TIA-1152-A
  - (2) Local operation of all CCTV equipment: exercising the pan, tilt, zoom, focus, iris opening, and power on/off functions, while observing the video picture on a portable monitor or laptop computer.
  - (3) Demonstration of camera sensitivity at low light levels to meet the specified requirements.



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- (4) Demonstration of pan/tilt speed and extent of movement to meet the specified requirements.
- (5) Random test of at least one installed camera to verify camera enclosure pressurization.
- (6) Operation of all camera systems from the central camera control system: exercising the pan, tilt, zoom, focus, and iris opening functions, while observing the video picture locally.
- (7) Setup, selection, and demonstration of pre-programmed preset positions for each camera system.

**Documentation.** The camera system supplier shall provide three sets of operating manuals, service manuals, and maintenance instructions for all components of the system.

**Service Agreement.** The equipment manufacturer shall be capable of providing an extended maintenance contract at the State Highway Administration's expense after all warranties expire.

**MEASUREMENT AND PAYMENT.** Network-based HD CCTV camera will be measured and paid for at the contract unit price bid for each. The payment will be full compensation for the HD CCTV Camera, mounting hardware, materials, labor, testing and test equipment rental fees (if applicable), and all other incidentals necessary to complete the work.



**CATEGORY 800**  
**TRAFFIC**

**SECTION 807 — ELECTRICAL SERVICE EQUIPMENT**

**DELETE:** 807.03.02 Base Mounted Metered Service Pedestal in its entirety

**INSERT:** The following.

**807.03.07 Base Mounted Metered Service Pedestal.** Base Mounted Metered Service Pedestals shall consist of a base-mounted aluminum pedestal containing a 200 Amp 2 pole main circuit breaker for service disconnect, branch circuit breakers; and integral meter socket. The pedestal shall have the option of being ordered with the meter socket facing to the front or back, as shown in the Contract Documents. All conduit stub-outs shall extend 6 in. beyond the edge of the foundation and shall be arranged as shown in the contract documents.

Design the Base Mounted Metered Service Pedestal for pad mounting using 18-in. long anchor bolts. The pedestal shall measure 16 in. wide, 17 in. deep, and 48 in. tall. The post and meter socket shall meet NEMA 3R. Provisions shall be provided to padlock the customer service side door closed to protect the circuit breakers, and to install a utility company seal to secure the meter. The meter shall be protected by a hinged hood.

Main circuit breakers shall consist of an industrial-grade, F-frame style circuit breaker. Branch circuit breakers shall consist of industrial grade, QC-style circuit breakers mounted on non-energized clips. Internal cables between the terminal block and the breakers shall be number 4 AWG THHN.

Unless otherwise specified in the Contract Documents, provide breakers as follows:

- (a) 1 - 100-amp double-pole breaker
- (b) 1 - 60-amp double-pole breaker
- (c) 1 - 30-amp double-pole breaker
- (d) 1 - 60-amp single-pole breaker
- (e) 2 - 30-amp single-pole breakers

Breakers shall be arranged to provide an equal total load per phase.

Base Mounted Metered Service Pedestals shall be UL508 listed “Suitable for Service Equipment,” and shall be acceptable to the local utility companies for use as a service connection.

**807.04 MEASUREMENT AND PAYMENT.**

**DELETE:** 807.04.03 in its entirety

**INSERT:** The following.

**807.04.03.** Base Mounted Metered Service Pedestal will be measured and paid for at the Contract unit price per each. The payment will be full compensation for all enclosures, panel boards, circuit breakers, internal wiring, wiring devices, meter sockets, meter, shunts, cover plates, wiring and all materials, labor, equipment, tools, concrete, and incidentals necessary to complete the work. Concrete foundation for the Base Mounted Metered Service Pedestal shall be incidental to the Base Mounted Metered Service Pedestal.

**CATEGORY 800**  
**TRAFFIC**

**SECTION 807 — ELECTRICAL SERVICE EQUIPMENT**

**807.03 CONSTRUCTION.**

**807.03.02 Base Mounted Metered Service Pedestal**

**INSERT:** The following after the last paragraph:

Provide photocontrol as specified including contactor, photocell, photocell receptacle selector switch and associated internal wiring.

**807.04 MEASUREMENT AND PAYMENT.**

**DELETE:** 807.04.03 in its entirety

**INSERT:** The following.

**807.04.03.** Base Mounted Metered Service Pedestal will be measured and paid for at the Contract unit price per each. The payment will be full compensation for all enclosures, concrete foundation, panel boards, circuit breakers, photocell, photocell receptacle, contactor, selector switch, internal wiring, wiring devices, meter sockets, meter, shunts, cover plates, wiring and all materials, labor, equipment, tools, concrete, and incidentals necessary to complete the work. Concrete foundation for the Base Mounted Metered Service Pedestal shall be incidental to the Base Mounted Metered Service Pedestal.

**CATEGORY 800**  
**TRAFFIC**

**SECTION 808 — LIGHTING STRUCTURES**

**808.01 DESCRIPTION.**

**DELETE:** The description paragraph in its entirety.

**INSERT:** The following.

Furnish and install low level steel and aluminum lighting poles, bracket arms and fittings, and steel high mast lighting structures as specified or as directed. Exclude concrete foundations.

**808.02 MATERIALS.**

**ADD:** The following at the end of the list of materials.

High mast shafts	A595 Grade A
Steel base plates and other structural steel	A709 Grade 50 including Charpy V Notch requirements for Zone 2
Galvanization for hardware	A153

Design high mast lighting structures for mounting a head frame and lowering device assemblies. Provide design in accordance with the 2001 AASHTO “Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signs” and as indicated in contract documents. Structures shall include a reinforced handhole with a hinged handhole cover that shall be padlocked. Padlocks shall be keyed alike and shall be in accordance with the Administration standards.

Contractors and/or fabricators name and logo shall not be placed on the lighting standards. Marked numbers shall appear on surface areas that will not be visible to traffic after erection.

The shaft of high mast lighting structures shall be made of tapered sections that telescope each other. Shaft diameters and tapers shall be as shown in the Contract Documents.

Telescoping sections shall be forced into place and be thoroughly wedged to produce the required engagement as listed on the Contract Documents. Submit erection plans and procedures to the Engineer for approval prior to installation of the high mast lighting structure on location. Structures shall be installed with all internal wiring, attachments,

and hoist cable assemblies in place and erected in accordance with the manufacturers recommendations. Erect the structures plumb. Check plumb using two transits set 90 degrees apart. Plumbing shall not be done in full sun to avoid deflection from radiant heat. Tolerance for plumb shall be 3 in. per 100 ft. Tighten nuts to secure the structure in place.

The loading, transporting and unloading of all parts shall be conducted to avoid injury and deformation of the metal. Repair areas damaged in transport or erection to the satisfaction of the Engineer. During the erection process, handle all materials carefully and store on platform, skids, or other supports to keep parts off of the ground. The steel shall be kept free and clean from all foreign materials, particularly grease, oil, concrete, chock marks and dirt that may affect the natural oxidation of the steel. All structures shall be treated with care given to any product such that the finished surface remains as prepared in the fabrication shop. Any foreign matter that gets on the surface after galvanizing shall be removed as soon as possible and the soiled areas shall be returned to the conditions as listed above.

**Luminaire Head Assembly and Lowering Gear.** Provide all zinc coated structural and sheet metal parts meeting the same structural requirements as the shaft. All bolts, nuts, washers, and lock washers shall be stainless steel. All luminaires shall be as stated in Section 806.

The luminaire support frame shall be a steel ring integrally welded together and shall serve as a raceway for electrical wiring to the luminaires. The frame shall be suspended from and held in place by three stainless steel suspension cables of 3/16 in. min diameter. These cables shall be permanently affixed through a weight equalizing spring assembly to a single sustaining raising-lowering winch. The three suspension cables securing the frame shall pass over pulleys of non-corrosive material fitted with permanently lubricated ball bearings, cable guides and cable retainers. The suspension cables, weight equalizing spring assembly, and winch shall be installed within the shaft. A means shall be provided within the shaft to prevent the three suspension cables from fouling the power cable when raising and lowering the luminaire frame. The raising-lowering winch shall be suitable for manual as well as power driven operation.

The downward travel of the lowering ring shall be sufficient to lower the lights to a position 5 ft above the base of the standard. Cushioned bumpers, or similar devices, shall be provided to absorb any shock resulting from contact between the lowering ring and pole during the up and down travel of the ring.

The lowering gear shall include a braking mechanism to prevent the luminaires from lowering without intentional operation of the winch.

**Latching Mechanism.** Each pole shall be provided with a latching mechanism that shall secure the suspension cables and minimize the stress on the winch cable and winch. The

latching mechanism shall be completely accessible through the access door in the pole base. Additionally, a safety chain shall be provided capable of supporting the full weight of the luminaires and lowering equipment in the event of a failure of the latching mechanism.

**Electric Drive Assembly.** The electric drive assembly shall be a reversible continuous heavy duty electric drill with a 240 volt universal motor, a torque clutch, a remote control station with a 35 ft long extension cord, and a mounting bracket to firmly hold the drive unit in place when it is engaged with the hoisting winch. The electric drive assembly shall be provided with a socket to fit the 1/2 in. square input shaft of the winch. The drill shall produce the necessary torque to raise and lower the lowering ring with six luminaires through 10 successive cycles with no more than one minute between each cycle and without producing excess heating or overloading of the electric drive assembly.

Provide a remote control for the electric drive assembly that allows the operator to control the raising and lowering of the luminaires while standing clear of the luminaire assembly and pole.

The electric drive assembly shall raise or lower the luminaires at a rate of not less than 10 ft per minute. As part of the electric drive assembly a transformer shall be provided to convert from the operating voltage of the luminaires to 240 volts for the electric drive assembly. The transformer shall have a 10 ft long 3/C, 600 volt, heavy duty portable cable with plug to match the drive unit receptacle in the base of the lighting mast, and a grounded weatherproof receptacle on the load side to supply the drive unit motor. All outlets shall be easily accessible from the access door.

Electric drive assemblies shall be turned over to the Engineer at the completion of construction.

**Electrical Equipment for High Mast Lighting Structures.**

- (a) Terminal boards shall be rated 30 amperes, 600 volts, fabricated from non-tracking materials and equipped with covers. They shall be similar and equal to General Electric Company Type EB-5, Square D Class 9080, Type S or Westinghouse Type TBA.
- (b) Plugs and receptacles shall be heavy duty, weather resistant, rated 20 amperes, 480 volts AC, grounded type. Receptacles shall have weatherproof cap and mating plug.
- (c) Junction boxes shall be galvanized cast iron with hubs and hinged covers.

**Testing.** All electrical equipment shall be tested and its operation shall be demonstrated to the Engineer. Upon completion of erection and following the installation of the



luminaires and all electrical components, test the lowering device on each standard in the presence of the Engineer. The test shall consist of two complete operations, conducted on two different days, starting with the unlatching or unlocking, lowering the head assembly to its min height, raising the head assembly back to its installed height, and latching or locking. The test shall be considered satisfactory when 80 percent of the operations require no second attempts to complete any function and the remaining 20 percent of the operations require no more than three attempts to complete any function. Should the equipment fail this test, adjust or modify those components causing the failure and repeat the tests from the beginning.

**808.03 CONSTRUCTION.**

**ADD:** The following after the paragraph 'Perform all fabrication...pole is plumb'

Fabrication, welding and non-destructive testing shall conform to the contract documents and AASHTO Highway Signs, Luminaries and Traffic Signals 4<sup>th</sup> Edition 2001, unless otherwise specified.

**808.04 MEASUREMENT AND PAYMENT.**

**ADD:** The following after 808.04.04.

**808.04.05** High Mast Lighting Structures, Luminaires & Lowering Gear will be measured and paid for at the contract unit price per each light pole furnished and installed. The payment will be full compensation for the high mast lighting pole, the luminaire head assembly and lowering gear, all electrical equipment including internal wiring, luminaires, testing and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

**808.04.06** Electric Drive Assemblies will be measured at the contract unit price per each. The payment will be full compensation for electric drill, mounting bracket, transformers, remote controls, testing, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

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**SECTION 808 — LIGHTING STRUCTURES**

**808.02 MATERIALS.**

**ADD:** The following after the last paragraph.

Supply tamper resistant bolts for handhole covers for lighting structures.

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TRAFFIC**

**SECTION 811 — ELECTRICAL HAND HOLES, MANHOLES, PULL AND JUNCTION  
BOXES**

**811.02. MATERIALS.**

**811.02.02 Manholes.**

**ADD:** The following at the end of the list of materials.

PVC Underdrain 905

**811.02.03 Pull and Junction Boxes**

**ADD:** The following at the end of the list of materials.

Galvanizing A 123

Stainless Steel Type 304

Supply tamper resistant bolts for access cover to pull and junction box covers.

For concrete barrier or parapet embedded pull and junction boxes, supply galvanized steel pull and junction boxes. For externally mounted pull or junction boxes, supply stainless steel pull and junction boxes.

**811.03 CONSTRUCTION.**

**811.03.01 Hand Holes and Manholes.**

**DELETE:** The first paragraph “Install hand holes...other sealer as directed”

**INSERT:** The following.

Install manholes flush with the finished grade to drain. Mix, place and test concrete as specified in section 420. Install aggregate or 6 in. PVC drain as required. Outlet the underdrains into drainage structures whenever possible. Outlets that empty into a drainage structure shall be at least 9 in. above the normal flow line in the structure and be constructed of solid smooth wall underdrain outlet pipe. Maintain at least 18 in. of cover over the pipe. Rodent screens are not required when an underdrain outfalls into a drainage structure. Rodent screens are required when an underdrain outfalls into a ditch or slope. When outfalling into a slope or ditch, slope the outlet pipe at least 3 percent. Use solid smooth wall PVC pipe as specified in section 905. Excavate and backfill in accordance with Section 809.03. When installing manholes in sidewalks, remove and

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reinstall the sidewalk to the nearest joint. Fill or patch spaces between conduit/duct cable and the manhole wall with concrete or other sealer as directed.

Install hand holes flush with the finished grade to drain. Mix, place and test concrete as specified in section 420. Install aggregate as required. Excavate and backfill in accordance with Section 809.03. When installing hand holes in sidewalks, remove and reinstall the sidewalk to the nearest joint. Fill or patch spaces between conduit and the hand hole and manhole wall with concrete or other sealer as directed.

**ADD:** The following.

### **811.03.03 Adjusting Handhole or Manhole to Grade and Replace Frame and Cover.**

Remove existing handhole or manhole frame and cover. Adjust vertical elevation of concrete or brick handhole or manhole by removing material or installing additional bricks or concrete. Install frame and cover. Mix, place and test concrete as specified in Section 420 to be level with final grade. Install concrete collar.

For locations where handholes or manholes are installed in sidewalk, the handhole shall not create a vertical step of 0.25 in. or greater.

### **811.04 MEASUREMENT AND PAYMENT**

**ADD:** The following at the end of the paragraph.

The 6 in. PVC drain shall be measured and paid for at the contract unit price per linear foot. Excavation for the 6 in. PVC drain shall be incidental to the linear foot bid item.

Adjust Handhole or Manhole to Grade and Replace Frame and Cover will be measured and paid for at the Contract unit price per each. The payment will be full compensation for all remove of existing frame and cover, adjusting vertical elevation of existing handhole or manhole, concrete repair of existing handhole or manhole, excavation, aggregate, concrete, concrete collar, frame, cover, bolts, bricks, pipes, backfill, sealer, and for all materials, labor, equipment, tools, and incidentals necessary to complete the work.

Oversized Handholes will be measured and paid for at the Contract unit price per each. The payment will be full compensation for all excavation, aggregate drain, concrete, concrete collar, rebar, bolts, bricks, reinforced precast concrete, backfill, sealer, frames and covers, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

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**SECTION 812 — WOOD SIGN SUPPORTS**

**812.02. MATERIALS.**

**ADD:** The following at the end of the list of materials.

Concrete Mix No. 3	902.10
Galvanized Steel Sleeve	A36
Galvanized Steel Shim Plate	909.02

**812.03 CONSTRUCTION.**

**ADD:** The following at the end of the last paragraph.

When specified, wood sign supports installed in sidewalk, concrete or brick paver areas shall have sleeved foundations installed in accordance with MD 812.05-01 and MD 812.05-02.

**812.04 MEASUREMENT AND PAYMENT**

**ADD:** The following at the end of the last paragraph.

Sleeved Foundation for Wood Sign Supports will be measured and paid for at the Contract unit price per each. The payment will be full compensation for all excavation, backfill, concrete, steel sleeve, steel shim plate and for all material, labor, equipment, tools and incidentals necessary to complete the work.

**CATEGORY 800  
TRAFFIC**

**SECTION 814 — SIGNAL HEADS**

**814.01 DESCRIPTION.**

**ADD:** The following after the first paragraph.

Furnish and install Aluminum and Polycarbonate 8 in. and 12 in. vehicle traffic control signal heads and hardware with LED Green, Yellow, and Red indications, as specified in the Contract Documents or as directed by the Engineer. All signal housing shall have a black face and yellow housing.

Furnish and install self-contained LED pedestrian countdown signals, as specified in the Contract Documents or as directed by the Engineer.

**814.02 MATERIALS.**

**ADD:** The following to the end of the list of materials.

LED Traffic Signal Modules	“Section 800 LED TRAFFIC SIGNAL MODULES”
ALL Red and Green Traffic Signals (LED or Incandescent)	COMAR 14.26.03 (Certification of compliance with Maryland Energy Efficiency Standards)

**814.02.01 LED Countdown Pedestrian Signal Heads.** Provide LED pedestrian signals and all component parts that meet the latest edition of the National Electrical Manufacturers Association (NEMA) Standards and Underwriters Laboratory (UL), as applicable. In addition, LED pedestrian countdown signals shall meet the requirements set forth in the most recent, formally-adopted version of the specification titled “Pedestrian Traffic Control Signal Indications (PTCSI) – Part 2: Light Emitting Diode (LED) Pedestrian Traffic Signal Modules,” published by the Institute for Transportation Engineers (ITE).

All LED countdown pedestrian signals shall be certified by the manufacturer to meet or exceed all requirements of that specification over their entire 5 year warranty period. If available, permanently engrave serial numbers and model numbers, on all removable components and hardware. The serial number and model number shall be etched, stamped, molded, or attached using metallic self-adhesive labels. The use of adhesive backed paper labels is not acceptable.

LED Countdown Signal Modules.

- (a) LED countdown modules shall fit into existing 16 in. traffic signal housings built to PTCSI standards without modification to the housing.
- (b) The LED countdown module shall be a single, self-contained device, not requiring on-site assembly for installation into existing traffic signal housing.
- (c) Design the assembly of the LED countdown module to assure all internal components are adequately supported to withstand mechanical shock and vibration from high winds and other sources.
- (d) The signal module shall be protected by a ¼ in. thick non-glare UV treated polycarbonate face lens.
- (e) The signal shall have 2 individual sets of wires for electrical connections. One set for the hand/man section and another for the countdown section. Each set shall be made of three secured, color coded (blue, red, white), 36 in. long, 600V, 16 AWG jacketed wires, rated for service at +105°C.

Environmental.

- (a) The LED countdown module shall be rated for use in the ambient operating temperature range of -40°C (-40°F) to +74°C (+165°F).
- (b) Completely seal the LED countdown module against dust and moisture intrusion per the requirements of NEMA Standard 250 – 1991 sections 4.7.2.1 and 4.7.3.2 for type 4 enclosures to protect all internal components.

Chromaticity.

- (a) The measured chromaticity coordinates for the white walking Person and the Portland Orange Hand and Digits shall conform to the chromaticity requirements of section 8.04 and figure 1 of the PTCSI standard.
- (b) The chromaticity measurements shall remain unchanged over the input line voltage range of 80 VAC to 135 VAC.

Display.

- (a) The LED countdown signal module shall consist of a double overlay message combining the symbols of a Hand and walking Person and two “7 segment” digits forming the time display.
- (b) Arrange the Pedestrian icon LEDs to form solid icon symbols. The shape of the

symbols shall conform to the standard symbols for pedestrian signals.

- (c) Distribute the LED's evenly in each Pedestrian icon. The distance between each LED shall be evenly spaced.
- (d) The Hand/Person symbols shall be at least 10 in. high and 6.5 in. wide and shall incorporate sufficient LED's to assure adequate luminous intensity.
- (e) The countdown digits shall be at least 9 in. high and shall be made of 2 rows of at least 144 LED's.
- (f) Provide Portland Orange LED's shall be of the latest Alln GaP technology and the white LED's of the latest In GaN technology.
- (g) Interconnect the individual LED light sources so that a catastrophic failure of a single LED will result in a total loss of not more than 3 LED's or 5 percent of the signal light output.

Drive circuitry.

- (a) The LED drive current shall be regulated to compensate for line voltage fluctuations over the range of 80VAC to 135 VAC. The luminous output shall not vary more than 1 percent over the voltage range and shall not be perceptible to the human eye.
- (b) The drive circuitry shall include voltage surge protection to withstand high-repetition noise transients and low-repetition high-energy transients as stated in section 2.1.6, NEMA Standard TS-2, 1992.
- (c) The on-board circuitry shall meet FCC title 47, Sub-Part B, Section 15 regulations concerning the emission of electronic noise.
- (d) The circuitry shall ensure compatibility and proper triggering and operation of load switches and conflict monitors in signal controllers currently in use by the procuring traffic authority.
- (e) The countdown signal shall not be activated by input signals under 80 VAC.
- (f) The "countdown" portion of the signal shall have a high "off state" input impedance to ensure it does not prevent the conflict monitor from detecting an open load failure on the pedestrian signals. The input impedance of the countdown signal shall be such as to produce a load switch leakage voltage above 25 VAC to the conflict monitor for up to 4 units per channel.
- (g) The countdown signal drive circuitry shall not suffer any damage when subjected to defective load switches providing a half wave signal output.



- (h) Typical power consumption of the countdown display shall not exceed 5 watts with a power factor greater than 90 percent.

Countdown Function.

- (a) The countdown module shall be compatible with all types of traffic controllers.
- (b) The countdown timer module shall have a micro-processor capable of recording its own time when connected to a traffic controller.
- (c) When connected, the module shall blank out the display during the initial cycle while it records the countdown time using the Walk & D/Walk signal indications.
- (d) The display of the number of remaining seconds shall begin only at the beginning of the pedestrian change interval.
- (1) After the countdown displays “zero,” the display shall remain dark until the beginning of the next countdown.
- (2) The countdown pedestrian signal shall display the number of seconds remaining until the termination of the pedestrian change interval.
- (3) Countdown displays shall not be used during the walk interval, nor during the yellow change interval of a concurrent vehicular phase.
- (e) The countdown timer module shall continuously monitor the traffic controller for any changes to the pedestrian phase time and re-program itself automatically if needed.
- (f) The countdown module shall register the time for the walk and clearance intervals individually and shall begin counting down from the start of the clearance time or the sum of both interval times if selected.
- (g) If the walk interval is pre-empted (emergency vehicle), the countdown module shall skip the remaining walk time and begin the clearance interval countdown to reach 0 at the same time as the flashing hand becomes solid.
- (h) If the clearance interval is pre-empted (train), the countdown module shall skip the remaining clearance time and reach 0 at the same time as the flashing hand becomes solid.
- (i) In the cycle following a pre-emption call, the signal shall display the correct time and not be affected by the reduced previous cycle. The countdown shall always reach 0 at the same time as the flashing hand becomes solid.

- (j) When the flashing hand becomes solid, the module will display “0” for one second and then blank-out.
- (k) The countdown timer shall be capable of timing 2 consecutive complete pedestrian cycles outputted by the traffic controller (no steady hand signal between cycles).
- (l) The countdown module shall have an internal conflict monitor preventing any possible conflicts between the Hand/Person signal indications and the time display. It shall be impossible for the countdown to display any time during a solid hand indication.
- (m) The countdown module shall have accessible dip-switches for the following user selectable options:
  - (1) Display 0 during stand-by.
  - (2) Turn on all LEDs for testing
  - (3) "Coordinated" mode, (displays clearance time only)
  - (4) Disable countdown display.
- (n) The LED module shall have a removable plug on the rear of the unit to allow for easy access to dip switches.
- (o) If the pedestrian change interval is interrupted or shortened as a part of a transition into a preemption sequence, the countdown pedestrian signal display shall be discontinued and go dark immediately upon activation of the preemption transition.

