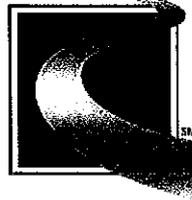


MARYLAND TRANSPORTATION AUTHORITY
Baltimore, Maryland

Invitation for Bids

WILLIAM PRESTON LANE, JR., MEMORIAL (BAY) BRIDGE



**Maryland
Transportation
Authority**

Contract No. BB-2042-000-002

**Bay Bridge Facilities
Fuel Tank Replacements**

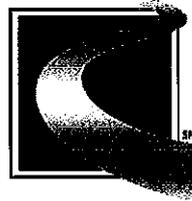
Anne Arundel County

January 2010

MARYLAND TRANSPORTATION AUTHORITY
Baltimore, Maryland

Invitation for Bids

WILLIAM PRESTON LANE, JR., MEMORIAL (BAY) BRIDGE



**Maryland
Transportation
Authority**

Contract No. BB-2042-000-002

**Bay Bridge Facilities
Fuel Tank Replacements**

Anne Arundel County

January 2010

NOTICE TO BIDDERS

A "Pre-Bidding Session" for the purpose of answering or obtaining answers to questions of parties interested in constructing the work relative to Right-of-Way, Utilities, Design, and Construction Details will be conducted at **9:30 am** on **February 3rd, 2010**, in the Conference Room, at the Maryland Transportation Authority, 300 Authority Drive, 1st Floor, Baltimore, Maryland 21222. While attendance at the Pre-Bid conference is not mandatory, this is the offeror's opportunity to raise questions and/or issues of concern regarding the project.



NOTICE TO BIDDERS

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

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



Maryland
Transportation
Authority

CONTRACT PROVISIONS

Contract No. BB 2042-000-002

2 of 2

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

11/20/08



IMPORTANT INFORMATION REGARDING MBE UTILIZATION AND BIDDING REQUIREMENTS

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

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

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

ATTACHMENT A

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

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

**ATTACHMENT B Part 2**

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

- Prime Contractor's name, address and phone number.
- Project description.
- Project number/Solicitation Number.
- List the minority firm name(Column 1), certification number and MBE Classification (Column 2), Total sub contract dollar amount (Column 3) and NAICS Codes of the services to be performed or products to be supplied (Column 4)
- Clarify for each sub-contractor if it will provide services, is a supplier or will supply and install (Column 5)
- It is the Contractor's responsibility to ensure that the proposed subcontractors are certified to perform the proposed work. All Contractors are to submit an approvable MBE plan at time of bid. Approvable means, the subcontractors are certified in the applicable NAICS Codes through MDOT and can perform the proposed services for the required participation goal. Contractors pending MBE certification at time of bid are **not** eligible for participation. If you submit a firm that is not certified to perform the proposed services and your contract falls short of the established MBE goal, your firm will be considered **non-responsive or not reasonably susceptible of being selected for award.**
- Prime Contractors are strongly encouraged to check the MDOT database at www.mbe.mdot.state.md.us to see if the subcontractor is certified to perform the services and to make sure the subcontractor has not graduated from the listed NAICS codes. If you have questions after checking the data base, you may contact the Authority MBE Office at 410-537-1048 for further assistance.

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

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

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



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

- Attachment B must be signed and dated.
- If you are the apparent low bidder, you will receive a letter from the Authority requesting your MBE Attachment C (Outreach Efforts Compliance Statement) and Attachment D (Subcontractor Project Participation Affidavit). You will have ten (10) working days to submit the attachments to the Authority. If you requested a waiver at time of bid, all of the back up documentation that complies with COMAR 21.11.03.11, must be submitted within the ten working days with Attachments C & D.
- If the apparent low bidder fails to return the required documentation within the allotted ten (10) days, the Procurement Officer may determine that the apparent low bidder is not responsible and therefore not eligible for contract award.

Dual Certification Procurement Information

Effective on October 1, 2009, Minority Business Enterprise (MBE) firms may elect to be dually certification as woman-owned businesses and as members of an ethnic or racial category. For purposes of achieving any gender or ethnic/racial MBE participation subgoals in a particular contract, an MBE firm that has dual certification may participate in the contract either as a woman-owned business or as a business owned by a member of a racial or ethnic minority group, **but not both**.

WARNING – PLEASE READ:

- ◆ **A firm must be listed in the MDOT MBE/DBE Directory with the gender category in order to be used to meet the gender subgoal.**
- ◆ **A firm must be listed in the MDOT MBE/DBE Directory with an ethnic/racial category in order to be used to meet the ethnic/racial subgoal.**



- ◆ **A firm must be listed in the MDOT MBE/DBE Directory with both the gender and ethnic/racial categories in order for a contractor to have the option of selecting which of those categories it will use for the firm on a State contract.**
- ◆ **Contractors should designate whether the MBE firm will be used as a woman-owned business or as a business owned by a member of a racial/ethnic group before calculating the percentage of MBE participation goals and subgoals they intend to meet.**

Maryland's MBE/DBE Directory will reflect the dual certification status beginning October 1, 2009. You can access the MBE/DBE Directory at <http://mbe.mdot.state.md.us>. Firms with dual certification will now be listed as follows:

Example:

ABC Corporation, Inc.
123 Corporate Circle
Hanover, MD 21076
Female/African American
00-000



Maryland
Transportation
Authority

CONTRACT PROVISIONS

Contract No. BB 2042-000-002

Page 1 of 1

Notice to Bidders/Offerors

eMaryland Marketplace

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

For registration requirements, visit:
www.eMarylandMarketplace.com



NOTICE TO ALL HOLDERS OF THIS CONTRACT DOCUMENT

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

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

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

Category 1 Devices

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

Category 2 Devices

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

Category 3 Devices

- (a) Truck Mounted Attenuators (TMAs) 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.
- (c) Temporary End Treatments.

Category 4 Devices

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



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



TABLE OF CONTENTS

| | <u>Page No.</u> |
|--|-----------------|
| Invitation for Bids | i |
| Contract Provisions | |
| Check list prior to submitting bids | ii-iii |
| Important information regarding MBE utilization and bidding Requirements | iv-vii |
| Notice to Bidders/Offerors about eMaryland Marketplace | viii |
| National Cooperative Highway Research Program | ix-x |
| Table of Contents | xi-xiii |
| Special Provisions | 1-8 |
| Revisions to General Provisions | 9-15 |
| Revisions to Terms and Conditions | 16-24 |
| Revisions to Technical Requirements: | |
| CATEGORY 100 PRELIMINARY: | |
| Section 104.01 General / Traffic Control Plan (TCP) | 25-27 |
| Section 104.11 Temporary Pavement Markings | 28-29 |
| Section 104.14 Cones for Maintenance Of Traffic | 30 |
| CATEGORY 200 GRADING: | |
| Section 203 Borrow Excavation | 31-34 |
| Section 212 Excavation and Removal of Existing Above Ground and Underground Storage Tanks | 35-49 |
| CATEGORY 300 DRAINAGE | |
| Section 308 Erosion and Sediment Control | 50-52 |
| Section 316 Prefabricated Trench Drains | 53 |
| CATEGORY 400 STRUCTURES | |
| Section 429 Fuel Station Canopy | 54-60 |
| CATEGORY 500 PAVING | |
| Section 520 Plain and Reinforced Portland Cement and Concrete Pavement | 61-62 |



Maryland
Transportation
Authority

CONTRACT PROVISIONS

Contract No. BB 2042-000-002

CATEGORY 700 LANDSCAPING

Section 710 Tree, shrub, & Perennial Installation and Establishment..... 63

CATEGORY 800 TRAFFIC AND UTILITIES

Section 820 General Electric Work and Testing..... 64-71

CATEGORY 900 MATERIALS

Section 902 Portland Cement Concrete and Related Products 72-86
 Section 916 Soil and Soil-Aggregate Borrow..... 87
 Section 950.03 Reflectorization of Signs and Channelizing Devices..... 88

CATEGORY 1000 EQUIPMENT

Section 1002 Fuel Storage and Dispensing Equipment..... 89-106
 Section 1006 Testing and Commissioning 107-110
 Section 1010 Chain Link Slide Gates 111-116
 Section 1012 Access Control, Intercom and CCTV System 117-139

CATEGORY 2000 MECHANICAL & ELECTRICAL SYSTEMS

(The following specifications are in CSI format. All references to DIVISION 0 AND DIVISION 1 shall mean the SHA Standard Specifications for Construction and Materials, July 2008, GENERAL PROVISIONS and TERMS AND CONDITIONS)

Section 15510 – Basic Mechanical Requirements..... 140-149
 Section 15550 – Basic Materials and Methods..... 150-154
 Section 15580 – Piping..... 155-157
 Section 15620 – Furnaces..... 158-159
 Section 16050 – Common Work Results for Electrical..... 160-163
 Section 16060 – Grounding and Bonding for Electrical Systems 164-169
 Section 16073 – Hangers and Supports for Electrical Systems..... 170-176
 Section 16075 – Identification for Electrical Systems..... 177-185
 Section 16120 – Low-Voltage Electrical Power Conductors and Cables..... 186-191
 Section 16410 – Enclosed Switches and Circuit Breakers 192-197

Wage Rates 198-202
 Contractor Affirmative Action Program..... 203-219

Affirmative Action Requirements Utilization of Minority Business Enterprises for
 Straight State Contracts..... 220-225

Proposal Form..... 226

Schedule of Prices..... 227-241



CONTRACT PROVISIONS

Contract No. BB 2042-000-002

| | <u>Page No.</u> |
|---|-----------------|
| Contract Time and Bonding..... | 242 |
| Buy American Steel Act | 243-245 |
| Exhibit to Solicitation State of Maryland - Maryland Transportation Authority Minority Business Enterprise Participation | 246-256 |
| Bid/Proposal Affidavit..... | 257-267 |
| Escrow Account For Retained Funds | 268 |
| Proposal Guaranty..... | 269 |
| Bid Guarantee | 270-271 |
| Bid Bond | 272-274 |
| Appendix A – Geotechnical Report..... | A1- A19 |



SP 1-1 PROJECT DESCRIPTION

CONTRACT NO.: BB 2042-000-002

TITLE: Bay Bridge Facilities Fuel Tank Replacements

FACILITY: William Preston Lane Jr., Memorial Bridge (US 50 / US 301)

LOCATION: Anne Arundel County

ADVERTISED: **January 19, 2010**

PRE-BID MEETING: 9:30 a.m. on February 3, 2010 in the Conference Room at the Maryland Transportation Authority, 300 Authority Drive, 1st Floor, Engineering Building, Baltimore, MD 21222

PROJECT CONTACT: Project Manager: Mr. Doug Novocin (410)-537-7840
Contract Administration: Ms. Maggie Johnson (410)-537-7807

BIDS DUE: **12:00 Noon on February 24, 2010** in the Bid Box on the 1st floor of the Maryland Transportation Authority, Engineering Building, 300 Authority Drive, Baltimore, MD 21222

CLASSIFICATION: Class C (\$500,001 – \$1,000,000)

CONTRACT TIME: One Hundred and Eighty (180) Calendar Days

LIQUIDATED DAMAGES: **\$300.00 per Calendar Day**

MINIMUM MBE GOALS: 25% Overall

BID DOCUMENTS: **\$60.00** - Bid documents can be purchased between 7:30 a.m. and 3:30 p.m., Mondays, Wednesdays, Thursdays and Fridays and between 10:00 a.m. and 4:00 p.m. on Tuesdays at the Ticket Office located at the Francis Scott Key Bridge, Maryland Transportation Authority, Administration Building, 303 Authority Drive, Baltimore, MD 21222.



This project is located at three (3) Maryland Transportation Authority Bay Bridge Facilities on the western shore of the Chesapeake Bay in Anne Arundel County, Maryland.

This project includes removal of underground storage tanks and installation of above ground storage tanks at the following locations:

1. The Administration Building and Salt Storage Facility (north of US RT 50/301)
2. The Police/Maintenance Facility on Oceanic Drive (south of US RT 50/301) (includes the construction of a new fueling area)
3. The Temporary Building/Garage on Ferry Slip Road (south of US RT 50/301)

Without intending to limit or restrict the extent of work required under the Contract, the work generally comprises the following:

- a) Remove two (2) 1,000 gallon above-ground storage tanks (ASTs).
- b) Remove four (4) underground storage tanks (USTs) of varying size and associated piping.
- c) Remove fuel dispensers and two (2) canopies.
- d) Construct new concrete pad under canopy, and under new ASTs as shown on the Contract Drawings.
- e) Furnish and install one (1) new 8,000-gallon AST divided into two compartments of 2,000 and 6,000 gallons, and all associated appurtenances and piping; and furnish and install one (1) new 1,000-gallon AST, and all associated appurtenances and piping. Furnish and install five (5) new dispensers to dispense diesel, unleaded, and E-85 fuels with containment sumps, pedestals, and all associated appurtenances and piping. Construct new canopy over new fuel station.
- f) Furnish and install one (1) new 4,000-gallon AST, and all associated appurtenances and piping.
- g) Furnish and install propane piping and heating system for one (1) new 500-gallon AST (AST to be supplied by others), construct new concrete pad, 2 heating units and all associated appurtenances and piping.
- h) Install new power and control wiring for dispensers, tank monitoring system, and lighting for canopy.
- i) Install new chain link fence as shown on the Contract Drawings.
- j) Install one (1) new sliding gate as shown on the Contract Drawings.
- k) Install new power, card readers, security camera, intercom and control wiring to the gate location.
- l) Repave parking area and landscape surface restoration as shown on the Contract Drawings.

SP 1-2 SPECIFICATIONS

All work on this project shall conform to the Maryland Department of Transportation, State Highway Administration's Specifications entitled, "Standard Specifications for Construction and Materials" dated



July 2008, revisions thereof, or additions thereto, and the Special Provisions included in this Invitation for Bids.

SP 1-3 ORIGINAL FACILITY PLANS AND SITE VISITS

The original facility plans are on file at the Engineering/Finance Building of the Francis Scott Key Bridge and will be made available for inspection to prospective bidders. Parties interested in viewing the plans should contact Ms. Cheryl McKinlay, Project Engineer-Environmental, at (410) 537-7809. Parties interested in visiting the site should contact Mr. Ken Cimino, Administrator, at (410) 537-6659.

SP 1-4 PROMPT PAYMENT TO SUBCONTRACTORS

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

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

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

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



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

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

SP 1-5 WORK HOURS

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

SP 1-6 INSURANCE

TC-5.01 INSURANCE

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

1. The Contractor shall not commence work under this contract until he has obtained all of the minimum amounts of insurance required by these Special Provisions and the insurance has been approved by the Project Engineer. The Contractor shall furnish to the Maryland Transportation Authority ("Authority") duly executed certification of all required insurance on forms satisfactory to the Authority. The certificates of insurance shall state that it is in force and cannot be cancelled, released or non-renewed except upon thirty (30) days prior written notice, registered mail to the Authority. All Contractors' insurance policies, with the exception of the Worker's Compensation and Employer's Liability shall be endorsed to provide as additional insureds the Maryland Transportation Authority and the State of Maryland.
2. The Contractor shall purchase and maintain such insurance as is specified herein which will provide the Authority, its members, employees and agents, as well as the Contractor from claims which may arise out of or as a result of the Contractor's operations under this contract, whether such operations be by the Contractor, by any Subcontractor, by anyone directly or indirectly employed by any of them or by anyone whose acts any of them may be liable. This insurance shall be maintained in full force until the Contract has been accepted by the Authority and final payment is made.
3. The Authority requires the following minimum levels of insurance coverage for this contract:
 - a) Worker's Compensation and Employer's Liability

The Contractor shall, at all times, maintain and keep in force such insurance as will protect him from claims under the Worker's Compensation Act of the State of Maryland and



maintain and keep Employer's Liability Insurance at a limit of One Hundred Thousand Dollars (\$100,000.00). The Contractor shall also maintain United States Long Shore and Harbors Act coverage, if such exposure exists.

b) Comprehensive General Liability Insurance

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

c) Comprehensive Automobile Liability Insurance

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

d) Additional Insurance

The Contractor shall also procure and keep in effect:

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

4. Accident Notification - The Contractor shall send a written report to the Engineer and to the Maryland Transportation Authority within twenty-four (24) hours of any accident or other event arising in any manner from the performance of the contract which results in or might result in personal injury or property damage.
5. Failure to comply with these Special Provisions may lead to termination for default or convenience.
6. There will be no special payment for the insurance as required by this contract and all costs incidental thereto shall be included in the Lump Sum for "Mobilization", (refer to Section 108), or if the Contract does not include such an item, the insurance costs are to be included in pay items for the Proposal.



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

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

The Contractor shall:

1. Identify specific work categories appropriate for subcontracting;
2. At least ten (10) days before bid opening, solicit Minority Business Enterprises, through written notice that:
 - a) Describe the categories of work and,
 - b) Provide information regarding the type of work being solicited and specific instructions on how to submit a bid.
3. Attempt to make personal contact with Minority Business firms.
4. Assist Minority Business Enterprises to fulfill bonding requirements or to obtain a waiver of these requirements.
5. Upon acceptance of a bid, provide the Authority with a list of Minority Businesses with whom the Contractor negotiated, including price quotes from Minority and Non-minority firms.

Third Tier Subcontracting:

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

Waivers:

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

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

Criminal Fraud Provisions:



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

SP 1-8 PROGRESS SCHEDULE REQUIREMENTS

Refer to Section 109 of the Standard Specifications.