Housing. Countdown Pedestrian Signals shall have a single piece cast aluminum case housing, a lens, and a single piece cast aluminum swing down door frame.

- (a) The maximum overall dimension of the signal shall be 18.5 in. W x 18.75 in. H x 9 in. D. (470 x 476 x 229 mm), including the visor and hinges. The distance between the mounting surfaces of the upper and the lower openings shall be 15.75" (400 mm).
- (b) The case shall be one piece corrosion resistant aluminum alloy die casting, complete with integrally cast top, bottom, sides and back.
  - (1) Four integrally cast hinge lug pairs, two at the top and two at the bottom of each case, shall be provided for operation of the swing down door.
  - (2) When properly mated to other pedestrian signal components and mounting

hardware, the case shall provide a dustproof and weatherproof enclosure and shall provide for easy access to and replacement of all components.

(3) The case shall be mounted via upper and lower openings, suitable for either post top or bracket mounting. The openings shall accommodate standard 1.5" (39 mm) pipe brackets. The bottom opening of the case shall have a shurlock boss integrally molded into the case. The dimension of the shurlock boss shall be:

Outside diameter 2.625 in. (667 mm)

Inside diameter 1.969 in. (50 mm)

Number of teeth 72

Angle of teeth 90°

Depth of teeth 5/64 in. (2 mm)

A shurlock boss of the same dimensions shall be an option for the top opening of the case. The radial angular grooves of the shurlock boss when used with the shurlock fittings shall provide positive positioning of the entire signal to eliminate rotation or misalignment of the signal.

(c) The door frame shall be a one piece corrosion resistant aluminum alloy die casting, complete with two hinge lugs cast at the bottom and two latch slots cast at the top of each door.

(1) The door shall be attached to the case by means of two Type 304 stainless steel spring pins.

(2) Two stainless steel hinged bolts with captive stainless steel wingnuts and washers shall be attached to the case with the use of stainless steel spring pins.

(3) Latching or unlatching of the door shall require no tools.

Warranty. Manufacturers shall provide a written warranty with the following minimum provisions:

(a) LED countdown signal modules shall be replaced, repaired or purchase value refunded if the module fails to function as intended due to workmanship or material defects within the first 60 months from the date of delivery.

(b) LED countdown signal modules which exhibit luminous intensities less than the minimum specified values within the first 60 months of the date of delivery shall be replaced, repaired or purchase value refunded.

Compatibility Testing: The LED Pedestrian Countdown Signal manufacturer shall certify that their equipment meets the Load Switch and Signal Conflict Monitor Compatibility testing requirements found in the most recent, formally-adopted version of the specification titled "Pedestrian Traffic Control Signal Indications – Part 2: Light Emitting Diode (LED)

Pedestrian Traffic Signal Modules,” published by the Institute for Transportation Engineers (ITE).

**814.04 MEASUREMENT AND PAYMENT.**

**ADD:** The following after the first paragraph.

Aluminum and Polycarbonate LED Signal heads 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 LED signal heads will have the LED module fitted into the housing assembly. The payment will be full compensation for the housing, LED signal module, and, mounting hardware, assembly, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

LED Countdown Pedestrian Signals will be measured and paid for at the contract unit price each of the size as specified in the Contract Documents. The payment will be full compensation for furnishing and installing the pedestrian signals, LED modules, housing, equipment specified, all mounting hardware, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

**CATEGORY 800**  
**TRAFFIC**

**SECTION 818 — SIGNAL STRUCTURES**

**818.01 DESCRIPTION.**

**ADD:** The following after the first paragraph.

Furnish and install galvanized steel traffic signal mast arms and mast arm poles, galvanized steel pedestal poles and transformer bases, and galvanized steel traffic signal strain poles at locations specified in the Contract Document or as directed by the Engineer.

**818.02 MATERIALS.**

**ADD:** The following to the end of the list of materials.

Provides poles which shall meet 2013 edition of AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, with 2019 interim revisions, except as noted. All welding shall conform to American Welding Society (AWS) Structural Welding Code D1.1 Steel, Tubular Structures.

**818.02.01 Galvanized Steel Traffic Signal Mast Arms and Mast Arm Poles.**

Each mast arm(s) and mast arm pole structure furnished shall consist of a design from a steel pole shaft with a steel base plate and flange plate, steel mast arm shaft(s) with steel flange plate(s), six flange bolts per mast arm, six anchor bolts and miscellaneous hardware.

- (a) Manufacture the mast arms and mast arm poles from steel tubing conforming to A 595 Grade A or equal. Each mast arm and mast arm pole shall be fabricated of one length and shall have one longitudinal weld, parallel to the long axis of the mast arm or mast arm pole, with no transverse welds. Finish the longitudinal weld to form a smooth outside surface and the wall of the mast arms and mast arm poles shall be of uniform thickness including the welded area. The mast arms and mast arm poles shall be round or multi-sided (8 sides or more) in cross section and be uniformly tapered from butt to tip with a 1 in. reduction in diameter for each 7 ft in length (0.14 in./ft). Mast arms shall be of two piece design for all mast arms 50 ft in length. Mast arms shall be of three piece design for all mast arms 60 ft, 70 ft and 75 ft in length. The bolted splice for two or three piece mast arms shall be as specified in the Contract Document. Mast arm sections shall conform to Standards.
- (b) The material for mast arm pole base plate shall conform to A 709, Grade 50 and shall be of sufficient size and strength. Secure the base plate to the lower end of the mast arm pole by two continuous electric arc welds. The base plate must telescope the mast arm pole with one weld on the inside of the base plate at the end of the mast arm pole shaft. Locate the remaining weld on the outside of the base plate, around the

- circumference of the mast arm pole. The weld connection shall develop the full strength of the adjacent mast arm pole shaft to resist bending action. Fabricate all base plates with the holes for anchor bolts to the size and location dimensions as shown on the appropriate detail.
- (c) All mast arms and mast arm poles must be furnished with flange plate(s) as noted in the Standards. Connect these attachments, including the bolts, in such a manner as to develop the minimum guaranteed yield and ultimate tensile strength for the mast arm and mast arm pole. This assembly shall be capable of transferring the maximum moment being carried by the mast arm without distortion or rotation of the mast arm or the attachment. Connect flange plate(s) by the use of 6 bolts. The size of the plates and bolts shall be as shown in the Standards. Furnish four (1-1/2 in. O.D.) rubber grommets for each mast arm to accommodate signal heads wiring access.
  - (d) Secure the mast arm flange plate to the lower end of the mast arm pole by two continuous electric arc welds. The mast arm flange plate shall telescope the mast arm with one weld located on the inside of the flange plate at the end of the mast arm. Locate the remaining weld on the outside surface of the flange plate around the circumference of the mast arm pole. The weld connections shall develop the full strength of the adjacent mast arm to resist bending action.
  - (e) Mast arm flange plates and mast arm pole flange plates surfaces shall be plane to within 1/16 in. and shall be free of any buildup of galvanizing (drips, runs, etc.) which would prevent intimate contact between the connecting surfaces.
  - (f) Weld access hole frames into the mast arm pole as detailed in Standard MD 818.11. A galvanized steel cover, conforming to C 1010 shall cover the access hole frame. Secure the access hole cover's top to the access hole frame by a hinge fabricated from stainless steel using a 0.125 in. diameter stainless steel hinge pin. Secure the hinge to the access hole frame with 2 (1/4 in. - 20 UNC) hex head stainless steel bolts. Secure the hinge access hole cover by 2 (1/4 in. - 20 UNC) hex head stainless steel bolts and lock nuts. Provide a slotted opening at the bottom of the access hole cover to allow for attachment of a furnished (1/4 in. - 20 UNC) hex head stainless steel bolt into the access hole frame face.
  - (g) A 3/8 in. diameter by 1 in. stud copper servit post for two #6 AWG stranded wire shall be furnished into the bottom of the access hole frame.
  - (h) Provide mast arm poles with entrance ways for cable as noted on the appropriate Standard. These holes shall be factory drilled and a straight tapped coupling, conforming to Underwriters Laboratory's UL-6 Specification, for 3 in. rigid conduits, shall be installed for each hole. A nipple with a unitized hexagonal fitting and integral inside radius on one end shall then be installed and fully seated on the interior side of the coupling. Location and installation of the coupling shall be as shown in the Standards.

- (i) Install "J" hooks as follows, located 1 ft above the highest mast arm T dimension.
  - (1) Weld a single "J" hook inside the pole for single mast arm poles.
  - (2) Weld two "J" hooks inside the pole for twin mast arm poles and triple mast arm poles.
- (j) Hot dip galvanize all mast arms, mast arm poles, access hole frames and hardware, except materials manufactured from stainless steel or cast aluminum. The galvanized coating shall conform to the thickness, adherence and quality requirements of A 123 or A 153 for hardware. Chase and clean threaded components after galvanizing. Tap all internally threaded components the minimum amount required to permit assembly on the coated externally threaded fastener. Provide internally threaded components with a lubricant which shall be clean and dry to the touch.
- (k) Furnish each mast arm pole with four removable ornamental anchor bolt covers made of plastic. Bolt holes for attaching the bolt covers to the base plate shall be drilled at the location obtained by following the diagonal line of the base plate until it intersects the bolt circle diameter, then proceeding tangentially from the bolt circle diameter a distance equal to the Anchor Bolt Center to Bolt Slot Center Distance as provided in Standard MD 818.14. Attachment to the base shall be made using hex head stainless steel bolts (1/4 in. - 20 UNC).
- (l) Furnish each mast arm extension section and mast arm pole with a removable domed cap, fabricated from cast aluminum, circumferentially attached to the outside of the pole shaft or mast arm end with 3 hex head stainless steel bolts (1/4 in.- 20 UNC). All mast arm caps shall have inside diameter one in. larger than the outside diameter of mast arm end.
- (m) Each mast arm and mast arm pole shall have an identification plate mechanically attached, oriented such that the identification plate may be read from a ground observation position.
  - (1) Single piece mast arms and the butt section of two and three piece mast arms shall have the identification plate attached 6 in. above the flange plate.
  - (2) Each extension section of two and three piece mast arms shall have the identification plate attached 6 in. from the larger diameter end.
  - (3) Poles shall have the identification plate attached 6 in. above the bottom flange plate.
- (n) Insert recessed hub type, galvanized malleable iron plugs flush into all mast arm pole couplings.

**Anchor Bolts.**

- (a) Make each mast arm pole anchor bolt of steel in accordance with F1554, Grade 55 S1.
- (b) Anchor bolt threads shall be of cut thread design with a minimum 9 in. of threads at the top and bottom.
- (c) The template and anchor plates shall be as shown the contract documents.
- (d) Stamp the diameter of the anchor bolt into the top of the threaded end of each anchor bolt.
- (e) Provide each anchor bolt with two anchor bolt nuts and two flat washers.
  - (1) Anchor bolt nuts shall conform to A 194 grade 2 or 2H or A 563 D or DH.
  - (2) Tap all nuts oversize the minimum amount required to permit assembly on the coated externally threaded fastener.
  - (3) Washers shall conform to F436.
- (f) Hot dip or mechanically galvanize all nuts, washers and the top 12 in. of all anchor bolts. The galvanized coating shall conform to the thickness, adherence and quality requirements of A 123 or A 153 for hardware.

All high strength bolts (of a given length), nuts (of a given size) and washers (of a given diameter) shall be from the same manufacturing lot per each requisition of materials. The use of foreign made fasteners is prohibited!

**Alternate Design.** Alternate mast arm and mast arm pole designs will be considered provided the following qualifications are observed:

- (a) Alternate mast arm designs may use sectional construction provided each section has a minimum length of 30 ft except for the outer most section.
- (b) Overlap between sections shall be a minimum 18 in.
- (c) Bolt circle diameters shall be as specified in the Contract Document.
- (d) Alternate post designs may be straight (not tapered) sections and shall have a base diameter equal to, or no greater than 1 in. more than, those values shown on the Standards.
- (e) All alternate design must be structurally equivalent to the original design and as approved by the Engineer.

**818.02.02 Galvanized Steel Traffic Signal Pedestal Poles and Transformer Bases.**



Determine each pedestal pole's height by the total height of the pedestal pole including the transformer base.

- (a) 10 ft pole height consists of a 103 in. steel shaft with a steel base plate plus a 17 in. transformer base.
- (b) 14 ft pole height consists of a 151 in. steel shaft with a steel base plate plus a 17 in. transformer base.
- (c) 20 ft pole height consists of a 240 in. steel shaft with a steel base plate plus a 17 in. transformer base.

Each pedestal pole furnished shall consist of a design from a steel shaft with a steel base plate, transformer base and all miscellaneous hardware.

- (a) The pedestal pole shaft shall be fabricated of one length and shall have one longitudinal weld, parallel to the long axis of the pedestal pole shaft, with no transverse welds. The longitudinal weld shall be finished to form a smooth outside surface and the wall of the pedestal pole shaft shall be uniform in thickness including the welded area. The pedestal pole shaft shall be round or multi-sided (less than eight sides not acceptable) in cross section. 14 ft units shall be uniformly tapered from butt to tip with a 1 in. reduction in diameter for each 7 ft in length (0.14 in./ ft). 10 ft unit shall not be tapered.

- (1) 10 ft pedestal pole shaft shall be 4-1/2 in. outside diameter, Schedule 40 pipe, and conform to A 501, Grade A and A 500 Grade B or C, or equivalent.

- (2) All 14 ft pedestal poles shall be 7-1/2 in. outside diameter at the base and shall be made of 11 gauge (0.119 in.) thickness steel conforming to A 595, Grade A or equivalent.

- (3) All 20 ft pedestal poles shall be 7-1/2 in. outside diameter at the base and shall be made of 3 gauge (0.25 in.) thickness steel conforming to A 595, Grade A or equivalent.

- (b) The base plate material shall meet the requirements of A 709, Grade 50. Secure the base plate to the lower end of the pedestal pole shaft by two continuous electric arc welds. The base plate shall telescope the pedestal pole shaft with one weld on the inside of the base plate at the end of the pedestal pole shaft. The remaining weld shall be located on the outside of the base plate at the top of the pedestal pole shaft. The weld connection shall develop the full strength of the adjacent pedestal pole shaft to resist bending action. All bases plate shall be fabricated with the holes for anchor bolts to the size and location dimensions as shown in MD 818.16 and 818.17.

- (c) Furnish 14 ft pedestal poles with entrance ways for cable as noted in the contract

documents. These holes shall be factory drilled and a straight tapped coupling, conforming to Underwriters Laboratory's UL-6 Specification, for 2 in. rigid conduits, shall be installed for each hole. A nipple with a unitized hexagonal fitting and integral inside radius on one end shall then be installed and fully seated on the interior side of the coupling. Location and installation of the coupling shall be as shown in MD-818.17.

- (d) All pedestal poles and hardware, except materials manufactured from stainless steel or cast aluminum, shall be hot dipped galvanized. The galvanized coating shall conform to the thickness, adherence and quality requirements of A 123 and A 153 for hardware. Threaded components shall be chased and cleaned after galvanizing. All internally threaded components shall be tapped oversize the minimum amount required to permit assembly on the coated externally threaded fastener. Internally threaded components shall be provided with a lubricant which shall be clean and dry to the touch.
- (e) Furnish each pedestal pole with a removable domed cap, fabricated from cast aluminum, circumferentially attached to the side of the pole with three hex head type 304 stainless steel bolts (1/4 in. – 20 UNC).
- (f) Each pedestal pole shall have an identification plate mechanically attached 6 in. above the pedestal pole base plate and oriented so that the identification plate may be read from a ground observation position.
- (g) Recessed hub type, galvanized malleable iron plugs shall be inserted flush into all couplings.

**Transformer Bases.**

- (a) All transformer bases shall be approved by FHWA as meeting breakaway under NCHRP 350.
- (b) Furnish each transformer base with four hex head bolts, four hex head nuts and all associated hardware as shown on the appropriate detail for fastening the pedestal pole base plate to the top of the transformer base. All bolts shall conform to A 325 specifications and shall be galvanized.

**Anchor Bolts.**

- (a) Each pedestal pole anchor bolt shall be made of steel conforming to M 314, Grade 55 S1
- (b) Anchor bolt threads shall be of cut thread design with a minimum 6 in. of threads at the top.
- (c) The template and anchor plates shall be as shown on Standard MD 801.01.

- (d) The diameter of the anchor bolt shall be stamped into the top of the threaded end of each anchor bolt.
- (e) Each anchor bolt shall be provided with two attached heavy hex nuts and two attached flat washers.
  - (1) Anchor bolt nuts shall conform to A 194, grade 2 or 2H, or A 563, D or DH.
  - (2) All nuts shall be tapped oversize the minimum amount required to permit assembly on the coated externally threaded fastener.
  - (3) Washers shall conform to F 436.
- (f) All nuts, washers, and the top 12 in. of all anchor bolts shall be hot dipped or mechanically galvanized. The galvanized coating shall conform to the thickness, adherence and quality requirements of A 123 or A 153 for hardware.

All high strength bolts (of a given length), nuts (of a given size) and washers (of a given diameter) shall be from the same manufacturing lot per each requisition of materials. The use of foreign made fasteners is prohibited.

**818.02.03 Galvanized Steel Traffic Signal Strain Poles.**

Each strain pole furnished shall consist of a design from a steel shaft with a steel base plate, four anchor bolts and miscellaneous hardware.

- (a) Manufacture the strain pole shaft from steel tubing conforming to A 595 Grade A or equal. Each strain pole shaft shall be fabricated of one length and shall have one longitudinal weld, parallel to the long axis of the strain pole shaft, with no transverse welds. Finish longitudinal welds to form a smooth outside surface and the wall of the strain pole shaft shall be uniform in thickness including the welded area. The strain pole shaft shall be round or multi-sided (eight sides or more) in cross section and be uniformly tapered from butt to tip with approximately a 1 in. reduction in diameter for each 7 ft. in length (0.14 in./ft).
  - (1) All 30 ft. strain poles shall be 12 in. outside diameter at the base plate and made of zero gauge (0.312 in.) thickness steel.
  - (2) All 32 ft. strain poles shall be either 12 in. or 14 in. outside diameter at the base plate and made of double zero gauge (0.625 in.) thickness steel.
- (b) Furnish all strain poles with a base plate with a minimum 10 in. opening. The material shall meet the requirements of A 709, Grade 50 and be of sufficient size and strength. Secure the base plate the lower end of the strain pole shaft by two continuous electric arc welds. The base plate shall telescope the strain pole shaft with one weld on the inside of the base plate at the end of the strain pole shaft. The remaining weld shall be

located on the outside of the base plate around the circumference of the strain pole shaft. The weld connection shall develop the full strength of the adjacent strain pole shaft to resist bending action. Fabricate all base plates with the holes for anchor bolts to the size and location dimensions as shown on the appropriate detail.

- (c) Weld access hole frames into the strain pole as detailed in MD 818.11. Cover the access hole frame with a galvanized steel cover, conforming to C 1010. Secure the access hole covers top to the access hole frame by a hinge fabricated from stainless steel using a 0.125 in. diameter stainless steel hinge pin. Secure the hinge to the access hole frame by two 1/4 in.- 20 UNC hex head stainless steel bolts. Secure the hinge to the access hole cover by two 1/4 in.- 20 UNC hex head stainless steel bolts and lock nuts. Provide a slotted opening at the bottom of the access hole cover to allow for attachment of a furnished 1/4 in.- 20 UNC hex head stainless steel bolt into the access hole frame face.
- (d) A 3/8 in. diameter x 1 in. stud copper servit post for two #6 AWG stranded wire shall be furnished into the bottom of the access hole frame.
- (e) Furnish strain poles with entrance ways for cable as detailed in MD 818.15. These holes shall be factory drilled and a straight tapped coupling, conforming to Underwriters Laboratory's UL-6 Specification, for 3 in. rigid conduits, shall be installed for each hole. A nipple with a unitized hexagonal fitting and integral inside radius on one end shall then be installed and fully seated on the interior side of the coupling. Location and installation of the coupling shall be as shown in the Standards.
- (f) Weld a "J" hook near the top of the strain pole shaft for cable support.
- (g) All strain poles, access hole frame and hardware, except materials manufactured from stainless steel or cast aluminum, shall be hot dipped galvanized. The galvanized coating shall conform to the thickness, adherence and quality requirements of A 123 or A 153 for hardware. Clean and chase all threaded components after galvanizing. Tap all internally threaded components oversize the minimum amount required to permit assembly on the coated externally threaded fastener. Provide internally threaded components with a lubricant which shall be clean and dry to the touch.
- (h) Furnish each strain pole with four removable ornamental anchor bolt covers made of cast aluminum. Bolt holes for attaching the bolt covers to the base plate shall be drilled at the location obtained by following the diagonal line of the base plate until it intersects the bolt circle diameter, then proceeding tangentially from the bolt circle diameter a distance equal to the Anchor Bolt Center to Bolt Slot Center Distance as detailed in MD 818.14. Attach to the base using hex head stainless steel bolts (1/4 in.- 20 UNC).
- (i) Furnish each strain pole with a removable domed cap, fabricated from cast aluminum, circumferentially attached to the inside or outside of the pole shaft with three hex head stainless steel bolts (1/4 in. – 20 UNC).

- (j) Each strain pole shall have an identification plate mechanically attached, oriented such that the identification plate may be read from a ground observation position.
- (k) Insert recessed hub type, galvanized malleable iron plugs flush into all strain pole couplings.

**Anchor Bolts.**

- (a) Make each strain pole anchor bolt of steel and conforming to F1554, Grade 55 S1.
- (b) Anchor bolt threads shall be of cut thread design with a minimum 9 in. of threads at the top and bottom.
- (c) The template and anchor plates shall be as shown on MD 801.01.
- (d) Stamp the diameter of the anchor bolt into the top of the threaded end of each anchor bolt.
- (e) Provide each anchor bolt with two anchor bolt nuts and two flat washers.
- (f) Anchor bolt nuts shall conform to A 194 grade 2 or 2H or A 563 D or DH.
- (g) Tap all nuts oversize the minimum amount required to permit assembly on the coated externally threaded fastener.
- (h) Washers shall conform to F436.
- (i) Hot dip or mechanically galvanize all nuts, washers and the top 12 in. of all anchor bolts. The galvanized coating shall conform to the thickness, adherence and quality requirements of A123 or A153 for hardware.

All high strength bolts (of a given length), nuts (of a given size) and washers (of a given diameter) shall be from the same manufacturing lot per each requisition of materials. The use of foreign made fasteners is prohibited.

**Alternate Design.** Alternate strain pole designs will be considered provided the following qualifications are observed:

- (a) Alternate strain pole designs shall be of two piece construction.
- (b) Two piece construction shall have a minimum of 18 in. of overlap with 1 watertight transverse weld, smoothed to be inconspicuous.
- (c) Bolt circle diameters shall be followed.

- (d) Alternate strain pole designs shall have a base plate diameter equal to those values shown on the typical.
- (e) Single straight pipe sections are not acceptable.
- (f) All alternate designs shall be structurally equivalent to the physical requirements of this specification and as approved by the Engineer.

**818.04 MEASUREMENT AND PAYMENT.**

**ADD:** The following after the last paragraph.

**818.04.03** Mast Arm Pole and Mast Arm(s) will be measured and paid for at the contract unit price per each type of pole and mast arm(s) size as specified in the Contract Document. The payment will be full compensation for furnishing & installing all materials including vibration mitigation device, labor, equipment, materials, tools and incidentals necessary to complete the work.

**818.04.04** Breakaway Pedestal Poles will be measured and paid for at the Contract unit price per each type of pole and base furnished and installed. The payment will be full compensation for furnishing and installing pedestal poles, breakaway base and all materials, labor, equipment, tools and incidentals necessary to complete work.