SP 1-9 CORPORATE REGISTRATION

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

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

SP 1-10 CONTRACTOR'S EMPLOYEE IDENTIFICATION

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

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

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

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



Maryland
Transportation
Authority

SPECIAL PROVISIONS

Contract No. BB 2042-000-002

Page 8 of 8

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

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



**GENERAL PROVISIONS
GP-SECTION 1**

DEFINITIONS AND TERMS

GP 1.03 – ORGANIZATIONAL DEFINITIONS

Revise the definitions of Administration to read as follows:

Administration – The word “Administration” shall mean “Maryland Transportation Authority.”

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



**GENERAL PROVISIONS
GP-SECTION 2**

BIDDING REQUIREMENTS AND CONDITIONS

GP-2.06 PREPARATION OF THE BID

ADD: After paragraph (a), the following.

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

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

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

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

Sample forms shall be submitted to:

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



**GENERAL PROVISIONS
GP-SECTION 2
BIDDING REQUIREMENTS AND CONDITIONS**

GP 2.23 - BID PROTESTS

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

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

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

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



**GENERAL PROVISIONS
GP SECTION 4
SCOPE OF WORK**

GP 4.10 - WARRANTY OF CONSTRUCTION

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

Delete: The first paragraph in its entirety.

Insert: The following:

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



**GENERAL PROVISIONS
GP SECTION 5
CONTROL OF WORK**

GP 5.12 - FAILURE TO MAINTAIN ENTIRE PROJECT

Delete: Section GP 5.12 in its entirety

Insert: Revise the paragraph to read as follows:

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



**GENERAL PROVISIONS
GP SECTION 8
PROSECUTION AND PROGRESS**

GP 8.09 - LIQUIDATED DAMAGES

Delete: Section GP 8.09 in its entirety

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

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

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



**GENERAL PROVISIONS
GP SECTION 9**

PAYMENT

GP 9.05 LATE PAYMENTS

ADD the following:

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



**TERMS AND CONDITIONS
TC SECTION 4
CONTROL OF WORK**

See Section TC 4 of the SHA's *Standard Specifications (Part II Terms and Conditions)* in conjunction with the changes shown in this Section.

Revise as follows:

Revise the definition of Administration to read as follows:

Administration - The word "Administration" shall mean the Maryland Transportation Authority (MdTA).

TC - 4.01 WORKING DRAWINGS

DELETE SECTION (a) IN ITS ENTIRETY AND REPLACE WITH THE FOLLOWING

ADD:

- a) **General.** The specifications will be supplemented by working drawings, catalog cuts, schematics, material data, installation plans and manuals, user manuals, and other data necessary to demonstrate to the Engineer adequate control of the work, proper installation and handling, conformance to the specifications, and that the proposed materials and equipment is suitable for the intended use. All submittals involving structural work must be submitted and stamped by a registered Structural Engineer with Professional Engineer certifications valid in Maryland. All authorized alterations affecting the requirements and information given on the working drawings shall be in writing to the Engineer. Any deviations from the Specifications or Special Provisions shall be clearly highlighted and explained. When reference is made to the working drawings, the interpretation shall be the working drawings as affected by all authorized alterations then in effect. When reference is made to the working drawings, the interpretation shall be that working drawings include working drawings, catalog cuts, schematics, material data, installation plans and manuals, user manuals, and other data necessary to demonstrate to the Engineer adequate control of the work, proper installation and handling, conformance to the specifications, and that the proposed material or equipment is suitable for the intended use.

Working drawings will show details of all structures, lines, grades, typical cross section of roadway, general cross sections, location and designation of all units and elements. Cabinet drawings shall be to-scale showing the location of all equipment proposed to be mounted within the cabinet. One-line diagrams and schematics shall be provided for equipment



cabinets showing the interconnection of all devices located therein. Equipment layouts shall include rack-level elevation views as well as floor plans for all equipment racks. All working drawings, regardless if submitted as specified or submitted as equal substitutes, shall be furnished with complete, specific, detailed information from the manufacturer or supplier for the material or equipment the Contractor proposes to furnish, in which the requirements of the Specifications and Special Provisions shall be clearly shown to be met.

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

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

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

If the substitute material or equipment requires any re-design or affects other aspects of the project, the Contractor shall be responsible to provide such re-design including details and to adjust elements as necessary to achieve the re-design at no additional cost to the Authority. Cost saving re-designs will be considered under the value engineering specifications.

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

The Contractor shall provide, at no additional cost to the Authority, all required working drawings and shall have them adequately checked, after which they shall be submitted to the Engineer for review. The engineer may reject working drawings and return them for revisions, in which case the Contractor shall submit revised working drawings as required. No items involving working drawings shall be incorporated into the work until working drawings have



been accepted by the Engineer, however, acceptance shall not relieve the Contractor of any responsibility in connection with the working drawings.

The working drawings shall be prepared on sheets no smaller than 8.5" x 11" and no larger than 22" x 36". The sheet size and scale of the drawings shall be appropriate for the work depicted. All working drawings shall be submitted by the Contractor, no working drawings submitted directly by subcontractors, fabricators, suppliers, etc. shall be accepted. Acceptance of a material source or equipment source by the Engineer or the Authority shall NOT constitute approval of the material or equipment nor approval of the materials or equipment as a substitute or an "equal" product.

ADD:

- b) The working drawings shall be submitted electronically as files (FAXES are NOT acceptable). Electronic submission may be made via email for small submissions. Email is the preferred submission method. The email submissions shall be made to the email addresses provided by the Authority upon notice to proceed of the project and shall include cmckinlay1@mdta.state.md.us. Where electronic submittals are larger than what the Authority's email can support (currently about 4MB), the submission may be made using one or more of the following alternatives:

Post the submittals on a contractor-supported FTP server, or a service-provider server that may be accessed by the Authority, as long as an email notice with downloading instructions (including user ID and password if applicable) is made with the 'cover' sheet.

Copied onto a CD, DVD, or other supported data media and submitted to the Authority via standard mail. At least 5 copies of the media shall be provided for in-house distribution.

The address to mail such media transfers is:

Maryland Transportation Authority
Engineering Division
300 Authority Drive
Baltimore, MD 21222
ATTN: Cheryl McKinlay

ADD:

- c) Electronic Submittal Format. All electronic submittals shall be in a format readable by the Authority. The submittals shall be in Adobe portable document format (PDF) compatible with version 6.0 of Adobe Acrobat (not any later version).



Each submittal shall be a single file and for a single component or a group of components described in the associated bid line item. The Contractor may divide a bid item into multiple submittals for convenience if the situation warrants. Multi-file submittals shall not be accepted.

The first page of each submittal shall be a cover page. The cover page must be in the 8.5 x 11" sheet format. The cover page must include:

1. The Contract number.
2. The Contract title.
3. Submittal Number. For each project (Contract), a sequential number starting with number 1 shall be used. Where a submittal is rejected, or otherwise requires a re-submittal or replacement, the submittal number shall be appended with an "R" followed by the revision number.
4. The Contractor's name, mailing address, contact phone number, contact email address.
5. The relevant line items in the contract that the submittal is associated with.
6. A brief description of the materials or data represented in the submittal package.
7. The date of the submittal.
8. The manufacturer's name, web site address, mailing address, and contact phone number, if applicable.
9. The vendor's or reseller's name, web site address, mailing address, and contact phone number if applicable.
10. The cover page must contain a 6" x 3" blank space where the reviewers' stamps may be placed (electronically) without covering the data in the page.

The electronic file must not be secured. The reviewers of the electronic submittals will place electronic stamps and may include comments in the electronic submittals provided by the Contractor. Any security or incompatibility problems that prevent the use of the electronic stamps or electronic commenting will render the submittal unacceptable. The returned file may be secured to prevent accidental changes.

**ADD:**

- d) File Naming Conventions and Rules. It is necessary and required that file naming conventions and rules be followed to lend to organization and reduce confusion regarding the electronic submissions. Submittals that do not follow the file naming conventions described herein will be rejected without review. Strict adherence to the file naming rules is required. The file names for electronic submissions shall follow these rules:
1. The first five characters must be the first five characters of the contract number. For example, for contract BB 2042-000-006, the first six characters of the file name must be BB2042
 2. The seventh character must be a dash.
 3. The eight through tenth characters shall be the text "SUB," which is short for "Submittal" and used to indicate that the file is a submittal from a Contractor.
 4. The eleventh character must be a dash.
 5. The twelfth through fourteenth characters must be the submittal number, e.g., 001.
 6. In the event of a re-submittal, the 15th character will be an R followed by the re-submittal number.
 7. The remaining filename characters may be any short descriptive characters that may be useful to identify the nature of the submittal (fewer than 40 additional characters)
 8. Examples of filenames:
 - i. BB2042-SUB-001-Conduit.pdf
 - ii. BB2042-SUB-001R2-Conduit.pdf
 - iii. BB2042-SUB-015-Fiber Optic Cable.pdf
 9. After the submittal has been reviewed, the text 'SUB' will be replaced by the text 'TRN' by the Authority and the electronic file with electronic stamps and possibly containing electronic comments will be returned to the contractor via email, CD, DVD, or similar electronic file transfer.

ADD:

- e) Upon completion of the project, all electronic files that have been transmitted to the Contractor (TRN's) shall be transferred to CD's, DVD's or other media by the Contractor and provided to the Authority along with as-built data. Data provided shall include any original files in original format, used to generate the PDF submittals, these may include CADD, Visio, Word, Excel, MathCad, Access/Database, HTML, JPG/Pictures, Power point, or any other format that may have been used as the originating document. Provide 3 copies of all media.



**TERMS AND CONDITIONS
TC SECTION 4**

CONTROL OF WORK

TC-4.02 FAILURE TO ADEQUATELY MAINTAIN PROJECT.

ADD: To the existing paragraph.

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

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

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

The deduction will be equal to the daily prorated share of the lump sum price bid for Maintenance of Traffic or \$ 200.00 per day, whichever is more for each day or portion thereof that the deficiencies exist, and will continue until the deficiencies and proper assumption of the required maintenance provisions are satisfactorily corrected and accepted by the Engineer. The amount of monies deducted will be a permanent deduction and are not recoverable. Upon satisfactory correction of the deficiencies, payment of the Maintenance of Traffic lump sum item will resume.



**TERMS AND CONDITIONS
TC SECTION 5
LEGAL RELATIONS AND PROGRESS**

TC-5.01 INSURANCE.

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

INSERT: The following.

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

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

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

**TERMS AND CONDITIONS
TC SECTION 7**

PAYMENT

TC-7.03 FORCE ACCOUNT WORK.

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

INSERT: The following.

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

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

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

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

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

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

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



SPECIAL PROVISIONS

Contract No. BB 2042-000-002

Page 9 of 9

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



**CATEGORY 100
PRELIMINARY**

SECTION 104 — MAINTENANCE OF TRAFFIC

104.01 TRAFFIC CONTROL PLAN (TCP).

104.01.01 DESCRIPTION.

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

INSERT: The following.

Project Description.

Agency Contacts.

| CONTACT | TITLE | PHONE NUMBER |
|-----------------|-------------------------------|--------------|
| Ken Cimino | Administrator | 410-295-8157 |
| Howard Smith | Maintenance Supervisor | 410-537-6651 |
| Bobby Wojcik | Utility Coordinator | 410-537-6669 |
| Maurice Saxon | A/CFMO | 410-537-6651 |
| Gary McGuire | Facility Maintenance Tech. IV | 410-537-6650 |
| Cheryl McKinlay | Project Engineer | 410-537-7809 |
| | | |

Work Restrictions. On Monday of each week, the Contractor shall provide the Engineer with a complete schedule of work activities for the following two weeks, allowing the Authority a minimum of fourteen (14) calendar days or ten (10) working days notification. The Engineer shall then notify the affected facilities, the Engineering Division’s Traffic Section and other appropriate offices. No lane or shoulder closures are permitted on any road adjacent to the parking lots. The contractor must maintain vehicular and pedestrian access to all Facilities at all times.

For the area behind the existing MdTA Police and Automotive shop, maintain access to the garage at all times. If excavations outside the protected work area cannot be completed within a single work day then the excavation must be plated and made safe for vehicles to traverse.

For the work near the Administration Building, the contractor must maintain the existing E-Z Pass Handicap and 2 stop in center parking spaces. The contractor may close the back entrance



into the Administration Building.

For the existing gas pump and tank removal, a portion of the lot may be closed but only for as long as it takes to remove the canopy, remove the pumps, saw cut the existing curb, backfill and stabilize the area. Work schedule and activities MUST be coordinated with and as approved by Construction and Operations, prior to the Contractor commencing work.

For Site # 3, the temporary garages near the construction trailers. The UST removal work shall be completed in one week and the hole plated or adequately protected as approved by the Engineer. Work schedule and activities MUST be coordinated with and as approved by Construction and Operations, prior to the Contractor commencing work.

Contract LB 378-000-006R2 Staging area has priority for work done at Site # 3. Work schedule and activities MUST be coordinated with the Contractor, American Bridge Company, and as approved by the Engineer, prior to the Contractor commencing work.

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

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

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

| ELAPSED TIME, MINUTES | DEDUCTION |
|-----------------------|---|
| 1 - 5 | \$ <u>50.00</u> |
| Over 5 | \$ <u>50.00</u> per Minute (In addition to the Original 5 minutes) |

104.01.04 MEASUREMENT AND PAYMENT.

ADD: the following:



Maryland
Transportation
Authority

SPECIAL PROVISIONS

Contract No. BB 2042-000-002

Page 3 of 3

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

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

**CATEGORY 100
PRELIMINARY****SECTION 104 — MAINTENANCE OF TRAFFIC**

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

INSERT: The following.

104.11 TEMPORARY PAVEMENT MARKINGS.

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

104.11.02 MATERIALS.

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

104.11.03 CONSTRUCTION.

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

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

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

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

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



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

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

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

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

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

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

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

- (a) Nontoxic Lead Free Waterborne Pavement Marking Paint-in width specified-per linear foot.
- (b) Removable Preformed Pavement Line Markings-in width specified-per linear foot.
- (c) Removable Preformed Letters, Symbols, Arrows, and Numbers per each.
- (d) Removal of Removable Preformed Pavement Markings-any width-per linear foot.
- (e) Removal of Removable Preformed Letters, Symbols, Arrows and Numbers per each.
- (f) Removal of Existing Pavement Line Markings-any width per linear foot.
- (g) Removal of Existing Letters, Symbols, Arrows, and Numbers per each.
- (h) Black Out Tape Lines-in width specified-per linear foot.
- (i) Removal of Black Out Tape Lines-any width-per linear foot



**CATEGORY 100
PRELIMINARY**

SECTION 104 - MAINTENANCE OF TRAFFIC

104.14 CONES FOR MAINTENANCE OF TRAFFIC.

104.14.02 MATERIALS.

171 **DELETE:** First paragraph on this page “Cones shall be...an upright position”.

INSERT: The following.

All cones shall meet MdmUTCD and be new or like new condition. All cones shall be orange in color. Cones shall be at least 28 in. high, 10 in. diameter at the inside of the base, and reflectorized with two white retroreflective stripes. The top stripe shall be 6 in. wide and located 3 to 4 inches from the top of the cone. The second stripe shall be 4 in. wide and located 2 inches below the top band.

Tall-Weighted Cones. When specified, tall-weighted cones shall be at least 42 in. high and 7 in. diameter at the inside of the base. Tall-weighted cones shall be manufactured of low density polyethylene (LDPE) and have four high performance wide angle white and orange retroreflective stripes. The stripes shall be horizontal, circumferential and 6 in. wide. Alternate stripe colors with the top stripe being orange. Any nonretroreflective spaces between the orange and white stripes shall not exceed 1/2 in.

104.14.03 CONSTRUCTION.

ADD: The following after the first paragraph “The Contractor’s name...away from traffic”.

Equip all cones with approved weights or anchor collars, (15 lb maximum) as needed to maintain an upright position. Anchor collars shall fit to the base of the cone. For tall-weighted cones use anchor collars weighing 10 to 30 lb.



**CATEGORY 200
GRADING**

SECTION 203 — BORROW EXCAVATION

203.01.02 Notice to Contractor —Borrow Pits.

225 **ADD:** After the first paragraph.

This project is located in Anne Arundel County. The following conditions applicable to the county or city shall be complied with and documented.

DISTRICT 1

Dorchester (DO) County

Site plan approved by Soil Conservation District.
Grading permit from County Highway Department (except City of Cambridge).
Planning and Zoning approval for use.
Critical Areas approval (if applicable).
Inspection by County.

Somerset (SO) County

Site plan approved by Soil Conservation District.
Grading Permit from the County.
Land Use permit.
Critical Areas approval by Planning and Zoning (if applicable).
Inspection by MdTA.

Wicomico (WI) County

Site plan approved by Soil Conservation District.
Certificate of compliance with Planning and Zoning if located in Critical Area.
Inspection by MdTA.

Worcester (WO) County

Site plan approved by Soil Conservation District.
Critical areas approved by Planning and Zoning (if applicable).
Inspection by MdTA.

DISTRICT 2

Caroline (CO), Cecil (CE), Queen Anne's (QA) and Talbot (TA) Counties

Site plan approved by Soil Conservation District.
Planning and Zoning approval.
Critical Areas approval (if applicable).
Inspection by MdTA.

Kent (KE) County

Site plan approved by Soil Conservation District.
Grading permit.



Planning and Zoning approval.
Critical Areas approval (if applicable).
Inspection by MdTA.

DISTRICT 3

Montgomery (MO) County

Sediment control permit and plan approval by County
Department of Environmental Protection, Division of
Water Resources Management, Storm Water Management Section/Sediment
Control.
Approval by Maryland National Capital Park and Planning Commission (if
applicable).
Inspection by County.