**818.04.05** Strain Poles will be measured and paid for at the contract unit price per each type of pole furnished and installed. The payment will be full compensation for furnishing & installing all materials including labor, equipment, tools and incidentals necessary to complete the work.

**818.04.06** Anchor bolts will be measured and paid for as specified in Section 801.

**Tag Details**

**Galvanized Steel Traffic Signal Mast Arms and Mast Arm Poles.**

**Single Mast Arm Pole**

Mfg:	<u>  [1]  </u>	Contract. #:	<u>  [2]  </u>
Pole Height:	<u>  [3]  </u>		
Arm Sizes:	<u>  [4]  </u>		
Anchor Bolts:	<u>  [5]  </u>	Bolt Circle:	<u>  [8]  </u>
Flange Bolts:	<u>  [7]  </u>		

**One Piece Mast Arm**

Mfg:	<u>  [1]  </u>	Contract #:	<u>  [2]  </u>
Arm Length:	<u>  [6]  </u>		
Flange Bolts:	<u>  [7]  </u>		

**Two or three Piece Mast Arm - Butt Section**

Mfg:	<u>  [1]  </u>	Contract #:	<u>  [2]  </u>
Butt For Arms:	<u>  [4]  </u>		
Flange Bolts:	<u>  [7]  </u>		
Connection Bolt:	<u>  [9]  </u>		

**Two or three Piece Mast Arm –  
Extension Section**

Mfg:	<u>[1]</u>	Contract #:	<u>[2]</u>
Extension Arm:	<u>[6]</u>		
Connection Bolt:	<u>[9]</u>		

**Twin Mast Arm Pole  
(Identical Size Flange Plates)**

Mfg:	<u>[1]</u>	Contract #:	<u>[2]</u>
Pole Height:	<u>[3]</u>		
Arm Sizes:	<u>[4]</u>		
Anchor Bolts:	<u>[5]</u>	Bolt Circle:	<u>[8]</u>
Flange Bolts:	<u>[7]</u>		

Tag Reference.

- [ 1 ] Name of the manufacturer of the mast arm or mast arm pole.
- [ 2 ] Administration Contract Number of the mast arm or mast arm pole.
- [ 3 ] Pole Height
- [ 4 ] Mast Arm Size and Orientation. Length and Gauge Thickness
- [ 5 ] Anchor Bolts (Diameter, length and number of washers)
- [ 6 ] Mast Arm Length. Constructed Extension for arm length
- [ 7 ] Flange Bolt Size (diameter x length & washer type and quantity)
- [ 8 ] Bolt Circle (Diameter)



[ 9 ] Connection Bolt Size (diameter)

[ 10 ] Standard or Alternate Twin.

**Galvanized Steel Traffic Signal Pedestal Poles and Transformer Bases.**

Mfg: _____ [1] Contract #: _____ [2]
Pole Diameter: _____ [3] Height: _____ [4] Gauge: _____ [5]
Anchor Bolts: _____ [6] Bolt Circle: _____ [7]

Tag Reference.

[ 1 ] Name of the manufacturer of the pedestal pole.

[ 2 ] Administration Contract Number of the pedestal pole.

[ 3 ] Pole outside diameter at the base: 4-½ in. O.D. or 7-½ in. O.D.

[ 4 ] Pole height<sup>1</sup>: 10ft' , 14ft, 20 ft

[ 5 ] Pole gauge: Schedule 40 or 11 GA

[ 6 ] Anchor bolt size: 1 in. Dia. x 40 in. Length

[ 7 ] Bolt circle diameter: 11 in. Dia.

<sup>1</sup>Pole height includes the height of the pedestal pole and transformer base. Typically, the transformer base is 17 in. in height which corresponds to 10 ft pole having a height of 103 in.; and a 14 ft having a height of 151 in.

**Galvanized Steel Traffic Signal Strain Poles.**

<b>Mfg:</b> — [1]	<b>contract #</b> [2]	
<b>Pole Diameter:</b> [3]	<b>Height:</b> [4]	<b>Gauge:</b> [5]
<b>Anchor Bolts:</b> [6]	<b>Bolt Circle:</b> [7]	

Tag Reference.

[ 1 ] Name of the manufacturer of the strain pole.

[ 2 ] Administration Contract Number of the strain pole.

[ 3 ] Pole outside diameter at the base:

12" O.D. or 14" O.D.

[ 4 ] Pole height: 30' or 32'

[ 5 ] Pole gauge: 0 GA or 00 GA

[ 6 ] Anchor bolt size: 1-3/4" Dia. x 66" Length or 2-1/4" Dia. x 72" Length

[ 7 ] Bolt circle diameter: 16" Dia. or 22" Dia.

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**CATEGORY 800**  
**TRAFFIC**

**SECTION 819 — STEEL SPAN WIRE**

**819.01 DESCRIPTION.**

**DELETE:** The description paragraph in its entirety.

**INSERT:** The following.

Furnish and install steel span wire for signal head or sign mountings, interconnect runs, backguying, overhead communications cable pole to pole guying, overhead communications cable slack, span overhead communications cable, false dead ends or for tethering purposes.

**819.03 CONSTRUCTION.**

**DELETE:** The paragraph “Attach the span wire...free end of 2 ft.”

**INSERT:** The following.

Attach the span wire to the signal structure by wrapping two full turns of the span wire around the structures at the specified height leaving a free end of 2 ft.

**ADD:** The following after the third paragraph.

Install overhead communications cable steel span wire back guying, pole to pole guying, false dead ending and slack spans on all utility owned poles in accordance with the utility pole owners requirements. Install ram head type guy hooks for overhead communications cable steel span wire back guying, pole to pole guying, false dead ending and slack spans on all utility owned poles. Use wrap type guy grips to terminate the ends of overhead communications cable steel span wire back guying, pole to pole guying, false dead ending and slack spans. Strandwise devices shall not be used to terminate the steel span wire ends of overhead communications cable steel span wire back guying, pole to pole guying, false dead ending and slack spans.

**CATEGORY 800**  
**TRAFFIC**

**SECTION 821 — BREAKAWAY BASE SUPPORT SYSTEM**

**821.02 MATERIALS.**

**ADD:** The following after the last paragraph.

Supply tamper resistant bolts for access cover to breakaway transformer base for lighting structures.

**SPECIAL PROVISIONS**

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822 — REMOVE AND RELOCATE EXISTING SIGNS AND SIGN STRUCTURES 1 of 1

**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, luminaires, catwalks, sign lighting maintenance system, 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**

**AUDIBLE/TACTILE PEDESTRIAN PUSHBUTTON  
STATION AND SIGNS**

**DESCRIPTION.** Furnish and install self-contained audible/tactile pedestrian pushbutton station and signs, as specified in the Contract Documents or as directed by the Engineer.

**MATERIALS.** Provide audible/tactile pedestrian pushbutton station and signs and all component parts that meet the latest edition of the National Electrical Manufacturers Association (NEMA) Standards and Underwriters Laboratory (UL) standards, as applicable

If available, permanently engrave serial numbers and model numbers on all removable components and hardware. The serial number and model number shall be etched, stamped, molded, or attached using metallic self-adhesive labels. The use of adhesive backed paper labels is not acceptable.

**CONSTRUCTION.** Design audible/tactile pedestrian pushbutton station and signs to mount near or at the bottom of the pedestrian display mounting post. The pushbutton assembly for the audible signal may replace or supplement an existing pedestrian signal pushbutton.

Design audible/tactile pedestrian pushbutton station and signs as follows.

- (a) A single base unit at the traffic control cabinet shall be able to control 2 to 12 (maximum of 3 per phase) push button stations.
- (b) Only a single 2 conductor cable will be required from traffic controller cabinet per each pushbutton to operate all pushbutton features.
- (c) Each station will have a 2 in. button with a tactile raised directional arrow on the button.
  - (1) It shall be possible to change the arrow direction to one of four directions.
  - (2) Arrow/button shall vibrate during the walk period following a push of the button.
- (d) The push button station frame shall be cast aluminum with mounting holes for a 5 in. by 7.75 in. or larger pedestrian sign.

Provide audible/tactile pedestrian pushbutton station and signs that have the following features:

- (a) Locating tone
- (b) 5 walk sound choices that shall be field selectable.



## SPECIAL PROVISIONS

AUDIBLE/TACTILE PEDESTRIAN PUSHBUTTON STATION AND SIGNS

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- (c) 3 pedestrian clearance sound choices that shall be field selectable.
- (d) A direction of travel message shall be standard with extended push.
- (e) An information message shall be optional with extended push.

The audible sounds emitted by the audible/tactile pedestrian pushbutton station and signs shall have the following properties.

- (a) All audible sounds shall emanate from the push button station.
- (b) All audible sounds for all push button stations shall be synchronized.
- (c) Each audible feature shall have independently-adjustable minimum and maximum volume limits.
- (d) All sounds shall automatically adjust over a 60 dB range to compensate for ambient noise levels.
- (e) All volumes and optional features shall be settable using a handheld infrared device with password security. The infrared device shall be capable of updating/setting all push button stations, or the intersection from a single pushbutton station (Global updating).
- (f) The ability to mute sounds at all crosswalks except activated crosswalks.

The system shall have user-selectable multiple language capability.

The system shall be able to play an emergency preemption message.

The system shall be able to self-test its buttons and to report any faults to the traffic controller.

**Warranty.** Audible/Tactile pushbutton station and signs shall be warranted by the manufacturer for a period of 24 months from the date of delivery.

**Compatibility Testing.** Audible/Tactile pushbutton station and signs manufacturers shall certify that their modules meet the load switch and signal conflict monitor compatibility testing requirements found in the most recent, formally-adopted version of the specification titled "Pedestrian Traffic Control Signal Indications – Part 2: Light Emitting Diode (LED) Pedestrian Traffic Signal Modules," published by the Institute for Transportation Engineers (ITE).

**MEASUREMENT AND PAYMENT.** Audible/Tactile Pedestrian Pushbutton Station and Signs will be measured and paid for at the contract unit price each. The payment will be full compensation for furnishing, programming, delivery to the specified signal shop for testing, pick up, and installing the push button stations, signs, all cables, labor, equipment, tools, and incidentals necessary to

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AUDIBLE/TACTILE PEDESTRIAN PUSHBUTTON STATION AND SIGNS

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complete this work.

Audible/Tactile Pedestrian 2 Wire Central Control unit will be measured and paid for at the contract unit price per each. The payment will be full compensation for furnishing, programming delivery to the specified signal shop for testing, pick up, and installing the audible/tactile pedestrian base unit and all cables, labor, equipment, tools, and incidentals necessary to complete this work.

**CATEGORY 800**  
**TRAFFIC**

**CATALOG CUTS AND WORKING DRAWINGS**

**DESCRIPTION.** Prepare and transmit submittals to demonstrate the performance of the work 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. Submit stakeouts of the sign locations for all sign structure locations, as specified in the Contract Documents.

**MATERIALS.** Not Applicable.

**CONSTRUCTION.**

**Submittal Requirements.** Schedule and Coordinate submittals with the Contractors construction schedule. Submit a complete submittal schedule and list of required submittals with the first submittal, but no later than three days after the pre-construction conference. Arrange the schedule for submission of submittals so that related equipment items are submitted concurrently.

The Engineer may require changes to the submittal schedule to permit concurrent review of related equipment. Submit shop drawings for closely related items such as a sign and ITS support structures together.

**Submittal Documents.** Provide drawings neat in appearance, legible and explicit to enable proper review. D size plans shall still be legible when reduced to one half size. 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 drawings deviate from the Contract Documents, advise the Engineer in writing with the submittal and state the reason for the deviation.

No portion of the work requiring a Contractors drawing shall be started nor shall any materials be fabricated, delivered to the site, or installed prior to the approval or qualified approval of the drawings. Fabrication performed, materials purchased or on-site construction accomplished which does not conform to approved Contractors drawings shall be at the Contractors 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.

**SPECIAL PROVISIONS**  
**CATALOG CUTS AND WORKING DRAWINGS**

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In case of fixed mechanical and electrical equipment, submit layout drawings drawn to scale, to show required clearances for operation, maintenance and replacement of parts. Provide manufacturers certified performance curves, catalog cuts, pamphlets, descriptive literature, installation and application recommendations, 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.

Provide manufacturer's catalog, product and equipment data that includes 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.

Provide catalog cuts for sign luminaires with 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.

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 his 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 his 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 therefor.

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

**SPECIAL PROVISIONS**  
**CATALOG CUTS AND WORKING DRAWINGS**

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"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, include a 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 to:

Chief, Traffic Operations Division  
Maryland State Highway Administration  
7491 Connelley Drive  
Hanover, Maryland 21076

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 transmittal only on the exterior of each package. For original submittals, and each subsequent resubmittal that may be required, 9 copies will be submitted for projects administered by the District, and 6 copies will be submitted for projects administered by Office of Traffic and Safety. 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, TIMS number, TOD number, revision number, and date of drawing and revision.
- (b)** Applicable Contract Drawing Numbers and Specification Section and Paragraph Numbers.

**SPECIAL PROVISIONS**  
CATALOG CUTS AND WORKING DRAWINGS

CONTRACT NO. BA0065172  
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The first page of every catalog description, working drawing and material certification shall be stamped in red with the following. All pertinent Contract Document information shall be filled in the spaces provided.

MARYLAND STATE HIGHWAY ADMINISTRATION	
SUBMITTAL PACKAGE # _____ DATED _____	
CONTRACT # _____ LOCATION _____	
PROJECT DESC. _____	
ITEM # _____ THIS ITEM CONTAINS _____ PAGES	
ITEM DESCRIPTION _____	
<input type="checkbox"/> ACCEPTED	
<input type="checkbox"/> ACCEPTED AS NOTED	
<input type="checkbox"/> REJECTED - REVISE & RESUBMIT	
REVIEWERS NAME _____	DATE _____

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 copies of all Contractors drawings will be returned to the Contractor.

Each submittal shall be in accordance with the submission schedule. Allow thirty days for checking and appropriate action by the Engineer.

**SPECIAL PROVISIONS**  
CATALOG CUTS AND WORKING DRAWINGS

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Contractors 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 days for checking and appropriate action by the Engineer.

**MEASUREMENT AND PAYMENT.** Catalog Cuts, Manufacturers 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.

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**CATEGORY 800**  
**TRAFFIC**

**INSTALL CELLULAR ANTENNA AND LEAD-IN CABLE**

**DESCRIPTION.** Install Administration furnished cellular antenna and lead-in cable as specified in the contract documents or as directed by the Engineer.

**MATERIALS.**

Cellular antenna and lead in cable                      As approved by OIT and OOTS

**CONSTRUCTION.** Install Administration furnished cellular antenna and antenna lead in cable.

**MEASUREMENT AND PAYMENT.** Installing Administration furnished cellular antenna and lead in cable will be paid at the contract unit price per each. The payment will be full compensation for pickup, transportation and installation of the antenna and the antenna cable and for mounting hardware, material, labor, equipment, tools, and incidentals necessary to complete the work.

**CATEGORY 800**  
**TRAFFIC**

**TYPE 332/334 CABINETS**

**DESCRIPTION.** Furnish and install Type 332/334 cabinets for Intelligent Transportation Systems (ITS) devices as specified in the Contract Documents or as directed by the Engineer.

**MATERIALS.** All materials and equipment forming part of Type 332/334 cabinets shall be new and approved by the Engineer.

Cabinet and door  
Mounting hardware  
Anchor bolts, nuts and washers  
Conduit  
Power service conditioning and distribution equipment  
Environmental control equipment  
LED Cabinet Lighting

**CONSTRUCTION.** The following applies to all Type 332/334 cabinets, including those supplied by the manufacturer with Dynamic Message Signs (DMS).

**Cabinet: General.**

- (a) Fabricate assemblies of 0.060 in. minimum thickness aluminum or stainless steel sheet. Treat the metal surface with clear chromate.
- (b) All bolts, nuts, washers, screws (size 8 or larger), hinges and hingepins shall be stainless steel unless otherwise specified. Size 6 and smaller hardware shall be cadmium plated.
- (c) The enclosure, doors, lifting eyes, gasket channels, and all supports welded to the enclosure and doors shall be fabricated of 0.125 in. minimum thickness aluminum sheet.
  - (1) Bolted on supports shall be either the same material and thickness as the enclosure, or
  - (2) The input and power panels, and filter shell shall be fabricated of 0.080 in. minimum thickness aluminum sheet.

**Cabinet Equipment.**

- (a) All Type 332/334 cabinets shall include the following components.
  - (1) Metal-encased load center, configured for 120/240 volt operation.
  - (2) 19 in. EIA equipment rack assembly.
  - (3) Service Panel.
  - (4) Power Surge Suppression module configured for 120/240 Volt operation (See SURGE SUPPRESSION).
  - (5) T-1 Phone Line Surge Suppressor (See SURGE SUPPRESSION).

- (6) Front & rear LED traffic signal cabinet-style lighting
  - (7) Thermostatically-controlled fan cooling and cabinet heater.
- (b) The following equipment shall be completely removable from the cabinet without removing any other equipment and using only a slotted or Phillips screw driver.
- (1) Service Panel.
  - (2) T-1 Phone Line Surge Suppressor.
  - (3) All fuses, circuit breakers, switches (except Fan Fuse) and indicators shall be readily visible and accessible when the cabinet front door is open.
- (c) All equipment in the cabinet, when required, shall be clearly and permanently labeled.
- (1) The marker strips shall be made of material that can be easily and legibly written on using a pencil or ballpoint pen/marker.
  - (2) Marker strips shall be located immediately below the item they are to identify and be clearly visible with the items installed.
- (d) All assemblies shall allow air circulation through the top and bottom unless otherwise specified.
- (e) All assemblies and panels shall be mounted on the rack mounting rails per the cabinet detail.
- (f) All conductors, terminals, and parts which could be hazardous to maintenance personnel shall be protected with suitable insulating material.

**Housing Construction.** The housing shall be rainproof with the top of the enclosure crowned to prevent standing water. It shall have single front and rear doors, each equipped with a lock.

- (a) The cabinet exterior of the cabinet shall be unpainted, unless stated otherwise in the Contract Documents. All surfaces shall be free from dents, scratches, burrs, weld burns, or abrasions.
- (b) All exterior seams for enclosure and doors shall be continuously welded and shall be smooth.
  - (1) All edges shall be filed to a radius of 0.03125 in. minimum. Exterior cabinet welds shall be done by gas Tungsten arc TIG process only.
  - (2) ER5356 aluminum alloy bare welding electrodes conforming to AWS A5.10 requirements shall be used for welding on aluminum.
- (c) Procedures, welders and welding operators shall conform to the requirements and practices in AWS B3.0 and C5.6 for aluminum. Internal cabinet welds shall be performed using either a gas metal arc MIG or gas tungsten arc TIG process.
- (d) The enclosure door frames shall be double flanged out on all four sides and shall have strikers to hold tension on and form a firm seal between the door gaskets and the frame. The dimension between the door edge and the enclosure external surface when the door is closed and locked shall be 0.156 (+/-0.08) in.

- (e) Gaskets shall be provided on all door openings and shall be dust tight.
  - (1) Gaskets shall be 0.25 in. minimum thickness closed cell neoprene or silicone and shall be permanently bonded to the metal.
  - (2) If neoprene is used the mating surface of the gaskets shall be covered with a silicone lubricant to prevent sticking to the mating metal surface. A Gasket Top Channel shall be provided to support the top gasket on the door.
- (f) Rack bottom support mounting angles shall be provided on either side, level with the bottom edge of the door opening, for horizontal support and bolt attachment.
  - (1) In addition, side rack supports shall be provided for the upper rack bolt attachments.
  - (2) Spacer brackets between the side rack supports and the rack shall be a minimum thickness of either 0.188 in. aluminum or 0.059 in. stainless steel.
- (g) The housing shall be provided with 2 lifting eyes for placing the cabinet on its foundation. Each eye opening shall have a minimum diameter of 0.75 in. Each eye shall be able to support a weight load of 1000 lbs.
  - (1) All exterior bolt heads shall be tamper proof type.
  - (2) The housing shall not have a police door.
  - (3) The housing shall be equipped with metal hooks to hang a plastic envelope as specified herein.
- (h) Door lock handles shall have provisions for padlocking in the closed position.
  - (1) Each handle shall be 0.75 in. minimum diameter stainless steel with a minimum 0.5 in. shank.
  - (2) The padlocking attachment shall be placed at 4.0 in. from the handle shank center to clear the lock and key. An additional 4.0 in. minimum gripping length shall be provided.
- (i) The latching mechanism shall be a three-point draw roller type. The pushrods shall be turned edgewise at the outward supports and have a cross section of 0.25 in. thick by 0.75 in. wide, minimum.
- (j) When the door is closed and latched, the door shall be locked.
  - (1) The locks and handles shall be on the right side of the front door and the left side of the rear door.
  - (2) The lock and lock support shall be rigidly mounted on the door.
  - (3) In the locked position, the bolt throw shall extend a minimum of 0.25 +/-0.03125 in. into the cam area.
  - (4) A seal shall be provided to prevent dust or water entry through the lock opening.
- (k) The locks shall be compatible with the Administration's existing dead bolt cabinet locks, and key hole cover and be keyed for a number 2 key.

- (1) One key shall be supplied with each lock.
  - (2) The keys shall be removable in the locked position only.
  - (3) The lock body, key receptacle, and keyhole cover shall be brass.
- (l) The locks shall have rectangular, spring loaded bolts. The bolts shall have a 0.375 in. thick (tolerance: +/-0.035 in.).
- (m) The center latch cam shall be fabricated of a minimum thickness 0.1875 in. steel or aluminum.
- (1) The bolt surface shall horizontally cover the cam thickness.
  - (2) The cam shall be structured to only allow the door to open when the handle is moved toward the center of the door.
- (n) Rollers shall have a minimum diameter of 0.875 in. with nylon wheels and steel ball bearings.
- (o) The housing ventilation including intake, exhaust, filtration, fan assembly and environmental control are as follows:
- (1) The front and rear doors shall be provided with louvered vents. The louvered vent depth shall be a maximum of 0.25 in.
  - (2) A removable and reusable air filter shall be housed behind the door vents.
    - (a) The filter shall be 16 in. wide by 12 in. high by 1 in. thick.
    - (b) The filter area shall cover the vent opening area.
  - (3) A filter shell shall be provided that fits over the filter providing mechanical support for the filter.
    - (a) The shell shall be louvered to direct the incoming air downward.
    - (b) The shell sides and top shall be bent over a minimum of 0.25 in. to house the filter.
    - (c) The filter in its shell shall be held firmly in place with a bottom bracket and a spring loaded upper clamp.
- No incoming air shall bypass the filter.
- The bottom filter bracket shall be formed into a water-proof sump with drain holes to the outside housing.
- (p) The intake (including filter with shell) and exhaust areas shall pass a minimum of 60 cubic feet of air per minute for the Type 332/334 Cabinet.
- (q) The housing shall be equipped with dual electric fans with ball or roller bearings and a capacity of at least 100 cubic feet of free air delivery per minute each. The fans shall be mounted within the housing with a finger guard, and vented.
- (1) The fans shall be thermostatically controlled and shall be manually adjustable to turn



**SPECIAL PROVISIONS**  
**TYPE 332/334 CABINETS**

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- on between 33 C and 65 C with a differential of not more than 6 C between automatic turn on and off.
- (2) The fan circuit shall be protected at 125 percent of the fan motor ampacity.
  - (3) The manual adjustment shall be graded in 10 C increment scale.
- (r) The housing shall be equipped with a heater rated for traffic cabinet use installed in the bottom, and conforming to the following requirements.
- (1) The heating element shall be rated at 500 watts and have a minimum output of 1700 BTU/hr.
  - (2) The heating element shall have a built-in quick response thermostat with sealed contacts with a temperature control range of 40 F to 100 F, and a built-in thermal cut-off to automatically turn off the heater in case of overheating.
  - (3) The heating element shall have a protective cover with vent holes to prevent damage to adjacent wires or burns to service personnel.
- (s) Each cabinet shall be supplied with traffic cabinet-rated modular LED light assemblies, located vertically on both sides of the front and rear door frames to provide uniform illumination of the cabinet interior.
- (1) Cool White: 5000K
  - (2) Operating Temperature: -10C to +40C Free air or cabinet mounted.
  - (3) 24 Volt
  - (4) 280 lumens per single module.
  - (5) Class 2 Power supply included.
  - (6) Switched to activate whenever either door is opened.
  - (7) UL-2108 Approved
- (t) Hinges and Door Catches - Two-bolt per leave hinges shall be provided to bolt the enclosure to the door.
- (1) The housing doors shall have 4 hinges.
  - (2) Each hinge shall be 3.5 in. minimum length and have a fixed pin.
    - (a) The pin ends shall be welded to the hinge and ground smooth.
    - (b) The pins and bolts shall be covered by the door edge and not accessible when the door is closed.