Prince Georges (PG) County

Site Plan approved by Soil Conservation District.
County Grading Permit.
Tree conservation plan approval by Maryland National Capital Park and
Planning Commission (if applicable).
Critical Areas approval (if applicable).
Payment of all pertinent county fees and/or securing of county required bonding.
Inspection by MdTA with oversight by County.

DISTRICT 4

Baltimore (BA) County

Site Plan approved by the Department of Environmental Protection and the Soil
Conservation District.
County Grading Permit.
Critical Areas approval by the Department of Environmental Protection and
Resource Management (if applicable).
Inspection by County.

Harford (HA) County

Site Plan approved by Soil Conservation District.
County Grading Permit.
Critical Areas approval (if applicable).
Inspection by County.

DISTRICT 5

Anne Arundel (AA) County

Site Plan approved by Soil Conservation District.
Planning and zoning approval - special exception required.
Grading plan issued by the County Department of Inspections and Permits.
Critical Areas approval (if applicable).
Inspection by County and MdTA.

Calvert (CA) County



Site Plan approved by Soil Conservation District.
Grading plan issued by the County after a mining permit or exemption is issued.
Critical Areas approval (if applicable).
Inspection by MdTA.

Charles (CH) County

Site Plan approved by Soil Conservation District.
Special exception granted by the County.
Critical Areas approval (if applicable).
Inspection by MdTA.

St. Marys (SM) County

Site Plan approved by Soil Conservation District.
County Grading Permit.
Critical Areas approval (if applicable).
Inspection by MdTA.

DISTRICT 6

Allegany (AL) County

Site plan approved by Soil Conservation District.
Informational copy of plans to County Planning and Zoning Commission.
Inspection by MdTA.

Garrett (GA) and Washington (WA) Counties

Site plan approval by Soil Conservation District.
Inspection by MdTA.

DISTRICT 7

Carroll (CL) County

Site plan approved by County Planning Commission.
Sediment control plan approval by Soil Conservation District.
County Grading Permit.
Inspection by County.

Frederick (FR) County

Site plan approved by Soil Conservation District.
County Grading Permit.
Inspection by MdTA.

Howard (HO) County

Site Plan approved by Soil Conservation District.
County Grading Permit.
Inspection by County.

BALTIMORE CITY (BC)

Site plan approved Baltimore City Department of Public Works (BCDPW).
Inspection by BCDPW.



Maryland
Transportation
Authority

SPECIAL PROVISIONS

CONTRACT NO. BB 2042-000-002

Page 4 of 4

STATE AND FEDERAL PROPERTY

Borrow pits located on state and federal property are subject to Maryland Department of the Environment approval.
Inspection by MdTA.

**CATEGORY 200
GRADING**

**SECTION 212 – EXCAVATION AND DISPOSAL OF EXISTING ABOVE GROUND
AND UNDERGROUND STORAGE TANKS**

PART 1 - DESCRIPTION

A. SUMMARY

This Section specifies the excavation, removal, and disposal of two (2) existing above ground storage tanks (ASTs) (BB 001 and BB 002) and four (4) existing underground storage tanks (USTs) (BB 003, BB 004, BB 005, and BB 006), associated piping concrete pads, and all other incidentals to complete the work as specified herein and in accordance with Maryland Department of the Environment (MDE) regulations and requirements; the excavation, staging, and disposal of contaminated soil, groundwater, and residual sludge; and the preparation of the work for installation of new concrete pads and new aboveground storage tanks (AST) and associated systems, as indicated in the Contract Documents.

The work also includes, but is not limited to, furnishing notification and obtaining permits required by federal, state, and local regulating agencies; and furnishing all certifications and other official documentation required by federal, state, and local regulating agencies concerning the removal of USTs and the disposal of contaminated and/or hazardous wastes.

IF AT ANY TIME DURING TANK REMOVAL, SOIL OR GROUNDWATER CONTAMINATION IS SUSPECTED OR IF ANY TANK APPEARS TO BE LEAKING OR HAVE LEAKED IN THE PAST, THE CONTRACTOR SHALL CONTACT THE ENGINEER IMMEDIATELY BEFORE PROCEEDING WITH REMOVAL.

B. REFERENCES

1. American Petroleum Institute (API)
 - a. API 2015 Safe Entry and Cleaning of Petroleum Storage Tanks (2001).
 - b. API PUBL 1628 A Guide to the Assessment and Remediation of Underground Petroleum Releases (1996).
 - c. API RP 2219 Safe Operation of Vacuum Trucks in Petroleum Service (2005).
 - d. API RP 160 Closure of Underground Petroleum Storage Tanks (2001).
 - e. API RP 2003 Protection Against Ignitions Arising out of Static, Lightning, and Stray Currents (1998).
 - f. API STD 2217A Guidelines for Safe Work in Inert Confined Spaces in the Petroleum and Petrochemical Industries (2005).
2. Code of Maryland Regulations (COMAR)
 - a. COMAR 26.10.02 Underground Storage Tanks.
 - b. COMAR 26.10.06 Underground Storage System Technician and Remover Certification.

- c. COMAR 26.10.08 Release Reporting, Investigation and Confirmation.
 - d. COMAR 26.10.09 Release Response and Corrective Action For UST Systems Containing Petroleum or Hazardous Substances.
 - e. COMAR 26.10.13 Oil Contaminated Soil.
3. U. S. Environmental Protection Agency (EPA)
- a. EPA SW-846 Test Methods for Evaluating Solid Waste.
 - b. EPA 40 CFR Part 260 Hazardous Waste Management System: General.
 - c. EPA 40 CFR Parts 280 and 281 Underground Storage Tanks.
4. Occupational Safety and Health Administration (OSHA)
- a. OSHA 29 CFR 1910.120 Hazardous Waste Operations and Emergency Response.
 - b. OSHA 29 CFR 1910.146 Permit-Required Confined Spaces.
 - c. OSHA 29 CFR 1910.147 The Control of Hazardous Energy (Lockout/Tagout).

C. SUBMITTALS

1. Submit three (3) copies of the following documents prior to the commencement of work:
- a. Copy of the Contractor's Certified Underground Storage System Technician or Remover.
 - b. Copy of state notification for each tank.
 - c. Copy of state AST removal permit for each tank.
 - d. Copy of state UST removal permit for each tank.
 - e. Copies of notification for any other regulatory agencies.

D. QUALITY ASSURANCE

All work shall be performed in accordance with all applicable federal, state, and local codes, regulations, and standards governing the removal of ASTs and USTs.

The Contractor shall demonstrate, to the satisfaction of the Engineer that he meets the qualification requirements of the State of Maryland prior to award of the Contract. Specifically, the Contractor shall meet the all of the requirements of COMAR 26.10.06. A copy of certification, specified in Paragraph Part 1 C.1, shall be submitted with the bid. The Contract will not be awarded without proof of certification.

In deference to COMAR 26.10.06, the Contractor shall have a minimum of five (5) years of AST/UST removal experience with direct involvement in at least 10 systems.

E. MATERIALS ENCOUNTERED

1. Allowances Bid Items for different types of materials encountered in excavation are included in the Bid Form. This may include contaminated soils and/or contaminated groundwater. The Contractor shall immediately notify the Engineer when contaminated soils are encountered. The Engineer will notify the Maryland Transportation Authority (Authority) Environmental Manager, and the Authority's Environmental Manager will notify the MDE.
2. If the Contractor encounters or exposes any abnormal conditions during excavation that indicate the presence of a hazardous or toxic material other than those covered in this Section, work in that area shall immediately be suspended and the Engineer shall be notified. The Contractor's operations in this area shall not resume until permitted by the Engineer, however; the Contractor may continue working in other areas of the Project, unless directed otherwise.
 - a. Abnormal conditions shall include, but not be limited to, the presence of barrels, obnoxious or unusual odors, excessively hot earth, smoke, and other conditions that could indicate the presence of hazardous material or toxic waste.
 - b. Disposition of the hazardous or toxic material shall be made in conformance with all applicable requirements and regulations. Where the Contractor performs necessary work, as directed by the Engineer, required to dispose of these materials and no Bid Items covering this work are included in the Bid Form, the work shall be performed under Miscellaneous Work Allowance Bid Item.
 - c. The Engineer may require any material furnished on the project by the Contractor suspected to be hazardous or toxic, to be tested and certified to be in conformance with all applicable requirements and regulations.
 - d. Material found to be hazardous or toxic shall not be incorporated into the work. The required testing will be determined by the Engineer and may include, but not be limited to, the EPA Toxicity Characteristic Leaching Procedure (TCLP) or its successor. The evaluation and interpretation of the test data will be made by the Engineer.

F. TESTING AND CERTIFICATION

1. The Contractor shall perform all testing and furnish all equipment, instruments, qualified personnel and facilities necessary to perform all tests required by the Contract. Contractor shall supply an independent testing laboratory to provide testing services. The testing laboratory shall be approved by the Engineer.
2. The Contractor shall give sufficient notice to the Engineer to permit him to witness the tests.
3. The Contractor shall submit the name, address, and qualifications together with the scope of proposed services of the proposed testing laboratory to the Engineer for approval at least thirty (30) days prior to the scheduled commencement of any work involving such testing. Should the Contractor desire to use more than one laboratory for testing, the required information shall be submitted for each proposed laboratory as specified herein.