- (u) Front and rear doors shall be provided with catches to hold the door open at both 90° and 180°, +/-10°.
  - (1) The catch minimum diameter shall be either 0.375 in. for plated steel or aluminum rods or 0.25 in. for Stainless steel.
  - (2) The catches shall be capable of holding the door open at 90 in a 60 mph wind acting at an angle perpendicular to the plane of the door.
- (v) Each cabinet shall be supplied with a heavy duty plastic envelope to store site plans, wiring diagrams, schematics, etc.
  - (1) This envelope shall have metal grommets so that it hangs from the door hooks.
  - (2) The envelope shall have minimum dimensions of 10 in. x 15 in.

**Rack Assembly.** A standard EIA 19 in. rack assembly shall be installed inside the housing for mounting of the controller unit and cabinet assemblies.

- (a) The EIA portion of the rack shall consist of 2 pairs of continuous, adjustable equipment mounting angles.
- (b) The angle nominal thickness shall be either 0.1345 in. for plated steel or 0.105 in. for stainless steel.
- (c) The angles shall be tapped with 10-32 threads with EIA universal spacing.
- (d) The angles shall comply with Standard EIA RS-310-B and shall be supported at the top and bottom by either welded or bolted support angles to form a rigid framework.
- (e) Clearance between the rack rails for mounting assemblies shall be 17.75 in.
- (f) Two steel supporting angles extending from the front to the back rails shall be supplied to support the controller unit.
  - (1) The angles shall be designed to support a minimum of 50 lbs. each.
  - (2) The horizontal side of each angle shall be a minimum of 3 in.
  - (3) The angles shall be vertically adjustable.
- (g) The rack assembly shall be bolted to the cabinet at 4 points, via the housing guide frame supports and associated spacer brackets, 2 at the top and 2 at the bottom of the rails.
- (h) The rack frame shall be centered within the cabinet.
- (i) Each cabinet rack shall be equipped with one fixed shelf and one pull-out drawer as described below. Shelves shall be the full width of the rack and 12 in. deep. Both shall be located below the main device controller (LCU for CCTV, and DMS controller for message signs).

- (1) Shelves and pull-out drawers shall be constructed of 0.125 in. aluminum (minimum).
- (2) The fixed shelf shall be located directly below the controller or LCU and attach to the rack assembly by using four (4) Phillips head screws to the front of the rack. It shall have a 1 in. lip turned up along the back edge of the shelf.
- (3) The fixed shelf shall be designed to support a minimum of 50 lbs.
- (4) The pull-out drawer (aka the "laptop shelf") shall be located below the fixed shelf and shall consist of a 2-inch deep storage compartment with a lift-up lid, hinged from the rear. The lid shall have a rubber or other non-skid surface for laptop computers or other diagnostic equipment.

**Power Distribution.** Type 332/334 cabinets shall be equipped with a metal-encased, split-phase load center, equipped with main breakers rated at 60 amperes for DMS, and 30 amperes for CCTV and Detectors. The panel shall be mounted on a 0.125 in. aluminum plate that spans the right side front and rear rack rails, and shall be located on the lower right-hand side of the cabinet, below the rack assembly.

- (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.
  - (1) Two 15-ampere and two 20-ampere single pole circuit breakers shall be provided for each side of the load center, unless the cabinet is to be used for a Dynamic Message Sign (DMS).
  - (2) Cabinets used for Dynamic Message Signs 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 wall adjacent to the load center. This outlet shall be wired to remain energized at all times. Circuit interruption shall occur on 6 ma of ground-fault current and shall not occur on less than 4 ma of ground-fault current.
- (d) **Main Power Surge Suppression.** All Type 332/334 cabinets shall be provided with main input power surge suppression (See SURGE SUPPRESSION). The surge suppression equipment shall be located adjacent to the load center.

**Service Panel.** All cabinets shall have an aluminum service panel, containing electrical outlets and other associated equipment.

- (a) Viewed from the front door, the Service Panel shall be mounted on a 0.125 inch thick aluminum plate that is mounted between the left-side rack rails at the upper left-hand side of the cabinet.

- (b) The service panel shall be equipped with a metal-encased box with two, grounded, duplex outlets.
- (c) The outlet box shall be wired to one of the 15-ampere circuit breakers specified above.

**Panels: Mechanical.** All panels shall be fabricated from 0.125 in. sheet aluminum.

- (a) All panels shall be drilled and tapped, as necessary, to mount the terminal blocks, handi-box outlets, and other devices described herein, as well as to mount the panels to the required locations inside the cabinet.
- (b) Sharp edges or burrs caused by the cutting or drilling process shall be removed.
- (c) Details for all panels shall be submitted with the cabinet catalog cuts, showing the locations of all devices to be mounted.

**Cabinet Wiring.**

- (a) All conductors that carry AC power shall be encased in an appropriately-sized, continuous flexible metal conduit (sheath) from their origination point to their destination, as follows.
  - (1) Main Power: From a depth of at least 3 in. inside the main power conduit from the cabinet entry point to the Load Center.
  - (2) Branch Circuits: Between the load center and each individual circuit: GFCI outlet, service panel duplex outlets, and heater and fan circuit thermostats, and those thermostats and their respective components.

Flexible metal conduit shall be properly terminated at each panel or device box in accordance with the latest edition of the NEC.

- (b) All conductors used in cabinet wiring shall terminate with properly sized non-insulated or clear insulated spring-spade type terminals except when soldered for a specific application.
- (c) All conductors, except those which can be readily traced, shall be labeled. Labels attached to each end of the conductor shall identify the destination of the other end of the conductor.
- (d) All conductors shall conform to the following color-code requirements.
  - (1) The neutral conductors of AC circuits shall be identified by a continuous white or gray color.
  - (2) The equipment grounding conductors shall be identified by a solid green color.
  - (3) The ungrounded AC+ conductors shall be identified by a solid black wire.
- (e) All wiring harnesses and sheaths shall be neat, firm, and routed to minimize crosstalk and electrical interference.

- (1) Cabling shall be routed to prevent conductors from being in contact with metal edges.
  - (a) Cabling shall be arranged so that any removable assembly may be removed without disturbing conductors not associated with that assembly.
  - (b) Adhesive-type cable clamps shall not be accepted.
- (2) All cable assemblies consisting of three (3) or more wires/cables shall be wire wrapped.

**Cabinet Installation.**

(a) **Mounting.** Securely fasten Detector Cabinets-Type 332/334 on new or modified concrete bases, in pole-mounted configurations as shown on the Plans, or as directed by the Engineer. New foundations shall be incidental to the cabinet item.

- (1) Bolted stainless steel connections shall be provided with lockwashers, locking nuts, or other approved means to prevent the connection nuts from loosening.
- (2) Dissimilar materials shall be isolated from one another by stainless steel fittings.
- (3) Cabinets shall have a continuous neoprene gasket between the base and the foundation to prevent the ingress of water and other contaminants.

(b) **Power Connections.** Make all power connections to the Type 332/334 cabinet.

- (1) The neutral bus shall be isolated from the cabinet and equipment ground.
- (2) The bus shall terminate at the neutral lug ultimately attached to the meter pedestal.

(c) **Equipment Connections.** Make all equipment connections within the Type 332/334 cabinet to provide the required operation.

**Testing.** After the equipment specified in the Contract Documents has been installed, and all and connecting cabling has been installed, a field test shall be conducted for each cabinet.

- (a) The test is designed to demonstrate that all hardware, cable, and connections furnished and installed operate correctly and that all functions are in conformance with the Specifications.
- (b) The field test will begin within 48 hours after the Engineer is advised by the Contractor that he is ready to begin the test.
- (c) The test may begin when the Contractor is satisfied that all work has been completed at each cabinet location. After the cabinet and equipment has been placed in operation, demonstrate that all equipment furnished and installed operates as specified herein.
- (d) Each cabinet and its associated equipment shall be tested for proper operation for 30 consecutive days.
  - (1) During the testing period, all Contractor-provided equipment in the cabinet shall operate without failures of any type.
  - (2) If any component malfunctions or fails to provide the capabilities specified herein, during

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**TYPE 332/334 CABINETS**

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the 30-day test period, the replace or repair the defective equipment within 48 hours or notification by the Engineer.

- (3) The cost of correcting component malfunctions shall be borne by the Contractor.
- (4) After a component malfunction has been corrected to the satisfaction of the Engineer, a new 30-day test period shall be started.
  - (a) The 30-day test applies only to Contractor-furnished hardware.
  - (b) In the event of a failure of hardware furnished by others that prevents the 30- day test from continuing, the test shall be suspended until the non-Contractor furnished hardware has been repaired or replaced.
  - (c) The cost of correcting malfunctions in Contractor-furnished equipment shall be borne by the Contractor.
- (e) After a component malfunction has been corrected to the satisfaction of the Engineer, a new 30-day test period shall be started.
  - (1) The 30-day test applies only to Contractor-furnished hardware.
  - (2) In the event of a failure of hardware furnished by others, or failure of detector hardware, that prevents the 30-day test from continuing, the 30-day test will be suspended until the other hardware failures are corrected, at which time the test will resume.
- (f) **Documentation.** The equipment supplier shall provide three sets of operating manuals, service manuals, and maintenance instructions for all components of the system.

**MEASUREMENT AND PAYMENT.**

**ITS Equipment Cabinets.** This work will be measured and paid for at the contract unit price each for each Type 332/334 that is furnished, installed and accepted. The payment shall be full compensation for the Type 332/334 cabinet, concrete cabinet foundation, neoprene gasket, racks, assembly cables, connections, all testing, labor, tools, materials, painting (if necessary), and incidentals necessary to complete this work.

**Dynamic Message Signs (DMS).** Type 332/334 cabinets supplied by manufacturers with their DMS will not be measured separately, but the cost shall be incidental to the price bid for each DMS furnished and installed. The cost shall include the cabinet, concrete cabinet foundation, neoprene gasket, and all necessary equipment, including the sign controller, racks, assembly cables, connections, testing, labor, tools, materials, painting (if necessary) and incidentals necessary to complete the work.

**CATEGORY 800**  
**TRAFFIC**

**SECTION 806—LUMINAIRES AND LAMPS**

**806.03 CONSTRUCTION.**

**806.03.05 Luminaire Photometric Data and Calculations.**

**(b) Photometric Calculations.**

**ADD:** The following after the seventh paragraph, “For Light Emitting ... no greater than 4 to 1.”

For Light Emitting Diode (LED) Underpass Luminaires, correction factors shall be applied for the lumen retention at 50 000 hours. The illuminance shall not decrease by more than 30 percent at 50 000 hours, which results in a Lamp Lumen Depreciation (LLD) factor of 0.70. Apply an additional factor of 0.9 for Luminaire Dirt Depreciation (LDD), to obtain a total maintenance factor of 0.63 for calculations. Provide a luminaire mounting height of 17.5 ft with light centers directly over the edge line of the roadway. Assume four luminaires in a straight line, parallel to the roadway, spaced at 40 ft each. Perform calculations for illuminance and luminance based on a R3 class pavement. The calculation grid shall be based on one 12 ft lane and shall be placed between the center two luminaires. Calculate two lines of points for the each lane. The first and the second line of calculation points shall be 4 ft from the left and 4 ft from the right edge lines, respectively. Start each line of calculation points directly under the second luminaire and continue every 5 ft until directly under the third luminaire. Each line shall have 9 points, and a total of 18 points shall be calculated. To be acceptable, the average maintained illuminance of all 18 points shall be 4.0 ft candles or greater with an average to minimum uniformity ratio no greater than 1.5 to 1.

**(d) Fixed Aim LED Luminaires.**

**ADD:** The following after the last sentence, “For 480 volt operation...to reduce the voltage”.

All LED Roadway Luminaires shall be cobrahead style unless otherwise specified in the Contract Documents.

**ADD:** The following after the paragraph for (d) Fixed Aim LED Luminaires.

**(e) Underpass LED Luminaires.** LED Underpass Luminaires shall be a complete lighting device consisting of a cast aluminum housing, LED arrays, LED drivers, terminal blocks, mounting hardware, associated hardware, all necessary wiring, and an optical assembly that provides an Illuminating Engineering Society of North America (IESNA) Type II, Type III, Type IV, or Type V distribution as specified in

the contract documents. If no distribution type is specified, then the Luminaire must have an IESNA Type III distribution. Glare control optics shall be utilized when available. LED Underpass Luminaires should meet the requirements of a Full Cutoff distribution as defined by IESNA. For 480 volt operation, an integral transformer shall be provided to reduce the voltage.

**806.04 MEASUREMENT AND PAYMENT.**

**ADD:** The following after the second paragraph.

LED Underpass Luminaires will be measured and paid for at the Contract unit price per each. The payment will be full compensation for the LED Underpass Luminaire and drivers, mounting hardware, wiring, integral transformer, and all materials, labor, equipment, tools, and incidentals necessary to complete the work.



**CATEGORY 800**  
**TRAFFIC**

**SECTION 806 — LUMINAIRES AND LAMPS**

**806.03.05 Luminaire Photometric Data and Calculations.**

**DELETE:** 806.03.05 (c).

**INSERT:** The following.

- (c) **High Mast Luminaires.** High mast luminaires shall have an IES type 5 distribution pattern or as specified in the Contract Documents. The luminous intensity shall not exceed 100 candelas per 1000 lamp lumens for any point 80 degrees, or higher, above nadir; or exceed 0 candelas per 1000 lamp lumens for any point 90 degrees, or higher, above nadir.

**CATEGORY 800**  
**TRAFFIC**

**SECTION 810 — ELECTRICAL CABLE, WIRE AND CONNECTORS**

**810.03 CONSTRUCTION.**

**810.03.03 Preassembled Cable Duct.**

**DELETE:** The second paragraph beginning “After backfilling...or a rubber device.” in its entirety.

**INSERT:** The following.

After backfilling, demonstrate that the conductors move freely within the duct by pulling the conductors out a minimum length of 2 ft. Pulling Tension shall conform to 810.03.02. Then, pull the cable back to its original position and install the cable duct end seals. Completely seal cable duct ends using a waterproof removable sealing compound, a molded plastic device, or a rubber device. After installation of the cable duct end seals, but prior to installing connector kits or splices, perform electrical circuit testing as specified in 820.03.02 (b) and record the results. Record the length of cable, locations of both ends of the cable duct, and the insulation resistance on a form acceptable to the Engineer, and forward the form to the Engineer.

**810.04 MEASUREMENT AND PAYMENT.**

**810.04.01.**

**ADD:** The following after the last sentence in 810.04.01.

Cable end duct seals will not be measured, but their cost will be incidental to the linear foot cost for the duct cable. Preassembled Cable Duct that has not had the required electrical tests performed and reported to the engineer will not be measured or paid for.

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TRAFFIC**

**SECTION 816 — TRAFFIC CONTROL DEVICE CABINETS AND EQUIPMENT**

**816.04 MEASUREMENT AND PAYMENT.**

**DELETE:** 816.04.02 in its entirety.

**INSERT:** The following.

**816.04.02** Concrete foundations for Traffic Control Device Cabinets and Equipment will not be measured and paid for, but will be incidental to the pertinent traffic control cabinet item.

**CATEGORY 800**  
**TRAFFIC**

**SECTION 817 — PUSH BUTTONS AND PUSH BUTTONS SIGNS**

**817.01 DESCRIPTION.**

**ADD:** The following after the first paragraph.

Furnish and install self-contained audible/tactile pedestrian push button station and push button signs, as specified in the Contract Documents or as directed by the Engineer.

**817.02 MATERIALS.**

**ADD:** The following to the end of the list of materials.

**817.02.01 Audible/Tactile Pedestrian Push Button Station and Push Button Sign.** Provide audible/tactile pedestrian pushbutton station and signs and all component parts that meet the latest edition of the National Electrical Manufacturers Association (NEMA) Standards and Underwriters Laboratory (UL) standards, as applicable

If available, permanently engrave serial numbers and model numbers on all removable components and hardware. The serial number and model number shall be etched, stamped, molded, or attached using metallic self-adhesive labels. The use of adhesive backed paper labels is not acceptable.

**817.03 CONSTRUCTION.**

**ADD:** The following after the last paragraph.

**817.03.01 Audible/Tactile Pedestrian Push Button Station and Push Button Sign.** Design audible/tactile pedestrian pushbutton station and signs to mount near or at the bottom of the pedestrian display mounting post. The pushbutton assembly for the audible signal may replace or supplement an existing pedestrian signal pushbutton.

Design audible/tactile pedestrian pushbutton station and signs as follows.

- (a) A single base unit at the traffic control cabinet shall be able to control 2 to 12 (maximum of 3 per phase) push button stations.
- (b) Only a single 2 conductor cable will be required from traffic controller cabinet per each pushbutton to operate all pushbutton features.
- (c) Each station will have a 2 in. button with a tactile raised directional arrow on the button.

- (1) It shall be possible to change the arrow direction to one of four directions.
- (2) Arrow/button shall vibrate during the walk period following a push of the button.
- (d) The push button station frame shall be cast aluminum with mounting holes for a 5 in. by 7.75 in. or larger pedestrian sign.

Provide audible/tactile pedestrian pushbutton station and signs that have the following features:

- (a) Locating tone
- (b) 5 walk sound choices that shall be field selectable.
- (c) 3 pedestrian clearance sound choices that shall be field selectable.
- (d) A direction of travel message shall be standard with extended push.
- (e) An information message shall be optional with extended push.

The audible sounds emitted by the audible/tactile pedestrian pushbutton station and signs shall have the following properties.

- (a) All audible sounds shall emanate from the push button station.
- (b) All audible sounds for all push button stations shall be synchronized.
- (c) Each audible feature shall have independently-adjustable minimum and maximum volume limits.
- (d) All sounds shall automatically adjust over a 60 dB range to compensate for ambient noise levels.
- (e) All volumes and optional features shall be settable using a handheld infrared device with password security. The infrared device shall be capable of updating/setting all push button stations, or the intersection from a single pushbutton station (Global updating).
- (f) The ability to mute sounds at all crosswalks except activated crosswalks.

The system shall have user-selectable multiple language capability.

The system shall be able to play an emergency preemption message.

The system shall be able to self-test its buttons and to report any faults to the traffic controller.

**Warranty.** Audible/Tactile pushbutton station and signs shall be warranted by the manufacturer for a period of 24 months from the date of delivery.

**Compatibility Testing.** Audible/Tactile pushbutton station and signs manufacturers shall certify that their modules meet the load switch and signal conflict monitor compatibility testing requirements found in the most recent, formally-adopted version of the specification titled “Pedestrian Traffic Control Signal Indications – Part 2: Light Emitting Diode (LED) Pedestrian Traffic Signal Modules,” published by the Institute for Transportation Engineers (ITE).

#### **817.04 MEASUREMENT AND PAYMENT.**

**ADD:** The following after the first paragraph.

Audible/Tactile Pedestrian Pushbutton Station and Signs will be measured and paid for at the contract unit price each. The payment will be full compensation for furnishing, programming, delivery to the specified signal shop for testing, pick up, and installing the push button stations, signs, all cables, labor, equipment, tools, and incidentals necessary to complete this work.

2 Wire APS Central Control unit will be measured and paid for at the contract unit price per each. The payment will be full compensation for furnishing, programming delivery to the specified signal shop for testing, pick up, and installing the audible/tactile pedestrian base unit and all cables, labor, equipment, tools, and incidentals necessary to complete this work.

**SPECIAL PROVISIONS INSERT**  
905 — PIPE

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**CATEGORY 900**  
**MATERIALS**

**SECTION 905 — PIPE**

**DELETE:** 905.03 in its entirety.

**INSERT:** The following.

**905.03 CERTIFIED CORRUGATED POLYETHYLENE PIPE PLANTS**

Polyethylene pipe conforming to specifications will be accepted on the manufacturer's certification based on the requirements outlined below. This includes the sampling, testing documentation, and certification of the product by the manufacturer in combination with an Administration Monitoring Program.

**905.03.01 Responsibilities of the Corrugated Polyethylene Pipe Manufacturer.** All manufacturers of Corrugated Polyethylene Pipe must be enrolled in the National Transportation Product Evaluation Program (NTPEP) to provide Corrugated Polyethylene Pipe to Administration projects. If a new manufacturer has applied to NTPEP and is awaiting the NTPEP process, the manufacturer may submit to OMT proof of application, a copy of the QCP, and results of an audit and comparison testing by an independent third-party firm which has been signed by a Professional Engineer. Upon review, a pending letter of approval will be issued until such time as the NTPEP audit process is completed.

**905.03.02 Test Facilities.** The NTPEP Certification Program requires all tests to be conducted at laboratories that are accredited by AASHTO or approved by the Administration. Each source may establish and maintain its own laboratory for the performance of quality control testing or may request to utilize an approved independent laboratory. The manufacturer shall make a written request and have written approval from the Administration prior to having material tested off site. The equipment required for all approved laboratories shall be qualified to perform the required test procedures as required by the applicable specification and standards.

**905.03.03 Certification.** The manufacturer shall certify as specified in TC-1.03, each shipment of material. The certification shall be submitted to the Structural Materials Lab for review and stamping upon shipment of material. The certification shall include the following:

- (a) Plant name, address, and location.
- (b) Lot or production identification.
- (c) Date of manufacture and shipment.
- (d) Number of units of each size pipe or total linear ft of each size pipe.
- (e) Contract number.
- (f) Statement of specification compliance.
- (g) Signature of the quality control manager, or authorized company representative (name shall be designated in the QCP).
- (h) Perforation dimensions.
- (i) Identification Markings.

**SPECIAL PROVISIONS INSERT**  
905 — PIPE

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- (j) Test data as applicable.
  - (1) Density
  - (2) Melt Index
  - (3) NCLS
  - (4) UCLS
  - (5) Carbon Black Content
  - (6) Water Inlet Data
  - (7) Pipe Stiffness
  - (8) Pipe Flattening
  - (9) Brittleness
  - (10) OIT
  - (11) Elongation at Break

**905.03.04 Records.** The manufacturer shall maintain quality control records according to their Quality Control Plan. All testing and inspection documents shall be maintained at the manufacturing facility for at least seven years from the manufactured date and made available upon request.

**905.03.05 Responsibilities of the Administration.** The Administration may independently verify the manufacturer's certification results by taking random samples of the finished pipe for testing from plant inspections or from project site samples and review all testing results for conformance to specifications.

The Administration will perform a visual inspection on pipe received at the project and will collect the manufacturer's certification at the time of delivery.



**SPECIAL PROVISIONS INSERT**  
908 — REINFORCING STEEL

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1 of 1

**CATEGORY 900**  
**MATERIALS**

**SECTION 908 — REINFORCING STEEL**

**908.10 TIE DEVICES FOR CONCRETE PAVEMENT**

**DELETE:** The following.

Tie devices shall have a minimum tensile strength of 48 000 psi.

**INSERT:** The following.

Tie devices shall have a minimum tensile strength of 40 000 psi.

**SPECIAL PROVISIONS INSERT**  
**918 — TRAFFIC BARRIERS**

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1 of 1

**CATEGORY 900**  
**MATERIALS**

**SECTION 918 — TRAFFIC BARRIERS**

**918.01 TRAFFIC BARRIER W BEAM/THRIE-BEAM**

**ADD:** The following after the last sentence.

Producers of Traffic Barrier shall participate in the National Transportation Product Evaluation Program (NTPEP) audit program.

**SPECIAL PROVISION INSERT**  
921 — MISCELLANEOUS

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1 of 2

**CATEGORY 900**  
**MATERIALS**

**SECTION 921 — MISCELLANEOUS**

**DELETE:** 921.06 TIMBER PRESERVATIVES in its entirety.

**INSERT:** The following.BA0065172

**921.06 TIMBER PRESERVATIVES.** All preserved wood used for highway construction and maintenance applications shall be treated per M 133, and the American Wood Protection Association (AWPA) and ICC-ES standards for preservative, retention, and penetration with United States Environmental Protection Agency (EPA) pesticide registrations. Timber preservatives shall meet the following:

- (a) Water borne preservatives shall be used where a clean surface is desired, or when the wood is to be painted. Moisture content of wood shall not be greater than 19 percent at the time of treatment.
- (b) All treated wood shall be free of excess preservative on the surface. Creosote-treated wood shall be double vacuum treated per EPA requirements for use in aquatic and marine environments.
- (c) Wood used for sign posts, fence posts, wood posts, guardrail posts, bridge decking, gates, stair treads, and offset blocks shall be treated per M 133 and AWPA standards with EPA pesticide registrations.
- (d) Wood used for piles, timbers, and composites shall be treated per M 133 and AWPA standards with EPA pesticide registrations.
- (e) Wood used for hand-contact surfaces such as handrails, playground equipment and picnic tables shall be treated per M 133 and AWPA standards with EPA pesticide registrations for residential applications. Fasteners for preservative treated wood shall be hot-dipped galvanized steel conforming to A153 or A653, Class G185. Type 304 or 316 stainless steel fasteners are also permitted.
- (f) Pressure treatment shall conform to the requirements of the AWPA “Use Category” as follows:

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921 — MISCELLANEOUS

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<b>Wood</b>	<b>End Use Category</b>	<b>AWPA Standard</b>
Bridge structures including decking, guard rail posts and offset blocks	UC4B - Ground Contact Heavy Duty	U1: Commodity Specification A (sawn solid products)
Foundation piles	UC4C - Ground Contact Extreme Duty	U1; Commodity Specification E (round timber piles)
Wood Composites	UC4A - Ground Contact, General Use	U1; Commodity Specification F (wood composites)
Sign posts, fence posts and gates	UC4A - Ground Contact, General Use	U1: Commodity Specifications A (sawn solid products) and B (round posts)
Piling, bracing and bulk heading	UC4B - Ground Contact Heavy Duty	U1; Commodity Specifications A (sawn solid products), B (round products) and E (round timber piles)
Piling, bracing, bulkheads and fender systems	UC5B Marine (Salt water) Immersion	U1: Commodity Specifications G (sawn products, round timber piles and plywood)

**CATEGORY 900**  
**MATERIALS**

**SECTION 950 — TRAFFIC MATERIALS**

**950.12 LUMINAIRES AND LAMPS**

**ADD**: The following after the last sentence of the second paragraph.

A Light Emitting Diode (LED) Underpass Luminaire shall be a complete lighting device consisting of a cast aluminum housing, LED arrays, LED drivers, terminal blocks, integral transformer, associated hardware, all necessary wiring, and an optical assembly.

**950.12.01 Luminaire Construction.**

**ADD**: The following after the last sentence of the first paragraph in (a).

All LED Roadway luminaires shall be cobrahead style unless otherwise specified in the Contract Documents.

**DELETE**: The second paragraph in (d) “Provide LED Roadway luminaires... shall be greater than 65.”

**INSERT**: The following.

Provide LED Roadway luminaires that use no more than 280 watts and are designed to operate at all voltages from 120 volt to 480 volt. For 480 volt operation, an integral transformer shall be provided to reduce the voltage. The power factor of the LED Roadway luminaire shall be 0.90 or higher. The Correlated Color Temperature (CCT) shall be less than 4000 K and the Color Rendering Index (CRI) shall be greater than 65.

**DELETE**: The fourth paragraph in (d) “Provide LED Roadway luminaire drivers... input high voltage surge protection.”

**INSERT**: The following.

Provide LED Roadway luminaire drivers that are Solid State (electronic) type with an input voltage range from 120-277VAC (+10 percent), input frequency of 60Hz, minimum power factor of 90 percent at full load, Total Harmonic distortion less than 20 percent, case temperature rated for -40°C to 50°C, and contain 3 kV input high voltage surge protection.

**ADD**: The following after the last sentence of the last paragraph in (d).

(e) Design LED Underpass luminaires for an operational life of at least eleven years with 70 percent lumen maintenance value of 50 000 hours (L70) at an average operating time of 12 hours per night. The illuminance shall not decrease by more

than 30 percent over the minimum operational life of eleven years. All components of the LED Underpass Luminaire must be rated for the full service life without maintenance.

Provide LED Underpass Luminaires that use no more than 95 watts and are designed to operate at all voltages from 120 volt to 480 volt. For 480 volt operation, an integral transformer shall be provided to reduce the voltage. The power factor of the LED Underpass Luminaire shall be 0.90 or higher. The Correlated Color Temperature (CCT) shall be less than 4000 K and the Color Rendering Index (CRI) shall be greater than 65.

All components of the LED Underpass Luminaire shall be UL approved. The luminaires shall be UL listed for wet locations. The LED Underpass Luminaire housing and lens/refractor shall be sealed to prevent intrusion of moisture for the full service life and comply with Ingress Protection Rating IP-65 or greater. The lens/refractor shall be constructed of a material that will not show visible yellowing due to UV exposure, or exposure to hydrocarbon emission, for the full service life. The LED Underpass Luminaire shall be 3G vibration rated.

Provide LED Underpass Luminaire drivers that are Solid State (electronic) type with an input voltage range from 120-277VAC ( $\pm 10$  percent), input frequency of 60Hz, minimum power factor of 90 percent at full load, Total Harmonic distortion less than 20 percent, case temperature rated for -30°C to 50°C.

LED Underpass Luminaire on board circuitry shall include a Surge Protection Device (SPD) to withstand high repetition noise transients as a result of utility line switching, nearby lightning strikes, and other interference. The SPD shall protect the luminaires from damage and failure for transient peak voltages up to 10kV and transient peak currents up to 10kA.

Complete all photometric testing of the LED Underpass Luminaires as specified in IESNA technical memorandums LM-63, LM-79 and LM-80. Perform all testing and calculations using photopic values. No correction for scotopic values will be permitted.

Design the LED Underpass Luminaire to mount as specified in contract documents. Mounting hardware shall be in accordance with manufacturer recommendations. All hardware shall be stainless steel. Include mounting hardware as required per Contract Documents or as directed by the Engineer.

For placement on the Qualified Product's List, the product evaluation application must be submitted on the Administration's Maryland Product Evaluation List (MPEL). After submittal, a minimum of 2 luminaires must be provided for evaluation. The Luminaires will be evaluated for 90 days, and returned to the supplier, if desired. The evaluation will be for general durability and suitability of the luminaires. All shipping costs will be the responsibility of the supplier.

**950.12.02**

**ADD:** The following after the last sentence of the section.

Refer to section 950.12.01 (e) for required lamp wattages and rated lamp life for LED Underpass Luminaires.

**CATEGORY 900**  
**TRAFFIC MATERIALS**

**SECTION 950.15 — TRAFFIC SIGNAL HEADS**

**DELETE:** The table and section titled Hardware in its entirety.

**INSERT:** The following.

<b>ITEM</b>	<b>DESCRIPTION</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
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 in.)	1.5	4	3	12
6	Stainless Steel	A 316	-	-	-
7	Galvanized Steel	A 157	A 153	G 60	-
8	Steel-Flat Sheet	16 gauge	-	-	-
9	Coating	*	Anodized Finish	-	-
10	Brass	CZ120	-	-	-

\*The signal head housing shall be yellow in conformance with AMS-STD-595A, Color Chip No. 13538. The signal head door and visor shall be optical flat (dull) black AMS-STD-595A, Color Chip No. 37038. Aluminum signal heads shall be painted using fusion bonded polyester coating method.

**Hardware.**

- (a) Hub plate shall conform to A, 1 through 5 and 9B.
- (b) Span wire hanger clamp shall conform to C, 1 thru 5.
- (c) Balance adjuster body shall conform to 10A.
- (d) Balance adjuster eyebolt and hardware shall conform to 6A, 7A, and 7B.
- (e) 2-way lower arm shall conform to 7C and 8A.
- (f) 2-way tri-stud arm shall conform to A, 1 thru 5.



**SPECIAL PROVISIONS**

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950.15 — TRAFFIC SIGNAL HEADS

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- (g) Span wire entrance fitting shall conform to C, 1 thru 5.
- (h) Mast arm mount signal bracket (1-way, 2-way, and 5-section) shall conform to 1A and 1D.
- (i) Side pole upper and lower arm assembly shall conform to 1B thru 5B or 1D thru 5D.

The maximum allowable play or space between the sides of the eyebolt and span wire clamp shall be 0.062 in.

**ADD:** The following under Electrical.

- (f) Terminal blocks screws shall be of the captive type secured by fasteners on the reverse side of the terminal block. Terminal block screws shall be a # 10 size.
- (g) Male spade terminal ends shall be furnished for each position on the terminal block angled at 45 degrees and perpendicular to the terminal block face.

**SPECIAL PROVISIONS**

950.06 — ELECTRICAL CABLE AND WIRE

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**CATEGORY 900  
TRAFFIC MATERIALS**

**SECTION 950.06 — ELECTRICAL CABLE AND WIRE**

**950.06.03 Cable Duct.**

**DELETE:** The last sentence of 950.06.03.

**INSERT:** The following.

Provide type XHHW cable, rated for 600 volts.

**CATEGORY 900**  
**MATERIALS**

**SECTION 950 — TRAFFIC MATERIALS**

**950.06 ELECTRICAL CABLE AND WIRE.**

**ADD:** After 950.06.09 Electric Service Wire.

**950.06.10 Fiber Optic Cable.** The fiber optic cable shall be of a loose tube construction and consist of single-mode or multi-mode fibers, as specified in the Contract Documents. The individual fibers shall possess the following features:

- (a) Type. (Single Mode) Step Index  
(Multi-Mode) Graded Index
- (b) Core diameter. (Single Mode) 8.3 microns, nominal  
(Multi-Mode) 62.5 microns  $\pm$ 3 microns
- (c) Cladding Diameter. (Single and Multi-Mode)  
125 microns  $\pm$ 2 microns
- (d) Core-to-cladding offset. (Single and Multi-Mode)  
 $\pm$  0.8microns  $\pm$ 2 microns
- (e) Coating Diameter. (Single Mode) 245 microns  $\pm$ 10 microns  
(Multi-Mode) 250 microns  $\pm$ 15 microns
- (f) Colored Fiber Diameter. (Single and Multi-Mode)  
250 microns, nominal
- (g) Cladding non-circularity. (Single and Multi-Mode) < 1.0 percent
- (h) Proof/Tensile Test. (Single and Multi-Mode) 100 kpsi, min.
- (i) Attenuation.
  - (Single-Mode):
    - (1) @ 1310 nm: < 0.5 dB/km
    - (2) @ 1550 nm: < 0.4 dB/km
  - (Multi-Mode):
    - (1) @ 850 nm: < 3.75 dB/km
    - (2) @ 1300 nm: < 1.5 dB/km

**(j) Attenuation Uniformity.**

(Single Mode): No point discontinuity > 0.10 db at 1310 nm or at 1550 nm.  
(Multi-Mode): No point discontinuity > 0.10 db at 750 nm or at 850 nm.

**(k) Attenuation at water peak.**

(Single-Mode): 2.1 db/km @ 1383 nm  $\pm$  3 nm  
(Multi-Mode): 2.1 db/km @ 783 nm  $\pm$  3 nm

**(l) Chromatic Dispersion (Single and Multi-Mode).**

Zero Dispersion Wavelength: 1332 nm to 1354 nm  
Zero Dispersion Slope: 0.097 PS/(NM<sup>2</sup>km)

**(m) Cutoff Wavelength.**

(Single-Mode):  $\leq$  1250 nm  
(Multi-Mode): NOT APPLICABLE

**(n) Mode-Field Diameter (Petermann II)(Single Mode),(Multi-Mode-NOT APPLICABLE).**

- (1)**  $9.30 \pm 0.50$  um @ 1310 nm
- (2)**  $10.50 \pm 1.00$  um @ 1550 nm<sup>3 of 7</sup>

**CONSTRUCTION.** Individual fibers shall be loose-tube buffered with an interstitial gel filling to prevent water intrusion in the event the conduit leaks or the cable is direct-buried. Each fiber buffer jacket shall be color coded, with a distinctly different color from other fibers in the cable.

Fiber optic cable installed in conduit shall conform to the following minimum requirements.

**(a) Structure.** Concentric, with dielectric central strength member and aramid reinforcement.

**(b) Jacket.** Medium-density Polyethylene outer, containing carbon black to prevent light penetration.

**(c) Filling.** Non-hygroscopic water blocking compound to prevent water and moisture penetration.

**(d) Maximum tension.**

- (1)** Installation (pulling) : 600 lbs.
- (2)** Long-Term (Installed): 200 lbs.

**(e) Minimum Bend Radii.**

- (1) During installation: 20 times the outer diameter of the cable.
- (2) Long Term: 10 times the outer diameter of the cable.

**(f) Installation.** All cables to be installed in a given conduit or duct facility shall be pulled as a unit.

- (1) Cables shall be pulled in conduit with a cable grip designed to provide a firm hold on the exterior covering of the cable, and with heat shrinkable end caps placed on the cable ends.
- (2) Establish voice communications between the cable feeding location and the cable pulling equipment prior to commencing pulling.
- (3) The cable reels shall be set up on the same side of the manhole as the conduit section in which the cable is to be placed.
- (4) The reel shall be leveled and brought into proper alignment with the conduit section so that the cable will pass from the top of the reel in a long smooth bend into the duct without twisting.
  - (a) The cable shall not be pulled from the bottom of the reel.
  - (b) The cable shall be fed by manually rotating the reel.

**(g) Pulling.** Cable shall not be pulled through any intermediate junction box, pull box, manhole, or any other opening in the conduit, unless specifically approved by the Project Engineer.

- (1) The necessary length of cable to be installed shall be pulled from manhole, manhole or cabinet to the immediate next downstream manhole, manhole or cabinet.
- (2) The remaining length of cable to be installed in the next conduit shall be carefully stored in a manner, which ensures that no damage to the cable shall occur.
- (3) Cable shall be stored in a manner that allows that length of cable to be safely pulled into the next conduit or duct.
- (4) Cable shall enter a manhole, or cabinet directly from the cable reel or storage stack, and shall be pulled directly out of the immediate downstream manhole or cabinet.

**(h) Splicing.** All cables shall run continuously from the field equipment cabinet or the environmental vault to their destination. Splicing of cable in conduit, pull boxes, junction boxes, manholes, or other locations are not permitted, unless approved in writing by the Engineer.

## SPECIAL PROVISIONS

### 950.06 — ELECTRICAL CABLE AND WIRE

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- (i) **Feeding cable.** An approved cable feeder guide shall be used between the cable reel or storage stack and the face of the duct to protect the cable, and to guide the cable into the duct as it is fed from the reel or the storage stack.
  - (1) The dimensions and set-up of the feeder guide shall be such that the cable does not bend at any location to a radius less than the cable's minimum allowable bending radius.
  - (2) This minimum bending radius of the cable shall not be exceeded at anytime during cable installation.
  - (3) Cable shall not be pulled over edges or corners, over or around obstructions, or through unnecessary curves or bends.
  
- (j) **Slack.** Cables shall be looped in and out of cabinets, manholes and manholes to provide a minimum of twenty-five (25) ft of slack and the least amount of stress on fibers.
  
- (k) **Storage.** Ensure that the cable is not damaged during storage or installation.
  - (1) The cable shall not be stepped on by workmen or run over by any vehicle or equipment.
  - (2) The cable shall not be pulled along the ground or over or around obstructions.
  
- (l) **Pulling Tension.** The allowable pulling tension shall be the cable manufacturer's recommended pulling tension for that cable for pulling by the outer jacket, or 80 percent of the manufacturer's maximum pulling tension for pulling by the outer jacket, whichever is smaller. Ensure that the allowable pulling tension is not exceeded at anytime during cable installation. To ensure the pulling tensions are not exceeded employ the following methods when pulling cable:
  - (1) Pulling the cable by hand.
  - (2) Attaching an approved strain gauge to the pulling line at the cable exit location, and at a sufficient distance from the take-up device, such that the strain gauge can be read throughout the entire cable pulling operation.
  
- (m) **Lubricant.** An approved lubricant, in the amount recommended by the cable manufacturer, shall be used to facilitate pulling the cable.
  - (1) The cable shall be lubricated as it is fed from the cable reel or storage stack into the cable feeder.
  - (2) An approved cable lubricator (funnel) shall be placed around the cable just ahead of the cable feeder to facilitate proper lubrication of the cable.
  - (3) After the cable has been installed, the exposed cable in a manhole, or cabinet shall be

wiped clean of cable lubricant with a cloth before leaving the manhole or cabinet.

- (n) Contractor's Qualifications.** At least 30 days prior to the installation of fiber optics cable, submit to the Project Engineer documentation indicating the qualifications and experience of the personnel to be involved in the installation and termination of the fiber optics cables.
- (1)** Said documentation shall include names, addresses, and telephone numbers of the three network owners, who may be contacted by the Administration regarding these installations.
  - (2)** No fiber optic cable shall be installed until the installation personnel have been approved by the Project Engineer in accordance with the minimum requirements specified above.
  - (3)** Personnel involved in the installation and termination of the fiber optics cables shall meet the following minimum requirements:
    - (a)** 3 years experience in the installation of fiber optic cables, including splicing, terminating, and testing of multi-mode and single-mode fibers.
    - (b)** 3 networks where fiber optic cables are installed in outdoor conduits, and the networks have been in continuous satisfactory operation for at least 2 years.
- (o) Fiber Cable Documentation.** Before any communications cable installation is performed, the provide the Engineer with 4 copies of the cable manufacturer's recommended and maximum pulling tensions for each cable size and type.
- (1)** These pulling tensions shall be specified for pulling from the cable's outer jacket.
  - (2)** 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.
- (p) Above-Ground Cable Markers.** Four-foot high plastic cable marker posts with 12 in. long steel in-ground bases shall be installed above the underground fiber cable. Posts shall be installed above all trench lines and directional bores at the following locations: As specified in the Contract Documents.
- (1)** Between manholes.
  - (2)** At locations where the conduit changes direction but there is no manhole.
  - (3)** At any location where the conduit passes under a roadway or other structure.
- (q) Terminations.** All fibers used shall be terminated at each cable end in the appropriate connector for the terminating equipment.

**SPECIAL PROVISIONS**

**950.06 — ELECTRICAL CABLE AND WIRE**

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- (1) All unused fibers in each cable shall be terminated in the same connectors as the active fibers, unless otherwise specified in the Contract Documents.
- (2) No fibers shall be left without a connector, unless otherwise specified in the Contract Documents.
- (3) The connector loss for complete connection to the terminal equipment shall not exceed 1.5 dB.



**CONTRACT PROVISIONS**  
PROPOSAL FORM PACKET — FEDERAL

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**STATE OF MARYLAND  
DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
PROPOSAL FORM**

Proposal by \_\_\_\_\_  
Name

\_\_\_\_\_  
Address (Street and/or P.O. Box)

\_\_\_\_\_  
City State Zip  
( ) ( )

\_\_\_\_\_  
A.C. Phone No. A.C. Fax No.



to furnish and deliver all materials and to do and perform all work, in conformance with the Standard Specifications, revisions thereto, General Provisions and the Special Provisions in this contract to IS-695 TSMO located in, Baltimore County, Maryland, for which Price Proposals will be received until 12:00 o'clock noon on Friday, September 11, 2020, this work being situated as follows: .

To the State Highway Administration  
BID BOX in Bldg. 4  
7450 Traffic Drive  
Hanover, Maryland 21076

In response to the advertisement by the Administration, inviting bids for the work in conformance with the Contract Documents, now on file in the office of the Administration. I/We hereby certify that I/we am/are the only person, or persons, interested in this bid proposal as principals, and that an examination has been made of the work site, the Specifications, the Plans, and Invitation for Bids, including the Special Provisions contained herein. I/We propose to furnish all necessary machinery, equipment, tools, labor and other means of construction, and to furnish all materials required to complete the project at the following unit price or lump sum price.

SCHEDULE OF PRICES

ITEM NO. CCS NO.	APPROXIMATE QUANTITIES	DESCRIPTION OF ITEMS	SECTION	UNIT PRICE		AMOUNTS	
				DOLLARS	CENTS	DOLLARS	CENTS
1001 100000	LUMP SUM	. DESIGN-BUILD A	XXX	LUMP SUM			
1002 100000	LUMP SUM	. DESIGN-BUILD B	XXX	LUMP SUM			

END OF CATEGORY NO. 1

STATE CONTRACT - BA0065172  
 FEDERAL CONTRACT - AC-NHPP-695-6(385)N

**CONTRACT PROVISIONS**  
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## **GENERAL MATERIAL REQUIREMENTS**

### **CONVICT PRODUCED MATERIALS**

Section 1019 of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) clarifies that materials produced by convict labor after July 1, 1991 may not be used for Federal-aid highway construction projects unless produced at a prison facility producing convict made materials for Federal-aid construction projects prior to July 1, 1987.

### **CONTRACT PROVISION BUY AMERICA**

This section only applies to projects partially or totally financed with Federal funds. The Contractor shall comply with Section 165 of the Surface Transportation Assistance Act of 1982 as amended by Section 1041(a) and 1048(a) of the Intermodal Surface Transportation Efficiency Act of 1991 (codified by SAFETEA-LU, §1903 as 23 U.S.C 313) with regard to the furnishing and coating of iron and steel products.

The Contract, if awarded, will be awarded to the responsive and responsible bidder who submits the lowest total bid for the Contract based on furnishing Domestic Products unless such bid exceeds the lowest total bid based on furnishing Foreign Products by more than twenty five percent (25%). Foreign Products will not be permitted to be used as a substitution for Domestic ones after the bid has been awarded.

Furnish steel or iron construction materials, including coating, for permanently incorporated work according to 23 CFR 635.410 and as follows:

- (a)** All manufacturing processes of steel or iron materials in a product, including coating; and any subsequent process that alters the steel or iron material's physical form or shape, changes its chemical composition, or the final finish; are to occur within the United States (One of the 50 States, the District of Columbia, Puerto Rico, or in territories and possessions of the U.S.). Manufacturing begins with the initial melting and mixing, and continues through the coating stage. The processes include rolling, extruding, machining, bending, grinding, drilling, welding, and coating. The action of applying a coating to steel or iron is deemed a manufacturing process. Coating includes epoxy coating, galvanizing, aluminizing, painting, and any other coating that protects or enhances the value of steel or iron. Any process from the original reduction from ore to the finished product constitutes a manufacturing process for iron.
  
- (b)** The following are considered to be steel manufacturing processes:

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- (1) Production of steel by any of the following processes:
  - (a) Open hearth furnace.
  - (b) Basic oxygen.
  - (c) Electric furnace.
  - (d) Direct reduction.
  
- (2) Rolling, heat treating, and any other similar processing.
  
- (3) Fabrication of the products:
  - (a) Spinning wire into cable or strand.
  - (b) Corrugating and rolling into culverts.
  - (c) Shop fabrication.
  
- (c) The manufacturing process for a steel/iron product is considered complete when the product is ready for use as an item (e.g., fencing, posts, girders, pipe, manhole cover, etc.) or could be incorporated as a component of a more complex product through a further manufacturing process (e.g., prestressed concrete girders, reinforced concrete pipe, traffic control devices, bearing pads, etc.). A product containing both steel and/or iron components, may be assembled outside the United States and meet Buy America requirements if the constituent steel and iron components (in excess of the minimal amounts permitted) were manufactured domestically and are not modified at the assembly location prior to final assembly.
  