4. The Contractor shall be responsible for furnishing all equipment, tools necessary to prepare and preserve the test samples as prescribed and delivering them to the approved testing laboratory.
5. All tests performed, and test results for each day shall be recorded in a daily report. These records shall remain complete and available to the Engineer at all times during the performance of work under the Contract and for a three-year period thereafter. Test records shall indicate the reference test, nature and number of observations made, and the number and type of deficiencies found.
6. All field tests and frequencies for civil construction work shall be in accordance with Maryland Department of Transportation, Method of Tests, Volume 1 (Field Procedure) unless otherwise indicated in this Section.

G. REGULATORY REQUIREMENTS

1. Statutes and Regulations: Underground Storage Tank closure shall be carried out in accordance with the requirements identified in EPA 40 CFR Part 280 as well as the applicable MDE regulations contained in COMAR.
2. Notification: The Contractor shall be responsible for contacting MDE and any other regulatory agency in accordance with the applicable reporting requirements. Written proof of MDE notification shall be provided to the Engineer. The Contractor shall obtain all permits and the required inspections in accordance with COMAR. No UST shall be permanently closed until the system is inspected by MDE in accordance with the provisions of COMAR. The Contractor shall notify the Engineer and the MDE thirty (30) days prior to UST removal.

H. RELATED DOCUMENTS

1. Maryland State Highway Administration (MDSHA) Standard Specifications for Construction and Materials, issued July 2008, with all of the latest addenda, are to be used for this section, except as modified here.

PART 2 - MATERIALS NOT USED

PART 3 - CONSTRUCTION

A. GENERAL

1. All work shall be performed in strict accordance with the provisions of the Contract Documents and with the provisions of API 1604. If there is any discrepancy, the more stringent provisions will govern.

2. Safety Guidelines: Personnel working inside and within the general vicinity of the tanks shall be trained and thoroughly familiar with the safety precautions, procedures, and equipment required for controlling the potential hazards associated with this work. Personnel shall be trained and certified in accordance with OSHA 29 CFR 1910.120 and OSHA 29 CFR 1910.146 (permit required – confined spaces) and physically carry proof of certification at all times on the site. Personnel shall use proper protection and safety equipment during work in and around the tanks as specified in API STD 2217A, API RP 1604, and the Contract Documents.
3. Burning and Explosives: Use of explosives or burning will not be allowed.
4. The existing tanks shall become the property of the Contractor and transportation and disposal shall be in accordance with all federal, state, and local requirements. The Contractor shall remove these tanks from the site no later than 48 hours after proper cleaning was completed and authorized to do so by the Engineer.
5. All supply pipes, vents, fill pipes, and other appurtenances related to the fuel distribution system shall be removed by the Contractor no later than 48 hours after proper cleaning was completed and authorized to do so by the Engineer.
6. The Contractor shall coordinate his work to allow vehicular and pedestrian ingress and egress during construction.
7. During the excavation, the Contractor shall maintain vehicular and pedestrian traffic flow safely through the parking lots. All labor, equipment, materials, signing, cones, barriers, steel plating, etc. required to maintain access through the facility shall be considered incidental to the applicable item(s) of work.

B. SITE PREPARATION

1. The two (2) ASTs to be removed and disposed are:
 - a. (BB 001) 1,000 gallon gasoline fiberglass coated steel tank manufactured by Dunn Industries.
 - b. (BB 002) 1,000 gallon diesel fiberglass coated steel tank manufactured by Dunn Industries.
2. The four (4) USTs to be removed and disposed are:
 - a. (BB 003) 4,000 gallon heating oil fiberglass coated steel tank manufactured by Dunn Industries.
 - b. (BB 004) 2,000 gallon gasoline fiberglass coated steel tank manufactured by Dunn Industries.
 - c. (BB 005) 2,000 gallon diesel fiberglass tank manufactured by Owens-Corning Fiberglass Corporation.

- d. (BB 006) 1,000 gallon heating oil fiberglass tank manufactured by Owens-Corning Fiberglass Corporation.
3. The hold down concrete pads under all tanks that will be removed shall be removed and disposed of off the Project site.
4. The existing tank locations as shown on the Contract Drawings are approximate. The Contractor shall be responsible for verification of the exact location of the underground tanks and piping.
5. Familiarize all personnel with the general work area. Locate and mark buried obstructions and other buried utility lines in the area. Use a pipe locator if necessary.
6. Notify the Engineer at least 48 hours prior to the commencement of work.
7. Place barriers and warning signs as approved by the Engineer to prevent unauthorized entry into work area and to protect all excavation areas.
8. Prohibit or mitigate all potential ignition sources within 25 feet of the work area or other zone as defined by NFPA 70. Potential ignition sources include open flames, spark producing equipment, and high temperature equipment such as internal combustion engines. Contractor shall observe appropriate safety precautions such as installing vapor isolating barriers, vapor concentration monitoring, and using equipment listed for use in hazardous zones as mitigation. Contractor shall submit a written safety plan for approval.
9. All flammable or combustible liquids and/or sludge remaining in the tanks and/or piping shall be removed and disposed of by the Contractor. Removal and disposal of fuel, sludge, etc. in the existing tanks and piping will be paid for at the unit price per gallon bid.
10. Turn off, secure, and label pump circuit breakers, and disconnect wiring to the pumps at the panel in accordance with OSHA 29 CFR 1910.147.
11. Prevent the discharge of static electricity by properly grounding equipment and by controlling the rate of flow of gases and liquids during the work.
12. Prevent the accumulation of vapors at ground level by proper venting.
13. Furnish a properly calibrated combustible gas indicator to monitor for hazardous vapor concentrations in the work area at all times. Calibration of the combustible gas indicator shall be in accordance with the manufacturer's instructions. Operators of the combustible gas indicator shall be completely familiar with the use of the instrument and the interpretation of the instrument readings and shall be approved by the Engineer before any work will be allowed to commence.

14. Scan the area for the presence of vapors and render the area non-combustible as necessary for safe performance of the work.

C. TANK PREPARATION

1. Drain product piping into the tanks and cap or remove product piping.
2. Remove residues and liquids from the tanks using explosion-proof or air-driven pumps certified by the manufacturer to be compatible with pumped media. All pump motors shall be properly grounded and suction hoses shall be bonded to the tanks, or otherwise grounded, to prevent electrostatic ignition hazards. If necessary, use a hand pump to remove the last few inches of liquid from the bottom of the tanks.
3. Carefully excavate to the top of the tanks to expose all pipe fittings or other appurtenances attached to the tanks. Excavated material shall be monitored visually and with the combustible gas indicator for indications of contamination. Material suspected of contamination shall be segregated and stockpiled separately from non-contaminated material for possible subsequent handling as a hazardous substance.
4. Remove the fill pipe, gauge pipe, vapor recovery truck connection, pumps, and other tanks fixtures. Leave the vent line connected until the tanks are purged completely.
5. Cap or remove all non-product lines, such as vapor recovery lines. Temporarily plug all other tank openings so that all vapors will exit through the vent line during the inserting process.

D. PURGING

1. Inert the tanks by displacing hazardous vapors in it with an inert gas. Filling the tanks with water and the use of steam to inert the tanks will not be permitted.
2. Vent all vapors from the tanks at least 12 feet above grade and three feet above all adjacent roof lines until the tanks are purged of flammable vapors. Be especially cautious to keep sources of ignition away from the work area during the process.
3. If an inert gas such as carbon dioxide or nitrogen is to be used to purge the tanks, introduce the gas into the tanks through a single opening at a point near the bottom of the tanks at the end opposite the vent. Gas shall be introduced at a rate and pressure low enough to avoid the generation of static electricity. The use of a carbon dioxide fire extinguisher to introduce inert gas into the tanks will not be permitted. Do not exceed 5 PSI gauge pressure in the tanks at any time.
4. If solid carbon dioxide (dry ice) is used to inert the tanks, use at least 1.5 pounds per 100 gallons of tank volume. The dry ice shall be crushed and distributed over the greatest

possible area of the tank. After introducing the dry ice into the tanks, plug all openings in the tanks, except the vent. Allow all of the dry ice to evaporate before proceeding.

E. TESTING

1. The tank atmosphere and the excavation area shall be regularly tested for flammable or combustible vapor concentrations using the properly calibrated combustible gas indicator until the tanks are removed from both the excavation area and the site.
2. The tank vapor space shall be tested by placing the combustible gas indicator probe into the fill opening with the drop tube removed, or into another opening if the drop tube cannot be removed. Readings shall be taken at the bottom, middle, and upper portions of the tanks. The instrument shall be cleared between each reading. Liquid product shall not be permitted to enter the probe. The tanks will be considered safe for removal from the ground when readings of 20 percent, or less, of the lower flammable limit are obtained.
3. Use an oxygen indicator to assess the oxygen concentration in the tanks when carbon dioxide, nitrogen, or any other inert gas is used to purge the tanks.