- (d) If domestically produced steel billets or iron ingots are exported outside of the U.S., as defined above, for any manufacturing process then the resulting product does not conform to the Buy America requirements. Additionally, products manufactured domestically from foreign source steel billets or iron ingots do not conform to the Buy America requirements because the initial melting and mixing of alloys to create the material occurred in a foreign country.
  
- (e) Due to a nationwide waiver, Buy America does not apply to raw materials (iron ore and alloys), scrap (recycled steel or iron), and pig iron or processed, pelletized, and reduced iron ore.
  
- (f) For the Buy America provisions to apply, the steel or iron product must be permanently incorporated into the project. If an item is rendered as a “donated material” in accordance with 23 U.S.C. 323 – Donations and Credits, it will have to comply with Buy America requirements. While States and local governments may receive a credit for donated material, this material must generally comply with Buy America requirements. Buy America does not apply to temporary steel items, e.g., temporary sheet piling, temporary bridges, steel scaffolding and falsework. Further, Buy America does not apply to materials which remain in place at the contractor convenience.

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- (g) Certifications which document that steel and iron have been manufactured and that coatings for iron or steel have been applied in the United States shall be provided to the Contractor by the manufacturer. The Contractor shall provide the required certifications to the Engineer prior to such items being incorporated into the permanent work. Certifications shall extend to materials utilized in manufactured and fabricated products purchased by the Contractor.
  
- (h) Products manufactured of foreign steel or iron materials may be used, provided the cost of such products as they are delivered to the project does not exceed 0.1% of the total contract amount, or \$2,500, whichever is greater. If a supplier or fabricator wishes to use a partial fabrication process where domestic and foreign source components are assembled at a domestic location, the “as delivered cost” of the foreign components should include any transportation, assembly and testing costs required to install them in the final product.

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**ALTERNATE BID  
USING FOREIGN PRODUCTS**

When a bidder elects to utilize Foreign Products on one or more items, the following summation indicating the Total Bid using Foreign Products must be completed in addition to the individual item bid tabulations.

The following instructions are given to the bidder in completing the Total Bid summation using Foreign Products:

- 1 - The "Bid Total" for the initial bid using Domestic Products shall be shown on line (1).
- 2 - The subtotal for Item Amounts using Domestic Products shall be shown on line (2), for those items which the Contractor elects to use Foreign Products.
- 3 - The subtotal for Item Amounts using Foreign Products shall be shown on line (3).
- 4 - The total Bid, utilizing Foreign Products shall be shown on line (4). The value is obtained by subtracting subtotal (2) from the Total Bid (1) and then adding subtotal (3).

Bid Total for Bid 1 using Domestic items	Line (1)_____
Total of Domestic Items	Line (2)-_____
Total of Foreign Items	Line (3)+_____
Bid Total using Foreign Items	Line (4)_____

ALTERNATE BID - USING FOREIGN PRODUCTS  
 BIDDER'S INSTRUCTIONS

When the bidder elects to submit a bid for one or more items using Foreign Products, the following form must be used. For each item that Foreign Products are contemplated, the appropriate "Item Numbers", "Approximate Quantities", "Description of Items", "Unit Price or Lump Sum Price", "Item Amount Domestic" and "Item Amount Foreign" shall be tabulated below as specified in the initial bid. The bidder shall indicate the unit price in dollars and cents and show the total cost of the item for each item that utilizes Foreign Products. When all items utilizing Foreign Products have been listed, the bidder shall indicate on Page 6 of 45 the subtotals of the Item Amounts for Domestic Products in Line (2) and for Foreign Products in Line (3).

Item Nos.	Approximate Quantities	Description of Items	Unit Price or Lump Sum Dollars.Cts.	Items Amount Domestic Dollars.Cts.	Items Amount Foreign Dollars.Cts.

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**NOTICE**

**All bidders shall complete and submit with their bid the Bid/Proposal Affidavit below.**

**BID/PROPOSAL AFFIDAVIT**

**A. AUTHORIZED REPRESENTATIVE AND AFFIANT**

**I HEREBY AFFIRM THAT:**

I, \_\_\_\_\_ (print name), possess the legal authority to make this Affidavit.

**B. CERTIFICATION REGARDING COMMERCIAL NONDISCRIMINATION**

The undersigned bidder hereby certifies and agrees that the following information is correct: In preparing its bid on this project, the bidder has considered all proposals submitted from qualified, potential subcontractors and suppliers, and has not engaged in “discrimination” as defined in §19-103 of the State Finance and Procurement Article of the Annotated Code of Maryland. “Discrimination” means any disadvantage, difference, distinction, or preference in the solicitation, selection, hiring, or commercial treatment of a vendor, subcontractor, or commercial customer on the basis of race, color, religion, ancestry, or national origin, sex, age, marital status, sexual orientation, sexual identity, genetic information or an individual’s refusal to submit to a genetic test or make available the results of a genetic test, disability, or any otherwise unlawful use of characteristics regarding the vendor’s, supplier’s, or commercial customer’s employees or owners. “Discrimination” also includes retaliating against any person or other entity for reporting any incident of “discrimination”. Without limiting any other provision of the solicitation on this project, it is understood that, if the certification is false, such false certification constitutes grounds for the State to reject the bid submitted by the bidder on this project, and terminate any contract awarded based on the bid. As part of its bid or proposal, the bidder herewith submits a list of all instances within the past 4 years where there has been a final adjudicated determination in a legal or administrative proceeding in the State of Maryland that the bidder discriminated against subcontractors, vendors, suppliers, or commercial customers, and a description of the status or resolution of that determination, including any remedial action taken. Bidder agrees to comply in all respects with the State’s Commercial Nondiscrimination Policy as described under Title 19 of the State Finance and Procurement Article of the Annotated Code of Maryland.



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**C. AFFIRMATION REGARDING BRIBERY CONVICTIONS**

**I FURTHER AFFIRM THAT:**

Neither I, nor to the best of my knowledge, information, and belief, the above business (as is defined in Section 16-101(b) of the State Finance and Procurement Article of the Annotated Code of Maryland), or any of its officers, directors, partners, controlling stockholders, or any of its employees directly involved in the business's contracting activities, including obtaining or performing contracts with public bodies, has been convicted of, or has had probation before judgment imposed pursuant to Criminal Procedure Article, §6-220, Annotated Code of Maryland, or has pleaded nolo contendere to a charge of, bribery, attempted bribery, or conspiracy to bribe in violation of Maryland law, or of the law of any other state or federal law, except as follows (indicate the reasons why the affirmation cannot be given and list any conviction, plea, or imposition of probation before judgment with the date, court, official or administrative body, the sentence or disposition, the name(s) of person(s) involved, and their current positions and responsibilities with the business):

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**D. AFFIRMATION REGARDING OTHER CONVICTIONS**

**I FURTHER AFFIRM THAT:**

Neither I, nor to the best of my knowledge, information, and belief, the above business, or any of its officers, directors, partners, controlling stockholders, or any of its employees directly involved in the business's contracting activities including obtaining or performing contracts with public bodies, has:

- (1) Been convicted under state or federal statute of:
  - (a) a criminal offense incident to obtaining, attempting to obtain, or performing a public or private contract; or
  - (b) fraud, embezzlement, theft, forgery, falsification or destruction of records, or receiving stolen property;
- (2) Been convicted of any criminal violation of a state or federal antitrust statute;
- (3) Been convicted under the provisions of Title 18 of the United States Code for violation of the Racketeer Influenced and Corrupt Organization Act, 18 U.S.C. §1961, et seq., or the Mail Fraud Act, 18 U.S.C. §1341, et seq., for acts in connection with the submission of bids or proposals for a public or private contract;

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- (4) Been convicted of a violation of the State Minority Business Enterprise Law, Section 14-308 of the State Finance and Procurement Article of the Annotated Code of Maryland;
- (5) Been convicted of a violation of the Section 11-205.1 of the State Finance and Procurement Article of the Annotated Code of Maryland;
- (6) Been convicted of conspiracy to commit any act or omission that would constitute grounds for conviction or liability under any law or statute described in subsection (1) through (5) above;
- (7) Been found civilly liable under a state or federal antitrust statute for acts or omissions in connection with the submission of bids or proposals for a public or private contract;
- (8) Been found in a final adjudicated decision to have violated the Commercial Nondiscrimination Policy under Title 19 of the State Finance and Procurement Article of the Annotated Code of Maryland with regard to a public or private contract; or
- (9) Been convicted of a violation of one or more of the following provisions of the Internal Revenue Code:
- (a) §7201, Attempt to Evade or Defeat Tax;
  - (b) §7203, Willful Failure to File Return, Supply Information, or Pay Tax,
  - (c) §7205, Fraudulent Withholding Exemption Certificate or Failure to Supply Information,
  - (d) §7206, Fraud and False Statements, or
  - (e) §7207 Fraudulent Returns, Statements, or Other Documents;
- (10) Been convicted of a violation of 18 U.S.C. §286 Conspiracy to Defraud the Government with Respect to Claims, 18 U.S.C. §287, False, Fictitious, or Fraudulent Claims, or 18 U.S.C. §371, Conspiracy to Defraud the United States;
- (11) Been convicted of a violation of the Tax-General Article, Title 13, Subtitle 7 or Subtitle 10, Annotated Code of Maryland;
- (12) Been found to have willfully or knowingly violated State Prevailing Wage Laws as provided in the State Finance and Procurement Article, Title 17, Subtitle 2, Annotated Code of Maryland, if:
- (a) A court:
    - (i) Made the finding; and
    - (ii) Decision became final; or
  - (b) The finding was:
    - (i) Made in a contested case under the Maryland Administrative Procedure Act; and
    - (ii) Not overturned on judicial review;

**CONTRACT PROVISIONS**  
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(13) Been found to have willfully or knowingly violated State Living Wage Laws as provided in the State Finance and Procurement Article, Title 18, Annotated Code of Maryland, if:

- (a) A court:
  - (i) Made the finding; and
  - (ii) Decision became final; or
- (b) The finding was:
  - (i) Made in a contested case under the Maryland Administrative Procedure Act; and
  - (ii) Not overturned on judicial review;

(14) Been found to have willfully or knowingly violated the Labor and Employment Article, Title 3, Subtitles 3, 4, or 5, or Title 5, Annotated Code of Maryland, if:

- (a) A court:
  - (i) Made the finding; and
  - (ii) Decision became final; or
- (b) The finding was:
  - (i) Made in a contested case under the Maryland Administrative Procedure Act; and
  - (ii) Not overturned on judicial review; or

(15) Admitted in writing or under oath, during the course of an official investigation or other proceedings, acts or omissions that would constitute grounds for conviction or liability under any law or statute described in §§B and C and subsections D(1) — (14) above, except as follows (indicate reasons why the affirmations cannot be given, and list any conviction, plea, or imposition of probation before judgment with the date, court, official or administrative body, the sentence or disposition, the name(s) of the person(s) involved and their current positions and responsibilities with the business, and the status of any debarment):

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**E. AFFIRMATION REGARDING DEBARMENT**

**I FURTHER AFFIRM THAT:**

Neither I, nor to the best of my knowledge, information, and belief, the above business, or any of its officers, directors, partners, controlling stockholders, or any of its employees directly involved in the business's contracting activities, including obtaining or performing contracts with public bodies, has ever been suspended or debarred (including being issued a limited denial of participation) by any public entity, except as follows (list each debarment or suspension providing the dates of the suspension or debarment, the name of the public entity and the status of the proceedings, the name(s) of the person(s) involved and their current positions and responsibilities with the business, the grounds of the debarment or suspension, and the details of each person's involvement in any activity that formed the grounds of the debarment or suspension):

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**F. AFFIRMATION REGARDING DEBARMENT OF RELATED ENTITIES**

**I FURTHER AFFIRM THAT:**

- (1) The business was not established and it does not operate in a manner designed to evade the application of or defeat the purpose of debarment pursuant to Sections 16-101, et seq., of the State Finance and Procurement Article of the Annotated Code of Maryland; and
- (2) The business is not a successor, assignee, subsidiary, or affiliate of a suspended or debarred business, except as follows (you must indicate the reasons why the affirmations cannot be given without qualification):

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**G. SUB-CONTRACT AFFIRMATION**

**I FURTHER AFFIRM THAT:**

Neither I, nor to the best of my knowledge, information, and belief, the above business, has knowingly entered into a contract with a public body under which a person debarred or suspended under Title 16 of the State Finance and Procurement Article of the Annotated Code of Maryland will provide, directly or indirectly, supplies, services, architectural services, construction related services, leases of real property, or construction.

**H. AFFIRMATION REGARDING COLLUSION**

**I FURTHER AFFIRM THAT:**

Neither I, nor to the best of my knowledge, information, and belief, the above business has:

- (1) Agreed, conspired, connived, or colluded to produce a deceptive show of competition in the compilation of the accompanying bid or offer that is being submitted;
- (2) In any manner, directly or indirectly, entered into any agreement of any kind to fix the bid price or price proposal of the bidder or offeror or of any competitor, or otherwise taken any action in restraint of free competitive bidding in connection with the contract for which the accompanying bid or offer is submitted.

**I. CERTIFICATION OF TAX PAYMENT**

**I FURTHER AFFIRM THAT:**

Except as validly contested, the business has paid, or has arranged for payment of, all taxes due the State of Maryland and has filed all required returns and reports with the Comptroller of the Treasury, the State Department of Assessments and Taxation, and the Department of Labor, Licensing, and Regulation, as applicable, and will have paid all withholding taxes due the State of Maryland prior to final settlement.

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**J. CONTINGENT FEES**

**I FURTHER AFFIRM THAT:**

The business has not employed or retained any person, partnership, corporation, or other entity, other than a bona fide employee, bona fide agent, bona fide salesperson, or commercial selling agency working for the business, to solicit or secure the Contract, and that the business has not paid or agreed to pay any person, partnership, corporation, or other entity, other than a bona fide employee, bona fide agent, bona fide salesperson, or commercial selling agency, any fee or any other consideration contingent on the making of the Contract.

**K. CERTIFICATION REGARDING INVESTMENTS IN IRAN**

- (1) The undersigned certifies that, in accordance with State Finance and Procurement Article, §17-705, Annotated Code of Maryland:
  - (a) It is not identified on the list created by the Board of Public Works as a person engaging in investment activities in Iran as described in State Finance and Procurement Article, §17-702, Annotated Code of Maryland; and
  - (b) It is not engaging in investment activities in Iran as described in State Finance and Procurement Article, §17-702, Annotated Code of Maryland.
- (2) The undersigned is unable to make the above certification regarding its investment activities in Iran due to the following activities: \_\_\_\_\_

**L. CONFLICT MINERALS ORIGINATED IN THE DEMOCRATIC REPUBLIC OF CONGO (FOR SUPPLIES AND SERVICES CONTRACTS)**

**I FURTHER AFFIRM THAT:**

The business has complied with the provisions of State Finance and Procurement Article, §14-413, Annotated Code of Maryland governing proper disclosure of certain information regarding conflict minerals originating in the Democratic Republic of Congo or its neighboring countries as required by federal law.

**M. I FURTHER AFFIRM THAT:**

Any claims of environmental attributes made relating to a product or service included in the bid or proposal are consistent with the Federal Trade Commission's Guides for the Use of Environmental Marketing Claims as provided in 16 CFR §260, that apply to claims about the environmental attributes of a product, package, or service in connection with the marketing, offering for sale, or sale of such item or service.

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**N. ACKNOWLEDGEMENT**

I ACKNOWLEDGE THAT this Affidavit is to be furnished to the Procurement Officer and may be distributed to units of: (1) the State of Maryland; (2) counties or other subdivisions of the State of Maryland; (3) other states; and (4) the federal government. I further acknowledge that this Affidavit is subject to applicable laws of the United States and the State of Maryland, both criminal and civil, and that nothing in this Affidavit or any contract resulting from the submission of this bid or proposal shall be construed to supersede, amend, modify or waive, on behalf of the State of Maryland, or any unit of the State of Maryland having jurisdiction, the exercise of any statutory right or remedy conferred by the Constitution and the laws of Maryland with respect to any misrepresentation made or any violation of the obligations, terms and covenants undertaken by the above business with respect to (1) this Affidavit, (2) the contract, and (3) other Affidavits comprising part of the contract.

I DO SOLEMNLY DECLARE AND AFFIRM UNDER THE PENALTIES OF PERJURY THAT THE CONTENTS OF THIS AFFIDAVIT ARE TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE, INFORMATION, AND BELIEF.

Date: \_\_\_\_\_

By: \_\_\_\_\_ (print name of Authorized Representative and Affiant)

\_\_\_\_\_ (signature of Authorized Representative and Affiant)

**CONTRACT PROVISIONS**  
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**COMPREHENSIVE SIGNATURE PAGE 1 OF 2**

THE BIDDER IS HEREBY NOTIFIED THAT THIS DOCUMENT SHALL BE SIGNED IN INK IN ORDER FOR THE BID TO BE ACCEPTED. BY SIGNING, THE BIDDER CERTIFIES THAT HE/SHE WILL COMPLY IN EVERY ASPECT WITH THESE SPECIFICATIONS.

FURTHER, I DO SOLEMNLY DECLARE AND AFFIRM UNDER THE PENALTIES OF PERJURY THAT THE CONTENTS OF THIS AFFIDAVIT (PARAGRAPHS A-N) ARE TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE, INFORMATION, AND BELIEF.

This bid form shall be filled out legibly in ink or typed. The bid, if submitted by an individual, shall be signed by an individual; if submitted by a partnership, shall be signed by such member or members of the partnership as have authority to bind the partnership; if submitted by a corporation the same shall be signed by the President and attested by the Secretary or an Assistant Secretary. If not signed by the President as aforesaid, there must be attached a copy of that portion of the By-Laws, or a copy of a Board resolution, duly certified by the Secretary, showing the authority of the person so signing on behalf of the corporation. In lieu thereof, the corporation may file such evidence with the Administration, duly certified by the Secretary, together with a list of the names of those officers having authority to execute documents on behalf of the corporation, duly certified by the Secretary, which listing shall remain in full force and effect until such time as the Administration is advised in writing to the contrary. In any case where a bid is signed by an Attorney in Fact the same must be accompanied by a copy of the appointing document, duly certified.

**IF AN INDIVIDUAL:**

NAME: \_\_\_\_\_

\_\_\_\_\_ Street and/or P.O. Box

\_\_\_\_\_ City State Zip Code Fed ID or SSN

\_\_\_\_\_ (SEAL) \_\_\_\_\_  
Signature Date

\_\_\_\_\_ Print Signature

WITNESS: \_\_\_\_\_

Signature

\_\_\_\_\_ Print Signature



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**COMPREHENSIVE SIGNATURE PAGE 2 OF 2**

**IF A PARTNERSHIP:**

NAME OF PARTNERSHIP: \_\_\_\_\_

\_\_\_\_\_  
Street and/or P.O. Box

\_\_\_\_\_  
City State Zip Code Fed ID or SSN

BY: \_\_\_\_\_ (SEAL) \_\_\_\_\_  
Signature Date

\_\_\_\_\_  
Print Signature

TITLE: \_\_\_\_\_ WITNESS: \_\_\_\_\_  
Signature

\_\_\_\_\_  
Print Signature

**IF A CORPORATION:**

NAME OF CORPORATION: \_\_\_\_\_

\_\_\_\_\_  
Street and/or P.O. Box

\_\_\_\_\_  
City State Zip Code Fed ID or SSN

STATE OF INCORPORATION: \_\_\_\_\_

BY: \_\_\_\_\_ (SEAL) \_\_\_\_\_  
Signature Date

\_\_\_\_\_  
Print Signature

TITLE: \_\_\_\_\_ WITNESS: \_\_\_\_\_  
Secretary's Signature

\_\_\_\_\_  
Print Signature

**CONTRACT PROVISIONS**  
PROPOSAL FORM PACKET — FEDERAL

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**MDOT DBE FORM A**  
**FEDERALLY-FUNDED CONTRACTS**  
**CERTIFIED DBE UTILIZATION AND FAIR SOLICITATION AFFIDAVIT**  
**PAGE 1 OF 2**

**This affidavit must be included with the bid/ proposal. If the bidder/offeror fails to accurately complete and submit this affidavit as required, the bid shall be deemed not responsive or the proposal shall be deemed not susceptible of being selected for award.**

In connection with the bid/proposal submitted in response to Solicitation No. BA0065172, I affirm the following:

**1. DBE Participation (PLEASE CHECK ONLY ONE)**

I have met the overall certified Disadvantaged Business Enterprise (DBE) participation goal of **twenty-seven percent (27%)**. I agree that this percentage of the total dollar amount of the Contract for the DBE goal will be performed by certified DBE firms as set forth in the DBE Participation Schedule - Part 2 of the MDOT DBE Form B (Federally-Funded Contracts).

**OR**

I conclude that I am unable to achieve the DBE participation goal. I hereby request a waiver, in whole or in part, of the goal. Within 10 business days of receiving notice that our firm is the apparent awardee or as requested by the Procurement Officer, I will submit a written waiver request and all required documentation in accordance with COMAR 21.11.03.11. For a partial waiver request, I agree that certified DBE firms will be used to accomplish the percentages of the total dollar amount of the Contract as set forth in the DBE Participation Schedule - Part 2 of the MDOT DBE Form B (Federally-Funded Contracts).

**2. Additional DBE Documentation**

I understand that if I am notified that I am the apparent awardee or as requested by the Procurement Officer, I must submit the following documentation within 10 business days of receiving such notice: (a) Outreach Efforts Compliance Statement (MDOT DBE Form C - Federally-Funded Contracts); (b) Subcontractor Project Participation Statement (MDOT DBE Form D - Federally-Funded Contracts); (c) DBE Waiver Request documentation per COMAR 21.11.03.11 (if waiver was requested); and (d) Any other documentation required by the Procurement Officer to ascertain bidder's responsibility/ offeror's susceptibility of being selected for award in connection with the certified DBE participation goal.

**CONTRACT PROVISIONS**  
PROPOSAL FORM PACKET — FEDERAL

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**MDOT DBE FORM A**  
**FEDERALLY-FUNDED CONTRACTS**  
**CERTIFIED DBE UTILIZATION AND FAIR SOLICITATION AFFIDAVIT**  
**PAGE 2 OF 2**

I acknowledge that if I fail to return each completed document (in 2 (a) through (d)) within the required time, the Procurement Officer may determine that I am not responsible and therefore not eligible for contract award or not susceptible of being selected for award.

**3. Information Provided to DBE firms**

In the solicitation of subcontract quotations or offers, DBE firms were provided not less than the same information and amount of time to respond as were non-DBE firms.

**4. Products and Services Provided by DBE firms**

I hereby affirm that the DBEs are only providing those products and services for which they are MDOT certified.

I solemnly affirm under the penalties of perjury that the information in this affidavit is true to the best of my knowledge, information and belief.