F. TEST PIT EXCAVATION

1. Test pit excavation may be required for location of electrical conduits and other utilities. It shall be the responsibility of the Contractor to determine the location of underground structures and utilities by the use of test pit excavation prior to excavation operations. Test pits shall be of the size, depth, and location as authorized by the Engineer. Each pit shall be backfilled and compacted as specified in Section 205.

G. SUPPORT OF EXCAVATION

1. Detail drawings and design calculations for sheeting, shoring, and other temporary support of excavation and methods of construction shall be submitted for record purposes. The drawings shall bear the seal and signature of a professional engineer registered in the State of Maryland. The Engineer will not review the drawings or calculations for approval. The Contractor shall be solely responsible for the adequacy of the excavation supports, and for the safety of excavations.

H. PROTECTION OF ADJACENT PAVEMENTS

1. Existing roadway and parking lot pavements shall be protected from damage during excavation and subsequent construction activities.
2. Damage to adjacent pavements shall be repaired and pavements restored to original condition at no additional cost to the Authority.

I. EXCAVATION:

1. Prior to start of earthwork operations, the Contractor shall install erosion/sediment control measures and devices as needed on the Contract Drawings to protect adjacent undisturbed areas and prevent runoff from entering the site storm water system. Remove all unstable bottom materials, including large stones, debris, and organic soils for the excavation bottom.
2. Topsoil, vegetation, concrete pavement, tank pads, bituminous pavement, and miscellaneous debris shall be removed and disposed of immediately after excavation. This material will not be stockpiled on site.
3. Contractor shall exercise care to preserve the material below and beyond the limits of excavation. Where excavation is carried below grade, backfill to the required grade.
4. Exploratory Excavations: Exploratory trenches shall be excavated as necessary to determine the tank location limits and the location of ancillary equipment.
5. Excavation for the convenience of the Contractor shall conform to the limits specified by the Engineer and shall be at no additional expense to the Authority.
6. Excavated Soil: Excavated soil shall be stockpiled in containers or dump trucks at the end of each work day and covered. Excavated material which is visibly stained and which has an obvious petroleum odor shall be considered contaminated and shall be reported immediately to the Engineer before proceeding. Contaminated soil shall be temporarily stockpiled in separate containers and covered.
7. Tank Excavation: Excavation around the perimeter of the tanks shall be performed in a manner that will limit the amount of potentially contaminated soil that could be mixed with previously uncontaminated soil. Contaminated soil shall be reported immediately to the Engineer. Surface water shall be diverted to prevent direct entry into the excavation. Dewatering of the excavation will be limited to that necessary to assure adequate access to the tanks and piping and to assure a safe excavation.
8. Open Excavations: Open excavations and stockpile containers shall be secured while awaiting verification test results from the soil beneath the tanks. The excavation shall not be backfilled without approval from the Engineer. Wherever practical, the excavation will be covered to limit rainwater entry.
9. All saw cutting shall be performed in accordance with Section 206.

J. REMOVAL OF TANKS

1. The existing tanks shall become the property of the Contractor and transportation and disposal shall be in accordance with all federal, state, and local requirements.
2. Tanks shall be covered if rain is expected while waiting for disposal transportation.

3. All supply pipes, vents, fill pipes, and other appurtenances related to the fuel distribution system shall be removed by the Contractor.
4. The existing dispensers and appurtenances associated with ASTs BB 001 and BB 002 and USTs BB 003, BB 004, BB 005, and BB 006 shall be removed and disposed of by the Contractor.
5. The existing fuel canopies shall be removed and disposed of by the Contractor.
6. The tanks shall be removed from the excavation and the exterior cleaned to remove all soil and inspected for signs of corrosion, structural damage, and leakage. All materials coming into contact with the tanks, or in the vicinity of the excavation, such as shovels, slings, and tools shall be of the non-sparking type. After removal from the excavation, the tanks shall be placed on a level surface adjacent to the tank excavation and secured with wood blocks to prevent movement and covered with plastic sheeting.
7. Contaminated Soil: After the tanks have been removed from the ground, the adjacent and underlying soil shall be examined for any evidence of leakage. The soil shall be visually inspected for staining and also screened for the presence of volatile and semi-volatile hydrocarbon contamination using real-time vapor monitoring instruments such as photoionization detector (PID) or similar instrument. If evidence of leakage or contaminated soil exists, the Contractor shall notify the Engineer immediately. If free product is observed, Contractor shall immediately notify the Engineer who shall immediately notify the MDE.
8. Contaminated Groundwater: If, after removal of the tanks, the excavation is found to contain grossly contaminated groundwater and/or floating product, upon request of and as directed by the Engineer, arrangements shall be made by the Contractor for their removal. If free product is observed, Contractor shall immediately notify the Authority's Environmental Manager who shall immediately notify the MDE.
9. Tank Cleaning:
 - a. Exterior: Soil shall be removed from the tanks exterior to eliminate soil deposition on roadways during transportation to a temporary storage area, to ensure markings will adhere to the tank surfaces, and to simplify tank cutting. Soil shall be removed using non-sparking tools. Soil removal shall be accomplished adjacent to the tank excavation sites as approved by the Engineer. Soil removed from the existing tank exteriors shall not be used as backfill in the tank excavation sites.
 - b. Temporary Storage: If the tanks are stored after the tank exteriors are cleaned and ancillary equipment is removed, the tanks shall be labeled as directed in API RP 1604, placed on blocks, and temporarily stored in an area designated by the Engineer. Prior to cleaning the tank interiors the tank atmospheres shall be monitored for combustible vapors and purged if combustible vapors are detected.
 - c. Interior: The tank interiors shall be cleaned in accordance with MDE regulations.

10. After removal from the ground and prior to removal from the site, the tanks shall be labeled to warn against certain types of reuse, to indicate the former contents, to indicate present vapor state, to indicate inserting method, and to indicate the date of removal. The label shall be similar to the following in legible letters at least 2 inches high. Tanks that have been used for diesel fuel shall be labeled with the following information:

TANK HAS CONTAINED DIESEL FUEL
NOT VAPOR FREE
NOT SUITABLE FOR STORAGE OF FOOD
OR LIQUIDS INTENDED FOR HUMAN
OR ANIMAL CONSUMPTION
MONTH/DAY/YEAR (OF REMOVAL)

11. Tanks that have used motor fuels shall be labeled with the following information:

TANK HAS CONTAINED LEADED GASOLINE
LEAD VAPORS MAY BE RELEASED IF
HEAT IS APPLIED TO THE TANK SHELL
NOT VAPOR FREE
NOT SUITABLE FOR STORAGE OF FOOD
OR LIQUIDS INTENDED FOR HUMAN
OR ANIMAL CONSUMPTION
MONTH/DAY/YEAR (OF REMOVAL)

12. Tanks that have used heating oil, or whose service history is unknown, shall be labeled with the following information:

TANK HAS CONTAINED HEATING OIL
NOT VAPOR FREE
NOT SUITABLE FOR STORAGE OF FOOD
OR LIQUIDS INTENDED FOR HUMAN
OR ANIMAL CONSUMPTION
MONTH/DAY/YEAR (OF REMOVAL)

13. Soil Examination, Testing, and Analysis:

- a. Upon removal of the tanks, the Contractor will collect soil and/or groundwater and/or sludge samples from the excavation. In the case of soil samples, the Contractor shall, at the direction of the Engineer, excavate soil to allow collection of samples. The excavation shall remain open until directed otherwise by the Engineer.
- b. Depending on the sample results, additional samples may be collected. The excavation shall remain open until the additional samples have been analyzed and until the Engineer directs the Contractor to proceed with new tank installation.
- c. The sample types and locations shall be determined by the Engineer in consultation with MDE based the method of closure, the nature of the stored substance, the type of backfill, the depth to groundwater, and other factors appropriate for identifying the presence of a release. Samples shall be tested according to methods approved by MDE.

- d. All contaminated materials shall be analyzed by the Contractor for disposal purposes per applicable regulations and disposal facility requirements.

K. SITE RESTORATION

1. The tank areas and any other excavations shall be backfilled only after the soil test results have been approved by the MDE and as directed by the Engineer. The excavation shall be dewatered if necessary.
2. After approval, backfill the excavation with approved material from the excavation process, supplemented by imported borrow, if necessary, and finish the surface as specified. All backfill and finish work will be in accordance with applicable provisions of Section 210. Compaction of backfill shall meet 92% of T-180 in pavement areas and 85% of T-180 in non-paved areas. Borrow material for backfill shall meet the requirements of Section 203.
3. The trenching and excavated areas shall be restored to original grade and condition. Paving, sub-base, grading, topsoil, and landscape material replacement, etc. required for restoration shall be considered incidental to the applicable item(s) of work.