\_\_\_\_\_  
Company Name

\_\_\_\_\_  
Signature of Representative

\_\_\_\_\_  
Address

\_\_\_\_\_  
Printed Name and Title

\_\_\_\_\_  
City, State and Zip Code

\_\_\_\_\_  
Date

CONTRACT PROVISIONS  
PROPOSAL FORM PACKET — FEDERAL

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**MDOT DBE FORM B  
FEDERALLY-FUNDED CONTRACTS  
DBE PARTICIPATION SCHEDULE**

**PART 1 – INSTRUCTIONS FOR DBE PARTICIPATION SCHEDULE**

**PARTS 2 AND 3 MUST BE INCLUDED WITH THE BID/PROPOSAL. IF THE BIDDER/OFFEROR FAILS TO ACCURATELY COMPLETE AND SUBMIT PART 2 WITH THE BID/PROPOSAL AS REQUIRED, THE BID SHALL BE DEEMED NOT RESPONSIVE OR THE PROPOSAL SHALL BE DEEMED NOT SUSCEPTIBLE OF BEING SELECTED FOR AWARD.**

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\*\*\* STOP \*\*\*

**FORM INSTRUCTIONS  
PLEASE READ BEFORE COMPLETING THIS FORM**

1. Please refer to the Maryland Department of Transportation (MDOT) DBE Directory at [www.mdot.state.md.us](http://www.mdot.state.md.us) to determine if a firm is certified for the appropriate North American Industry Classification System (“NAICS”) Code **and** the product/services description (specific product that a firm is certified to provide or specific areas of work that a firm is certified to perform). For more general information about NAICS, please visit [www.naics.com](http://www.naics.com). Only those specific products and/or services for which a firm is certified in the MDOT Directory can be used for purposes of achieving the DBE participation goal.
2. In order to be counted for purposes of achieving the DBE participation goal, the firm must be certified for that specific NAICS (“DBE” for Federally-funded projects designation after NAICS Code). **WARNING:** If the firm’s NAICS Code is in **graduated status**, such services/products **will not be counted** for purposes of achieving the DBE participation goals. Graduated status is clearly identified in the MDOT Directory (such graduated codes are designated with the word graduated after the appropriate NAICS Code).
3. Examining the NAICS Code is the **first step** in determining whether a DBE firm is certified and eligible to receive DBE participation credit for the specific products/services to be supplied or performed under the contract. The **second step** is to determine whether a firm’s Products/Services Description in the DBE Directory includes the products to be supplied and/or services to be performed that are being used to achieve the DBE participation goal.
4. If you have any questions as to whether a firm is MDOT DBE certified, or if it is certified to perform specific services or provide specific products, please call MDOT’s Office of Minority Business Enterprise at 1-800-544-6056 or send an email to [mbe@mdot.state.md.us](mailto:mbe@mdot.state.md.us).

**CONTRACT PROVISIONS**  
PROPOSAL FORM PACKET — FEDERAL

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**MDOT DBE FORM B**  
**FEDERALLY-FUNDED CONTRACTS**  
**DBE PARTICIPATION SCHEDULE**  
**PART 1 – INSTRUCTIONS FOR DBE PARTICIPATION SCHEDULE**  
**PAGE 2 OF 4**

5. The Contractor's subcontractors are considered second-tier subcontractors. Third-tier contracting used to meet a DBE goal is to be considered the exception and not the rule. The following two conditions must be met before MDOT, its Modal Administrations and the Maryland Transportation Authority may approve a third-tier contracting agreement: (a) the bidder/offeror must request in writing approval of each third-tier contract arrangement, and (b) the request must contain specifics as to why a third-tier contracting arrangement should be approved. These documents must be submitted with the bid/proposal in Part 2 of this DBE Participation Schedule.
6. For each DBE firm that is being used as supplier/wholesaler/regular dealer/broker/manufacturer, please follow these instructions for calculating the **amount of the subcontract for purposes of achieving the DBE participation goal:**
  - A. Is the firm certified as a broker of the products/supplies? If the answer is YES, please continue to Item C. If the answer is NO, please continue to Item B.
  - B. Is the firm certified as a supplier, wholesaler, regular dealer, or manufacturer of such products/supplies? If the answer is YES, continue to Item D. If the answer is NO, continue to Item C only if the DBE firm is certified to perform trucking/hauling services under NAICS Codes 484110, 484121, 484122, 484210, 484220 and 484230. If the answer is NO and the firm is not certified under these NAICS Codes, then no DBE participation credit will be given for the supply of these products.
  - C. For purposes of achieving the DBE participation goal, you may count only the amount of any reasonable fee that the DBE firm will receive for the provision of such products/supplies - not the total subcontract amount or the value (or a percentage thereof) of such products and/or supplies. For Column 3 of the DBE Participation Schedule, please divide the amount of any reasonable fee that the DBE firm will receive for the provision of such products/services by the total Contract value and insert the percentage in Line 3.1.
  - D. Is the firm certified as a manufacturer (refer to the firm's NAICS Code and specific description of products/services) of the products/supplies to be provided? If the answer is NO please continue to Item E. If the answer is YES, for purposes of achieving the DBE participation goal, you may count the total amount of the subcontract. For Column 3 of the DBE Participation Schedule, please divide the total amount of the subcontract by the total Contract value and insert the percentage in Line 3.1.

CONTRACT PROVISIONS  
PROPOSAL FORM PACKET — FEDERAL

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**MDOT DBE FORM B**  
**FEDERALLY-FUNDED CONTRACTS**  
**DBE PARTICIPATION SCHEDULE**  
**PART 1 – INSTRUCTIONS FOR DBE PARTICIPATION SCHEDULE**  
**PAGE 3 OF 4**

- E. Is the firm certified as a supplier, wholesaler and/or regular dealer? If the answer is YES and the DBE firm is furnishing and installing the materials and is certified to perform these services, please divide the total subcontract amount (including full value of supplies) by the total Contract value and insert the percentage in Line 3.1. If the answer is YES and the DBE firm is only being used as a supplier, wholesaler and/or regular dealer or is not certified to install the supplies/materials, for purposes of achieving the DBE participation goal, you may only count sixty percent (60%) of the value of the subcontract for these supplies/products (60% Rule). To apply the 60% Rule, first divide the amount of the subcontract for these supplies/products only (not installation) by the total Contract value. Then, multiply the result by sixty percent (60%) and insert the percentage in Line 3.2.
7. For each DBE firm that **is not** being used as a supplier/wholesaler/regular dealer/broker/manufacturer, to calculate the **amount of the subcontract for purposes of achieving the DBE participation goal**, divide the total amount of the subcontract by the total Contract value and insert the percentage in Line 3.1.
- Example:** \$ 2,500 (Total Subcontract Amount) ÷ \$10,000 (Total Contract Value) x 100 = 25%.
8. Please note that for USDOT-funded projects, a DBE prime may count towards its DBE participation goal work performed by its own forces. Include information about the DBE prime in Part 2.
9. **WARNING:** The percentage of DBE participation, computed using the dollar amounts in Column 3 for all of the DBE firms listed in Part 2, **MUST** at least equal the DBE participation goal as set forth in MDOT DBE Form A – Federally-Funded Contracts for this solicitation. If the bidder/offeror is unable to achieve the DBE participation goals, then the bidder/offeror must request a waiver in Form A or the bid will be deemed not responsive, or the proposal not susceptible of being selected for award. You may wish to use the Goal Worksheet shown below to assist you in calculating the percentage and confirming that you have met the applicable DBE participation goal.

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**MDOT DBE FORM B**  
**FEDERALLY-FUNDED CONTRACTS**  
**DBE PARTICIPATION SCHEDULE**  
**PART 1 – INSTRUCTIONS FOR DBE PARTICIPATION SCHEDULE**  
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<b>GOAL WORKSHEET</b>	
Total DBE Firm Participation (Add percentages in Column 3 for all DBE firms listed in DBE Participation Schedule)	(A) _____%
The percentage amount in Box A above should be equal to the percentage amount in Box E below.	
Add <i>Countable</i> Subcontract Amounts (see 6 through 8 of Instructions) for all DBE firms listed in DBE Participation Schedule, and insert in Box B	(B) \$ _____
Insert the Total Contract Amount in Box C	(C) \$ _____
Divide Box B by Box C and Insert in Box D	(D) = _____
Multiply Box D by 100 and insert in Box E	(E) = _____%

**CONTRACT PROVISIONS**  
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**MDOT DBE FORM B**  
**FEDERALLY-FUNDED CONTRACTS**  
**DBE PARTICIPATION SCHEDULE**  
**PART 2 – DBE PARTICIPATION SCHEDULE**

**PARTS 2 AND 3 MUST BE INCLUDED WITH THE BID/PROPOSAL. IF THE BIDDER/OFFEROR FAILS TO ACCURATELY COMPLETE AND SUBMIT PART 2 WITH THE BID/PROPOSAL AS REQUIRED, THE BID SHALL BE DEEMED NOT RESPONSIVE OR THE PROPOSAL SHALL BE DEEMED NOT SUSCEPTIBLE OF BEING SELECTED FOR AWARD.**

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Prime Contractor	Project Description	Solicitation Number

**LIST INFORMATION FOR EACH CERTIFIED DBE SUBCONTRACTOR YOU AGREE TO USE TO ACHIEVE THE DBE PARTICIPATION GOAL.**

COLUMN 1	COLUMN 2	COLUMN 3
		Unless the bidder/offeror requested a waiver in MDOT DBE Form A – Federally Funded Contracts for this solicitation, the cumulative DBE participation for all DBE firms listed herein must equal at least the DBE participation goal set forth in Form A.
<b>NAME OF DBE SUBCONTRACTOR AND TIER</b>	<b>CERTIFICATION NO.</b>	FOR PURPOSES OF ACHIEVING THE DBE PARTICIPATION GOAL, refer to sections 6, 7 and 8 in Part 1 - Instructions. State the percentage amount of the products/services in Line 3.1, except for those products or services where the DBE firm is being used as a wholesaler, supplier, or regular dealer. For items of work where the DBE firm is being used as a supplier, wholesaler and/or regular dealer, complete Line 3.2 using the 60% Rule.
<input type="checkbox"/> Please check if DBE firm is a third-tier contractor (if applicable). Please submit written documents in accordance with Section 5 of Part 1 - Instructions	<b>Certification Number:</b>  <hr/>	<b>3.1. TOTAL PERCENTAGE TO BE PAID TO THE SUBCONTRACTOR (STATE THIS PERCENTAGE AS A PERCENTAGE OF THE TOTAL CONTRACT VALUE- EXCLUDING PRODUCTS/SERVICES FROM SUPPLIERS, WHOLESALERS OR REGULAR DEALERS).</b>  _____% (Percentage for purposes of calculating achievement of DBE Participation goal)  <b>3.2 TOTAL PERCENTAGE TO BE PAID TO THE SUBCONTRACTOR FOR ITEMS OF WORK WHERE THE DBE FIRM IS BEING USED AS A SUPPLIER, WHOLESALER AND/OR REGULAR DEALER) (STATE THE PERCENTAGE AS A PERCENTAGE OF THE TOTAL CONTRACT VALUE AND THEN APPLY THE 60% RULE PER SECTION 6(E) IN PART 1 - INSTRUCTIONS).</b>  _____% Total percentage of Supplies/Products  x _____ 60% (60% Rule)  _____% (Percentage for purposes of calculating achievement of DBE Participation goal)

Please check if Continuation Sheets are attached.



**CONTRACT PROVISIONS**  
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**MDOT DBE FORM B  
FEDERALLY-FUNDED CONTRACTS  
DBE PARTICIPATION SCHEDULE  
CONTINUATION SHEET**

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Prime Contractor	Project Description	Solicitation Number

**LIST INFORMATION FOR EACH CERTIFIED DBE SUBCONTRACTOR YOU AGREE TO USE TO ACHIEVE THE DBE PARTICIPATION GOAL.**

COLUMN 1	COLUMN 2	COLUMN 3
		Unless the bidder/offeror requested a waiver in MDOT DBE Form A – Federally Funded Contracts for this solicitation, the cumulative DBE participation for all DBE firms listed herein must equal at least the DBE participation goal set forth in Form A.
<b>NAME OF DBE SUBCONTRACTOR AND TIER</b>	<b>CERTIFICATION NO.</b>	FOR PURPOSES OF ACHIEVING THE DBE PARTICIPATION GOAL, refer to sections 6, 7 and 8 in Part 1 - Instructions. State the percentage amount of the products/services in Line 3.1, except for those products or services where the DBE firm is being used as a wholesaler, supplier, or regular dealer. For items of work where the DBE firm is being used as a supplier, wholesaler and/or regular dealer, complete Line 3.2 using the 60% Rule.
<input type="checkbox"/> Please check if DBE firm is a third-tier contractor (if applicable). Please submit written documents in accordance with Section 5 of Part 1 - Instructions	<b>Certification Number:</b> <hr/>	<p><b>3.1. TOTAL PERCENTAGE TO BE PAID TO THE SUBCONTRACTOR (STATE THIS PERCENTAGE AS A PERCENTAGE OF THE TOTAL CONTRACT VALUE- EXCLUDING PRODUCTS/SERVICES FROM SUPPLIERS, WHOLESALERS OR REGULAR DEALERS).</b></p> <p>_____ % (Percentage for purposes of calculating achievement of DBE Participation goal)</p> <p><b>3.2 TOTAL PERCENTAGE TO BE PAID TO THE SUBCONTRACTOR FOR ITEMS OF WORK WHERE THE DBE FIRM IS BEING USED AS A SUPPLIER, WHOLESALER AND/OR REGULAR DEALER) (STATE THE PERCENTAGE AS A PERCENTAGE OF THE TOTAL CONTRACT VALUE AND THEN APPLY THE 60% RULE PER SECTION 6(E) IN PART 1 - INSTRUCTIONS).</b></p> <p>_____ % Total percentage of Supplies/Products</p> <p>x _____ 60% (60% Rule)</p> <p>_____ % (Percentage for purposes of calculating achievement of DBE Participation goal)</p>

Please check if Continuation Sheets are attached.

**CONTRACT PROVISIONS**  
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**MDOT DBE FORM B**  
**FEDERALLY-FUNDED CONTRACTS**  
**DBE PARTICIPATION SCHEDULE**

**PART 3 – CERTIFICATION FOR DBE PARTICIPATION SCHEDULE**

**PARTS 2 AND 3 MUST BE INCLUDED WITH THE BID/PROPOSAL AS DIRECTED IN THE SOLICITATION.**

I hereby affirm that I have reviewed the Products and Services Description (specific product that a firm is certified to provide or areas of work that a firm is certified to perform) set forth in the MDOT DBE Directory for each of the DBE firms listed in Part 2 of this DBE Form B for purposes of achieving the DBE participation goal that was identified in the DBE Form A that I submitted with this solicitation, and that the DBE firms listed are only performing those products/services/areas of work for which they are certified. I also hereby affirm that I have read and understand the form instructions set forth in Part 1 of this DBE Form B.

The undersigned Prime Contractor hereby certifies and agrees that it has fully complied with the State Minority Business Enterprise law, State Finance and Procurement Article §14-308(a)(2), Annotated Code of Maryland which provides that, except as otherwise provided by law, a contractor may not identify a certified minority business enterprise in a bid or proposal and:

- (1) fail to request, receive, or otherwise obtain authorization from the certified minority business enterprise to identify the certified minority business enterprise in its bid or proposal;
- (2) fail to notify the certified minority business enterprise before execution of the contract of its inclusion of the bid or proposal;
- (3) fail to use the certified minority business enterprise in the performance of the contract; or
- (4) pay the certified minority business enterprise solely for the use of its name in the bid or proposal.

I solemnly affirm under the penalties of perjury that the contents of Parts 2 and 3 of MDOT DBE Form B are true to the best of my knowledge, information and belief.

\_\_\_\_\_  
Company Name

\_\_\_\_\_  
Signature of Representative

\_\_\_\_\_  
Address

\_\_\_\_\_  
Printed Name and Title

\_\_\_\_\_  
City, State and Zip Code

\_\_\_\_\_  
Date

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**MDOT MBE/DBE FORM E**  
**GOOD FAITH EFFORTS GUIDANCE AND DOCUMENTATION**

**PART 1 – GUIDANCE FOR DEMONSTRATING GOOD FAITH EFFORTS**  
**TO MEET MBE/DBE PARTICIPATION GOALS**

In order to show that it has made good faith efforts to meet the Minority Business Enterprise (MBE)/Disadvantaged Business Enterprise (DBE) participation goal (including any MBE subgoals) on a contract, the bidder/offeror must either (1) meet the MBE/DBE Goal(s) and document its commitments for participation of MBE/DBE Firms, or (2) when it does not meet the MBE/DBE Goal(s), document its Good Faith Efforts to meet the goal(s).

**I. Definitions**

**MBE/DBE Goal(s)** – “MBE/DBE Goal(s)” refers to the MBE participation goal and MBE participation subgoal(s) on a State-funded procurement and the DBE participation goal on a federally-funded procurement.

**Good Faith Efforts** – The “Good Faith Efforts” requirement means that when requesting a waiver, the bidder/offeror must demonstrate that it took all necessary and reasonable steps to achieve the MBE/DBE Goal(s), which, by their scope, intensity, and appropriateness to the objective, could reasonably be expected to obtain sufficient MBE/DBE participation, even if those steps were not fully successful. Whether a bidder/offeror that requests a waiver made adequate good faith efforts will be determined by considering the quality, quantity, and intensity of the different kinds of efforts that the bidder/offeror has made. The efforts employed by the bidder/offeror should be those that one could reasonably expect a bidder/offeror to take if the bidder/offeror were actively and aggressively trying to obtain DBE participation sufficient to meet the DBE contract goal. Mere *pro forma* efforts are not good faith efforts to meet the DBE contract requirements. The determination concerning the sufficiency of the bidder's/offeror's good faith efforts is a judgment call; meeting quantitative formulas is not required.

**Identified Firms** – “Identified Firms” means a list of the DBEs identified by the procuring agency during the goal setting process and listed in the federally-funded procurement as available to perform the Identified Items of Work. It also may include additional DBEs identified by the bidder/offeror as available to perform the Identified Items of Work, such as DBEs certified or granted an expansion of services after the procurement was issued. If the procurement does not include a list of Identified Firms or is a State-funded procurement, this term refers to all of the MBE Firms (if State-funded) or DBE Firms (if federally-funded) the bidder/offeror identified as available to perform the Identified Items of Work and should include all appropriately certified firms that are reasonably identifiable.

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**Identified Items of Work** – “Identified Items of Work” means the bid items identified by the procuring agency during the goal setting process and listed in the procurement as possible items of work for performance by MBE/DBE Firms. It also may include additional portions of items of work the bidder/offeror identified for performance by MBE/DBE Firms to increase the likelihood that the MBE/DBE Goal(s) will be achieved. If the procurement does not include a list of Identified Items of Work, this term refers to all of the items of work the bidder/offeror identified as possible items of work for performance by MBE/DBE Firms and should include all reasonably identifiable work opportunities.

**MBE/DBE Firms** – For State-funded contracts, “MBE/DBE Firms” refers to certified **MBE** Firms. Certified MBE Firms can participate in the State’s MBE Program. For federally-funded contracts, “MBE/DBE Firms” refers to certified **DBE** Firms. Certified DBE Firms can participate in the federal DBE Program.

## **II. Types of Actions MDOT will Consider**

The bidder/offeror is responsible for making relevant portions of the work available to MBE/DBE subcontractors and suppliers and to select those portions of the work or material needs consistent with the available MBE/DBE subcontractors and suppliers, so as to facilitate MBE/DBE participation. The following is a list of types of actions MDOT will consider as part of the bidder's/offeror’s Good Faith Efforts when the bidder/offeror fails to meet the MBE/DBE Goal(s). This list is not intended to be a mandatory checklist, nor is it intended to be exclusive or exhaustive. Other factors or types of efforts may be relevant in appropriate cases.

### **A. Identify Bid Items as Work for MBE/DBE Firms**

#### **1. Identified Items of Work in Procurements**

(a) Certain procurements will include a list of bid items identified during the goal setting process as possible work for performance by MBE/DBE Firms. If the procurement provides a list of Identified Items of Work, the bidder/offeror shall make all reasonable efforts to solicit quotes from MBE Firms or DBE Firms, whichever is appropriate, to perform that work.

(b) Bidders/Offerors may, and are encouraged to, select additional items of work to be performed by MBE/DBE Firms to increase the likelihood that the MBE/DBE Goal(s) will be achieved.

#### **2. Identified Items of Work by Bidders/Offerors**

(a) When the procurement does not include a list of Identified Items of Work, bidders/offerors should reasonably identify sufficient items of work to be performed by MBE/DBE Firms.

(b) Where appropriate, bidders/offerors should break out contract work items into economically feasible units to facilitate MBE/DBE participation, rather than perform these work items with their own forces. The ability or desire of a prime contractor to perform the work of a

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contract with its own organization does not relieve the bidder/offeror of the responsibility to make Good Faith Efforts.

**B. Identify MBE Firms or DBE Firms to Solicit**

1. DBE Firms Identified in Procurements

(a) Certain procurements will include a list of the DBE Firms identified during the goal setting process as available to perform the items of work. If the procurement provides

a list of Identified DBE Firms, the bidder/offeror shall make all reasonable efforts to solicit those DBE firms.

(b) Bidders/offerors may, and are encouraged to, search the MBE/DBE Directory to identify additional DBEs who may be available to perform the items of work, such as DBEs certified or granted an expansion of services after the solicitation was issued.

2. MBE/DBE Firms Identified by Bidders/Offerors

(a) When the procurement does not include a list of Identified MBE/DBE Firms, bidders/offerors should reasonably identify the MBE Firms or DBE Firms, whichever is appropriate, that are available to perform the Identified Items of Work.

(b) Any MBE/DBE Firms identified as available by the bidder/offeror should be certified in the appropriate program (MBE for State-funded procurements or DBE for federally-funded procurements)

(c) Any MBE/DBE Firms identified as available by the bidder/offeror should be certified to perform the Identified Items of Work.

**C. Solicit MBE/DBEs**

1. Solicit all Identified Firms for all Identified Items of Work by providing written notice. The bidder/offeror should:

(a) provide the written solicitation at least 10 days prior to bid opening to allow sufficient time for the MBE/DBE Firms to respond;

(b) send the written solicitation by first-class mail, facsimile, or email using contact information in the MBE/DBE Directory, unless the bidder/offeror has a valid basis for using different contact information; and

(c) provide adequate information about the plans, specifications, anticipated time schedule for portions of the work to be performed by the MBE/DBE, and other requirements of the contract to

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assist MBE/DBE Firms in responding. (This information may be provided by including hard copies in the written solicitation or by electronic means as described in C.3 below.)

2. “All” Identified Firms includes the DBEs listed in the procurement and any MBE/DBE Firms you identify as potentially available to perform the Identified Items of Work, but it does not include MBE/DBE Firms who are no longer certified to perform the work as of the date the bidder/offeror provides written solicitations.

3. “Electronic Means” includes, for example, information provided *via* a website or file transfer protocol (FTP) site containing the plans, specifications, and other requirements of the contract. If an interested MBE/DBE cannot access the information provided by electronic means, the bidder/offeror must make the information available in a manner that is accessible by the interested MBE/DBE.

4. Follow up on initial written solicitations by contacting DBEs to determine if they are interested. The follow up contact may be made:

(a) by telephone using the contact information in the MBE/DBE Directory, unless the bidder/offeror has a valid basis for using different contact information; or

(b) in writing *via* a method that differs from the method used for the initial written solicitation.

5. In addition to the written solicitation set forth in C.1 and the follow up required in C.4, use all other reasonable and available means to solicit the interest of MBE/DBE Firms certified to perform the work of the contract. Examples of other means include:

(a) attending any pre-bid meetings at which MBE/DBE Firms could be informed of contracting and subcontracting opportunities;

(b) if recommended by the procurement, advertising with or effectively using the services of at least two minority focused entities or media, including trade associations, minority/women community organizations, minority/women contractors' groups, and local, state, and federal minority/women business assistance offices listed on the MDOT Office of Minority Business Enterprise website; and

(c) effectively using the services of other organizations, as allowed on a case-by-case basis and authorized in the procurement, to provide assistance in the recruitment and placement of MBE/DBE Firms.

**D. Negotiate With Interested MBE/DBE Firms**

Bidders/Offerors must negotiate in good faith with interested MBE/DBE Firms.

1. Evidence of negotiation includes, without limitation, the following:

(a) the names, addresses, and telephone numbers of MBE/DBE Firms that were considered;



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- (b) a description of the information provided regarding the plans and specifications for the work selected for subcontracting and the means used to provide that information; and
- (c) evidence as to why additional agreements could not be reached for MBE/DBE Firms to perform the work.

2. A bidder/offeror using good business judgment would consider a number of factors in negotiating with subcontractors, including DBE subcontractors, and would take a firm's price and capabilities as well as contract goals into consideration.

3. The fact that there may be some additional costs involved in finding and using MBE/DBE Firms is not in itself sufficient reason for a bidder's/offeror's failure to meet the contract DBE goal, as long as such costs are reasonable. Factors to take into consideration when determining whether a MBE/DBE Firm's quote is excessive or unreasonable include, without limitation, the following:

- (a) the dollar difference between the MBE/DBE subcontractor's quote and the average of the other subcontractors' quotes received by the bidder/offeror;
- (b) the percentage difference between the MBE/DBE subcontractor's quote and the average of the other subcontractors' quotes received by the bidder/offeror;
- (c) the percentage that the DBE subcontractor's quote represents of the overall contract amount;
- (d) the number of MBE/DBE firms that the bidder/offeror solicited for that portion of the work;
- (e) whether the work described in the MBE/DBE and Non-MBE/DBE subcontractor quotes (or portions thereof) submitted for review is the same or comparable; and
- (f) the number of quotes received by the bidder/offeror for that portion of the work.

4. The above factors are not intended to be mandatory, exclusive, or exhaustive, and other evidence of an excessive or unreasonable price may be relevant.

5. The bidder/offeror may not use its price for self-performing work as a basis for rejecting a MBE/DBE Firm's quote as excessive or unreasonable.

6. The "average of the other subcontractors' quotes received by the" bidder/offeror refers to the average of the quotes received from all subcontractors, except that there should be quotes from at least three subcontractors, and there must be at least one quote from a MBE/DBE and one quote from a Non-MBE/DBE.

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7. A bidder/offeror shall not reject a MBE/DBE Firm as unqualified without sound reasons based on a thorough investigation of the firm's capabilities. For each certified MBE/DBE that is rejected as unqualified or that placed a subcontract quotation or offer that the bidder/offeror concludes is not acceptable, the bidder/offeror must provide a written detailed statement listing the reasons for this conclusion. The bidder/offeror also must document the steps taken to verify the capabilities of the MBE/DBE and Non-MBE/DBE Firms quoting similar work.

(a) The factors to take into consideration when assessing the capabilities of a MBE/DBE Firm, include, but are not limited to the following: financial capability, physical capacity to perform, available personnel and equipment, existing workload, experience performing the type of work, conduct and performance in previous contracts, and ability to meet reasonable contract requirements.

(b) The MBE/DBE Firm's standing within its industry, membership in specific groups, organizations, or associations and political or social affiliations (for example union vs. non-union employee status) are not legitimate causes for the rejection or non-solicitation of bids in the efforts to meet the project goal.

**E. Assisting Interested MBE/DBE Firms**

When appropriate under the circumstances, the decision-maker will consider whether the bidder/offeror:

1. made reasonable efforts to assist interested MBE/DBE Firms in obtaining the bonding, lines of credit, or insurance required by MDOT or the bidder/offeror; and
2. made reasonable efforts to assist interested MBE/DBE Firms in obtaining necessary equipment, supplies, materials, or related assistance or services.

**III. Other Considerations**

In making a determination of Good Faith Efforts the decision-maker may consider engineering estimates, catalogue prices, general market availability and availability of certified MBE/DBE Firms in the area in which the work is to be performed, other bids or offers and subcontract bids or offers substantiating significant variances between certified MBE/DBE and Non-MBE/DBE costs of participation, and their impact on the overall cost of the contract to the State and any other relevant factors.

The decision-maker may take into account whether a bidder/offeror decided to self-perform subcontract work with its own forces, especially where the self-performed work is Identified Items of Work in the procurement. The decision-maker also may take into account the

performance of other bidders/offerors in meeting the contract. For example, when the apparent successful bidder/offeror fails to meet the contract goal, but others meet it, this reasonably raises the question of whether, with additional reasonable efforts, the apparent successful bidder/offeror



could have met the goal. If the apparent successful bidder/offeror fails to meet the goal, but meets or exceeds the average MBE/DBE participation obtained by other bidders/offerors, this, when viewed in conjunction with other factors, could be evidence of the apparent successful bidder/offeror having made Good Faith Efforts.

#### **IV. Documenting Good Faith Efforts**

At a minimum, a bidder/offeror seeking a waiver of the MBE/DBE Goal(s) or a portion thereof must provide written documentation of its Good Faith Efforts, in accordance with COMAR 21.11.03.11, within 10 business days after receiving notice that it is the apparent awardee. The written documentation shall include the following:

##### **A. Items of Work (Complete Good Faith Efforts Documentation Form E, Part 2)**

A detailed statement of the efforts made to select portions of the work proposed to be performed by certified MBE/DBE Firms in order to increase the likelihood of achieving the stated MBE/DBE Goal(s).

##### **B. Outreach/Solicitation/Negotiation**

1. The record of the bidder's/offeror's compliance with the outreach efforts prescribed by COMAR 21.11.03.09C(2)(a) through (e) and 49 C.F.R. Part 26, Appendix A. **(Complete Outreach Efforts Compliance Statement)**

2. A detailed statement of the efforts made to contact and negotiate with MBE/DBE Firms including:

(a) the names, addresses, and telephone numbers of the MBE/DBE Firms who were contacted, with the dates and manner of contacts (letter, fax, email, telephone, etc.) **(Complete Good Faith Efforts Form E, Part 3, and submit letters, fax cover sheets, emails, etc. documenting solicitations);** and

(b) a description of the information provided to MBE/DBE Firms regarding the plans, specifications, and anticipated time schedule for portions of the work to be performed and the means used to provide that information.

##### **C. Rejected MBE/DBE Firms (Complete Good Faith Efforts Form E, Part 4)**

1. For each MBE/DBE Firm that the bidder/offeror concludes is not acceptable or qualified, a detailed statement of the reasons for the bidder's/offeror's conclusion, including the steps taken to verify the capabilities of the MBE/DBE and Non-MBE/DBE Firms quoting similar work.

2. For each certified MBE/DBE Firm that the bidder/offeror concludes has provided an excessive or unreasonable price, a detailed statement of the reasons for the bidder's/offeror's

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conclusion, including the quotes received from all MBE/DBE and Non-MBE/DBE firms bidding on the same or comparable work. **(Include copies of all quotes received.)**

3. A list of MBE/DBE Firms contacted but found to be unavailable. This list should be accompanied by a Minority Contractor Unavailability Certificate signed by the MBE/DBE contractor or a statement from the bidder/offeror that the MBE/DBE contractor refused to sign the Minority Contractor Unavailability Certificate.

**D. Other Documentation**

1. Submit any other documentation requested by the Procurement Officer to ascertain the bidder's/offeror's Good Faith Efforts.

2. Submit any other documentation the bidder/offeror believes will help the Procurement Officer ascertain its Good Faith Efforts.

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**MDOT MBE/DBE FORM E**  
**GOOD FAITH EFFORTS GUIDANCE AND DOCUMENTATION**

**PART 2 – CERTIFICATION REGARDING GOOD FAITH EFFORTS DOCUMENTATION**

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Prime Contractor	Project Description	Solicitation Number

**PARTS 3, 4, AND 5 MUST BE INCLUDED WITH THIS CERTIFICATE ALONG WITH ALL DOCUMENTS SUPPORTING YOUR WAIVER REQUEST.**

I hereby request a waiver of (1) the Minority Business Enterprise (MBE) participation goal and/or subgoal(s), (2) the Disadvantaged Business Enterprise (DBE) participation goal, or (3) a portion of the pertinent MBE/DBE participation goal and/or MBE subgoal(s) for this procurement.<sup>1</sup> I affirm that I have reviewed the Good Faith Efforts Guidance MBE/DBE Form E. I further affirm under penalties of perjury that the contents of Parts 3, 4, and 5 of MDOT MBE/DBE Form E are true to the best of my knowledge, information and belief.

\_\_\_\_\_  
Company Name

\_\_\_\_\_  
Signature of Representative

\_\_\_\_\_  
Address

\_\_\_\_\_  
Printed Name and Title

\_\_\_\_\_  
City, State and Zip Code

\_\_\_\_\_  
Date

<sup>1</sup> MBE participation goals and subgoals apply to State-funded procurements. DBE participation goals apply to federally-funded procurements. Federally-funded contracts do not have subgoals.

\_\_\_\_\_

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**MDOT MBE/DBE FORM E**  
**GOOD FAITH EFFORTS GUIDANCE AND DOCUMENTATION**

**PART 3 – IDENTIFIED ITEMS OF WORK BIDDER/OFFEROR MADE AVAILABLE TO  
MBE/DBE FIRMS**

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Prime Contractor	Project Description	Solicitation Number

Identify those items of work that the bidder/offeror made available to MBE/DBE Firms. This includes, where appropriate, those items the bidder/offeror identified and determined to subdivide into economically feasible units to facilitate the MBE/DBE participation. For each item listed, show the anticipated percentage of the total contract amount. It is the bidder's/offeror's responsibility to demonstrate that sufficient work to meet the goal was made available to MBE/DBE Firms, and the total percentage of the items of work identified for MBE/DBE participation equals or exceeds the percentage MBE/DBE goal set for the procurement. Note: If the procurement includes a list of bid items identified during the goal setting process as possible items of work for performance by MBE/DBE Firms, the bidder/offeror should make all of those items of work available to MBE/DBE Firms or explain why that item was not made available. If the bidder/offeror selects additional items of work to make available to MBE/DBE Firms, those additional items should also be included below.

Identified Items of Work	Was this work listed in the procurement?	Does bidder/offeror normally self-perform this work?	Was this work made available to MBE/DBE Firms? If no, explain why?
	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No

Please check if Additional Sheets are attached.

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**MDOT MBE/DBE FORM E**  
**GOOD FAITH EFFORTS GUIDANCE AND DOCUMENTATION**

**PART 4 – IDENTIFIED MBE/DBE FIRMS AND RECORD OF SOLICITATIONS**

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Prime Contractor	Project Description	Solicitation Number

Identify the MBE/DBE Firms solicited to provide quotes for the Identified Items of Work made available for MBE/DBE participation. Include the name of the MBE/DBE Firm solicited, items of work for which bids/quotes were solicited, date and manner of initial and follow-up solicitations, whether the MBE/DBE provided a quote, and whether the MBE/DBE is being used to meet the MBE/DBE participation goal. MBE/DBE Firms used to meet the participation goal must be included on the MBE/DBE Participation Schedule, Form B. Note: If the procurement includes a list of the MBE/DBE Firms identified during the goal setting process as potentially available to perform the items of work, the bidder/offeror should solicit all of those MBE/DBE Firms or explain why a specific MBE/DBE was not solicited. If the bidder/offeror identifies additional MBE/DBE Firms who may be available to perform Identified Items of Work, those additional MBE/DBE Firms should also be included below. Copies of all written solicitations and documentation of follow-up calls to MBE/DBE Firms must be attached to this form. If the bidder/offeror used a Non-MBE/DBE or is self-performing the identified items of work, Part 4 must be completed.

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Name of Identified MBE/DBE Firm & MBE Classification	Describe Item of Work Solicited	Initial Solicitation Date & Method	Follow-up Solicitation Date & Method	Details for Follow-up Calls	Quote Rec'd	Quote Used	Reason Quote Rejected
<b>Firm Name:</b> _____  <b>MBE Classification (Check only if requesting waiver of MBE subgoal.)</b>  <input type="checkbox"/> African American-Owned <input type="checkbox"/> Hispanic American-Owned <input type="checkbox"/> Asian American-Owned <input type="checkbox"/> Women-Owned <input type="checkbox"/> Other MBE Classification _____ —		<b>Date:</b>  <input type="checkbox"/> Mail <input type="checkbox"/> Facsimile <input type="checkbox"/> Email	<b>Date:</b>  <input type="checkbox"/> Phone <input type="checkbox"/> Mail <input type="checkbox"/> Facsimile <input type="checkbox"/> Email	<b>Time of Call:</b>  <b>Spoke With:</b>  <input type="checkbox"/> Left Message	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Used Other MBE/DBE <input type="checkbox"/> Used Non-MBE/DBE  <input type="checkbox"/> Self-performing
<b>Firm Name:</b> _____  <b>MBE Classification (Check only if requesting waiver of MBE subgoal.)</b>  <input type="checkbox"/> African American-Owned <input type="checkbox"/> Hispanic American-Owned <input type="checkbox"/> Asian American-Owned <input type="checkbox"/> Women-Owned <input type="checkbox"/> Other MBE Classification _____ —		<b>Date:</b>  <input type="checkbox"/> Mail <input type="checkbox"/> Facsimile <input type="checkbox"/> Email	<b>Date:</b>  <input type="checkbox"/> Phone <input type="checkbox"/> Mail <input type="checkbox"/> Facsimile <input type="checkbox"/> Email	<b>Time of Call:</b>  <b>Spoke With:</b>  <input type="checkbox"/> Left Message	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Used Other MBE/DBE <input type="checkbox"/> Used Non-MBE/DBE  <input type="checkbox"/> Self-performing

Please check if Additional Sheets are attached.

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**MDOT MBE/DBE FORM E**  
**GOOD FAITH EFFORTS GUIDANCE AND DOCUMENTATION**

**PART 5 – ADDITIONAL INFORMATION REGARDING REJECTED MBE/DBE QUOTES**

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Prime Contractor	Project Description	Solicitation Number

This form must be completed if Part 3 indicates that a MBE/DBE quote was rejected because the bidder/offeror is using a Non-MBE/DBE or is self-performing the Identified Items of Work. Provide the Identified Items Work, indicate whether the work will be self-performed or performed by a Non-MBE/DBE, and if applicable, state the name of the Non-MBE/DBE. Also include the names of all MBE/DBE and Non-MBE/DBE Firms that provided a quote and the amount of each quote.

Describe Identified Items of Work Not Being Performed by MBE/DBE (Include spec/section number from bid)	Self-performing or Using Non-MBE/DBE (Provide name)	Amount of Non-MBE/DBE Quote	Name of Other Firms who Provided Quotes & Whether MBE/DBE or Non-MBE/DBE	Amount Quoted	Indicate Reason Why MBE/DBE Quote Rejected & Briefly Explain
	<input type="checkbox"/> Self-performing <input type="checkbox"/> Using Non-MBE/DBE	\$ _____	_____ <input type="checkbox"/> MBE/DBE <input type="checkbox"/> Non-MBE/DBE	\$ _____	<input type="checkbox"/> Price <input type="checkbox"/> Capabilities <input type="checkbox"/> Other
	<input type="checkbox"/> Self-performing <input type="checkbox"/> Using Non-MBE/DBE	\$ _____	_____ <input type="checkbox"/> MBE/DBE <input type="checkbox"/> Non-MBE/DBE	\$ _____	<input type="checkbox"/> Price <input type="checkbox"/> Capabilities <input type="checkbox"/> Other
	<input type="checkbox"/> Self-performing <input type="checkbox"/> Using Non-MBE/DBE	\$ _____	_____ <input type="checkbox"/> MBE/DBE <input type="checkbox"/> Non-MBE/DBE	\$ _____	<input type="checkbox"/> Price <input type="checkbox"/> Capabilities <input type="checkbox"/> Other

Please check if Additional Sheets are attached.

**CONTRACT PROVISIONS**  
PROPOSAL FORM PACKET — FEDERAL

CONTRACT NO. BA0065172  
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**INFORMATION REQUIRED TO BE SUBMITTED FOR FEDERALLY ASSISTED CONTRACTS:**

**(a) Each bidder shall provide the following information:**

NAME OF FIRM: \_\_\_\_\_

\_\_\_\_\_  
Street and/or P.O. Box

\_\_\_\_\_  
City

\_\_\_\_\_  
State

\_\_\_\_\_  
Zip Code

\_\_\_\_ DBE \_\_\_\_ Non-DBE      Age of the firm \_\_\_\_ years

Annual gross receipts per last calendar year \_\_\_\_ <\$500,000 \_\_\_\_ \$500,000-1,000,000

\_\_\_\_ \$1,000,000-3,000,000 \_\_\_\_ \$3,000,000-5,000,000 \_\_\_\_ \$5,000,000-10,000,000

\_\_\_\_ >\$10,000,000

**(b) Each bidder shall provide the following information for each firm quoting or considered as subcontractors and/or suppliers:**

NAME OF FIRM: \_\_\_\_\_

\_\_\_\_\_  
Street and/or P.O. Box

\_\_\_\_\_  
City

\_\_\_\_\_  
State

\_\_\_\_\_  
Zip Code

\_\_\_\_ DBE \_\_\_\_ Non-DBE      Age of the firm \_\_\_\_ years

Annual gross receipts per last calendar year \_\_\_\_ <\$500,000 \_\_\_\_ \$500,000-1,000,000

\_\_\_\_ \$1,000,000-3,000,000 \_\_\_\_ \$3,000,000-5,000,000 \_\_\_\_ \$5,000,000-10,000,000

\_\_\_\_ > \$10,000,000

NAME OF FIRM: \_\_\_\_\_

\_\_\_\_\_  
Street and/or P.O. Box

\_\_\_\_\_  
City

\_\_\_\_\_  
State

\_\_\_\_\_  
Zip Code

\_\_\_\_ DBE \_\_\_\_ Non-DBE      Age of the firm \_\_\_\_ years

Annual gross receipts per last calendar year \_\_\_\_ <\$500,000 \_\_\_\_ \$500,000-1,000,000

\_\_\_\_ \$1,000,000-3,000,000 \_\_\_\_ \$3,000,000-5,000,000 \_\_\_\_ \$5,000,000-10,000,000

\_\_\_\_ > \$10,000,000



**CONTRACT PROVISIONS**  
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NAME OF FIRM: \_\_\_\_\_

\_\_\_\_\_  
Street and/or P.O. Box

\_\_\_\_\_  
City State Zip Code

\_\_\_\_ DBE \_\_\_\_ Non-DBE Age of the firm \_\_\_\_ years  
Annual gross receipts per last calendar year \_\_\_\_ <\$500,000 \_\_\_\_ \$500,000-1,000,000  
\_\_\_\_ \$1,000,000-3,000,000 \_\_\_\_ \$3,000,000-5,000,000 \_\_\_\_ \$5,000,000-10,000,000  
\_\_\_\_ > \$10,000,000

NAME OF FIRM: \_\_\_\_\_

\_\_\_\_\_  
Street and/or P.O. Box

\_\_\_\_\_  
City State Zip Code

\_\_\_\_ DBE \_\_\_\_ Non-DBE Age of the firm \_\_\_\_ years  
Annual gross receipts per last calendar year \_\_\_\_ <\$500,000 \_\_\_\_ \$500,000-1,000,000  
\_\_\_\_ \$1,000,000-3,000,000 \_\_\_\_ \$3,000,000-5,000,000 \_\_\_\_ \$5,000,000-10,000,000  
\_\_\_\_ > \$10,000,000

NAME OF FIRM: \_\_\_\_\_

\_\_\_\_\_  
Street and/or P.O. Box

\_\_\_\_\_  
City State Zip Code

\_\_\_\_ DBE \_\_\_\_ Non-DBE Age of the firm \_\_\_\_ years  
Annual gross receipts per last calendar year \_\_\_\_ <\$500,000 \_\_\_\_ \$500,000-1,000,000  
\_\_\_\_ \$1,000,000-3,000,000 \_\_\_\_ \$3,000,000-5,000,000 \_\_\_\_ \$5,000,000-10,000,000  
\_\_\_\_ > \$10,000,000



**Submit additional copies of this page as page 41A of 44, 41B of 44, etc. as necessary, and place them as the last pages in the Invitation for Bids. Place an "X" for "NO" on the last copy. Any additional Copies: \_\_\_\_\_ NO \_\_\_\_\_ YES**

**CONTRACT PROVISIONS**  
PROPOSAL FORM PACKET — FEDERAL

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**EXTRA WORK, CONTRACT TIME, BONDING, LIQUIDATED DAMAGES, AND PROPOSAL GUARANTY**

**EXTRA WORK.** It is further proposed to do all "Extra Work" which may be required to complete the work contemplated at unit prices or lump sum prices to be agreed upon in writing prior to starting such extra work, or if such prices or sums cannot be agreed upon, to perform such work on a Force Account basis as specified in TC-7.03.

**CONTRACT TIME.** To commence work as specified in the "Notice to Proceed" and to prosecute the work to complete the contract within/or before

N/A (working days)

Friday, February 09, 2024 (calendar date)

Any delay in awarding or the execution of this contract will not be considered as a basis for any monetary claim, however, an extension of time may be considered by the Administration, if warranted.

**BONDING.** When the Contractor's bid is \$100,000 or more, the Contractor shall furnish a Payment Bond and a Performance Bond in the full amount of the Contract Award as security for the construction and completion of the contract in conformance with the Plans, Standard Specifications, revisions thereto, General Provisions and Special Provisions.

To guarantee all of the work performed under this contract to be done in conformance with the Standard Specifications, revisions thereto, General Provisions and Special Provisions in a good workmanlike manner and to renew or repair any work which may be rejected due to defective materials or workmanship, prior to final completion and acceptance of the work, also we have the equipment, labor, supervision and financial capacity to perform this contract either with our organization or with Subcontractors.

**LIQUIDATED DAMAGES.** The Contractor is hereby advised that liquidated damages in the amount of

N/A dollars (N/A) per working day

four thousand forty dollars (\$4,040) per calendar day

will be assessed for unauthorized extensions beyond the contracted time of completion.

**CONTRACT PROVISIONS**  
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**PROPOSAL GUARANTY.** A bid security is not required on Contract Proposals under \$100,000.

A bid security totaling at least five percent (5%) of the bid amount will be required on contracts of \$100,000 or over.

Acceptable forms of security for bid guaranty shall be per GP-2.07.

Enclosed herewith, find bid security based on at least five percent (5%) of the aggregate amount of the bid submitted, and made payable to the "State of Maryland". This bid security is a Proposal Guaranty (which is understood will be forfeited in the event the contract is not executed, if awarded to the signer of this affidavit).

**CONTRACT PROVISIONS**  
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**Commercial Nondiscrimination**

- A. As a condition of entering into this Agreement, Contractor represents and warrants that it will comply with the State’s Commercial Nondiscrimination Policy, as described under Title 19 of the State Finance and Procurement Article of the Annotated Code of Maryland. As part of such compliance, Contractor may not discriminate on the basis of race, color, religion, ancestry, national origin, sex, age, marital status, sexual orientation, sexual identity, genetic information or an individual’s refusal to submit to a genetic test or make available the results of a genetic test or on the basis of disability, or other unlawful forms of discrimination in the solicitation, selection, hiring, or commercial treatment of subcontractors, vendors, suppliers, or commercial customers, nor shall Contractor retaliate against any person for reporting instances of such discrimination. Contractor shall provide equal opportunity for subcontractors, vendors, and suppliers to participate in all of its public sector and private sector subcontracting and supply opportunities, provided that this clause does not prohibit or limit lawful efforts to remedy the effects of marketplace discrimination that have occurred or are occurring in the marketplace. Contractor understands that a material violation of this clause shall be considered a material breach of this Agreement and may result in termination of this Agreement, disqualification of Contractor from participating in State contracts, or other sanctions. This clause is not enforceable by or for the benefit of, and creates no obligation to, any third party.
  
- B. The Contractor agrees to include the clause contained in subsection (A), above, in all subcontracts, regardless of the tier.
  
- C. As a condition of entering into this Agreement, upon the request of the Commission on Civil Rights, and only after the filing of a complaint against Contractor under Title 19 of the State Finance and Procurement Article of the Annotated Code of Maryland, as amended from time to time, Contractor agrees to provide within 60 days after the request a complete list of the names of all subcontractors, vendors, and suppliers that Contractor has used in the past 4 years on any of its contracts that were undertaken within the State of Maryland, including the total dollar amount paid by Contractor on each subcontract or supply contract. Contractor further agrees to cooperate in any investigation conducted by the State pursuant to the State’s Commercial Nondiscrimination Policy as set forth under Title 19 of the State Finance and Procurement Article of the Annotated Code of Maryland, and to provide any documents relevant to any investigation that are requested by the State. Contractor understands that violation of this clause is a material breach of this Agreement and may result in contract termination, disqualification by the State from participating in State contracts, and other sanctions.