L. DISPOSAL

1. General: Disposal of the ASTs, USTs and contaminated soil shall be in accordance with MDE regulations. Disposal work shall include all necessary personnel, labor, transportation, packaging, detailed analysis (if required for disposal, manifesting or completing waste profile sheets), equipment, permitting, and reports.
2. Tanks and Ancillary Equipment Disposal: After the tanks, piping, and ancillary equipment have been removed from the excavation and cleaned, the tanks, piping, and equipment shall be disposed of in an approved off-site disposal facility certified by the State of Maryland. The tanks shall not be cut or broken into sections at the Project site. Each tank shall be manifested as required by the MDE to document delivery and acceptance at the disposal facility. The Contractor shall not sell the tanks intact.
3. Contaminated Material Disposal: Contaminated materials shall be divided into the following categories:
 - a. Non-Hazardous Petroleum Contaminated Soil;
 - b. Non-Hazardous Petroleum Contaminated Water;
 - c. Non-Hazardous Petroleum Contaminated Sludge;
 - d. Hazardous Soil;
 - e. Hazardous Water; or
 - f. Hazardous Sludge.

4. The Contractor shall haul petroleum-contaminated and/or hazardous soils from the site directly to an accepting soil treatment facility. Unnecessary stops enroute or parking of the vehicle will not be permitted. Transportation of petroleum contaminated and/or hazardous soils shall be in accordance with all applicable Maryland Department of Transportation (MDOT) regulations, other state DOT agency regulations as necessary when transporting these materials across state lines, and Federal Department of Transportation regulations. The soil treatment facility shall be fully permitted in the treatment of petroleum-contaminated and/or hazardous soils and shall have a current license to operate in the state where located. Petroleum-contaminated and/or hazardous water and sludge shall be transported and disposed of per all federal, state, and local requirements.
5. Records: Records shall be maintained of all waste determinations, including transportation manifests disposal receipts, and other data required by the MDE and other regulatory agencies. Following Contract closeout, the records shall become the property of the Authority.
6. Spills: Immediate containment actions shall be taken as necessary to minimize effect of any spill or leak. Cleanup shall be in accordance with applicable federal, state, and local law and regulations at no additional cost to the Authority. The Contractor shall report spills related to project activities to the MDE and the Engineer immediately following discovery and shall also comply with all applicable federal, state, and local requirements for spill response. A written follow-up report shall be submitted to the Engineer no later than seven (7) days after the removal.

M. TANKS CLOSURE AND DISPOSAL DOCUMENTATION

1. A tank closure report shall be prepared by the Authority's representative and submitted to the MDE with a copy to the Engineer within ten (10) days of completing work at the Project site. The Contractor shall submit all documentation regarding disposal of the tanks and any hazardous wastes within two (2) weeks after the completion of the work.
2. Final payment for the work will be withheld pending submission and approval of required destruction and disposal documentation. Tank closure reports shall include the following information as a minimum:
 - a. A cover letter signed by a responsible company official certifying that all services involved have been performed in accordance with the terms and conditions of the Contract Documents.
 - b. A narrative report describing what was encountered at each site, including:
 - 1) Condition and size of the ASTs or USTs removed;
 - 2) Location of the ASTs or USTs on the property;
 - 3) Any visible evidence of free product, leaks or stained soils;
 - 4) Results of vapor monitoring readings;
 - 5) Actions taken including quantities of materials removed;
 - 6) Collection data such as time of collection and method of preservation;

- 7) Reasons for backfilling site;
- 8) Whether or not groundwater was encountered, dewatering method, treatment used; and
- 9) Copies of all waste analysis/waste profile, manifests, and certification of final disposal by the responsible disposal facility official.

PART 4 - MEASUREMENT AND PAYMENT

A. TRANSFER OF DIESEL FUEL, GASOLINE AND LUBRICANTS

1. Transfer of diesel fuel, gasoline, and lubricants into an AST before removal of an existing UST shall be measured for payment as gallons.
2. Disposal of gasoline, diesel fuel, and heating oil shall be paid at the unit bid price per 100 gallons for "*Disposal of Diesel, Gasoline and Heating Oil*" indicated On the Bid Form.

B. TEST PIT

1. Test Pit Excavation by any approved means shall be measured by the cubic yard.
2. Test Pit Excavation shall be paid at the unit bid price for "*Test Pit Excavation*" indicated on the Bid Form.

C. EXCAVATION

1. Excavation for tank removal and backfill using excavated materials shall not be measured for payment but included in the lump sum price for each tank removal. The limits of excavation for tank removal shall be 2 feet from the sides and bottom of the tank and concrete pad. Any soil from the tank excavation within the two foot limit found to be contaminated shall be removed and disposed of in a location approved by MDE. The cost for the removal and disposal of contaminated soil found within the excavation limits will be included in the bid price for each tank removal.
2. Excavation of contaminated soil beyond the limits defined in 1. above, shall be made at the direction of the Engineer and shall be paid at the unit price indicated on the unit price schedule for "*Removal and Disposal of Contaminated Soil Beyond Excavation Limits*" indicated on the Bid Form.
3. Dewatering of excavations and groundwater control during excavation shall be included in the Lump Sum Price for "*Removal of Underground Tanks (each type and size)*" indicated on the Bid Form.



D. REMOVAL

1. Removal and disposal of ASTs, USTs, hold down concrete pads, existing pumps, dispensers, monitoring wells, associated piping, wiring, controls and pumps, and erosion/sediment control measures shall not be measured for payment.
2. All work for removal and disposal of ASTs and USTs shall be included in the Lump Sum Price for "*Removal of Underground Tanks (each type and size)*" indicated on the Bid Form.

E. DISPOSAL OF CONTAMINATED SOIL

"Removal and Disposal of Contaminated Soil Beyond Excavation Limits", if any, shall be measured by the ton and as documented by the authorized receiving facility.

F. DISPOSAL OF CONTAMINATED GROUNDWATER

"Removal and Disposal of Contaminated Groundwater", if any, by any approved means shall be measured by 100 gallons units. Measurement shall be made to the nearest 100 gallons (i.e. 1 to 149 gallons = 1 unit, 150 to 249 gallons = 2 units, etc.)

G. SOIL TESTING

"Soil Testing" will not be measured but will be paid for at the lump sum bid price. The price shall include all equipment and labor necessary to test for petroleum products on site.

H. SAW CUTTING

Saw cutting existing concrete or bituminous pavement shall not be measured. Payment for saw cutting will be included in the lump sum bid price for each tank removal item.

I. BORROW FOR BACKFILL

Per Section 203.

END OF SECTION

**CATEGORY 300
DRAINAGE**

SECTION 308 — EROSION AND SEDIMENT CONTROL

DELETE: 308.01.03 Quality Assurance Ratings in its entirety.

INSERT: The following.

308.01.03 Quality Assurance Ratings. A Quality Assurance Inspector will inspect each project every 2 weeks to ensure compliance with the approved Erosion and Sediment Control Plan. The MdTA Office of Engineering and Construction Erosion and Sediment Control (ESC) Quality Assurance Inspector is Mr. Timothy Plume @ 443-790-8975 and Tplume@mdta.state.md.us The scores will be reported on Form No. ESC1, Erosion and Sediment Control Field Investigation Report. The Quality Assurance Inspector will use the scores to determine the following ratings:

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

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

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

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

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

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



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

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

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

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

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

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

DELETE: 308.01.04 Incentive Payments and Liquidated Damages in its entirety.

INSERT: The following.

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



Maryland
Transportation
Authority

SPECIAL PROVISIONS

CONTRACT NO. BB 2042-000-002

Page 3 of 3

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

308.04 MEASUREMENT AND PAYMENT.

DELETE: 308.04 in its entirety.

INSERT: The following.

308.04 MEASUREMENT AND PAYMENT. Erosion and Sediment Control will be measured and paid for at the lump sum price bid for Erosion and Sediment Control. Payment will be compensation for all material, labor, equipment, tools, installation, maintenance, repair, resetting, any temporary and final stabilization practices and the final removal of all erosion and sediment control devices.

Payment for this item includes, but is not limited to, compensation for at grade inlet protect (AGIP), portable sediment tank, and same day stabilization.



**CATEGORY 300
DRAINAGE**

SECTION 316 – PREFABRICATED TRENCH DRAINS

316.01 DESCRIPTION. Construct prefabricated trench drains and connecting pipe drains.

316.02 MATERIALS.

316.02.01 Trench Drain. Prefabricated modular polyester polymer concrete or ductile iron channels with a nominal width of 6-inches. Channels shall be interlocking and sloped to provide a minimum of 0.5% slope. The channel shape shall be U bottom and include exterior ribs or anchors for concrete embedment. Trench Drain shall be suitable for AASHTO HS-20 wheel loads. Product shall be PolyDrain by ABT, Inc. or equal.

316.02.02 Trench Grates. Modular ductile iron manufactured by the same manufacturer as the trench drain channel. Grates shall be bolted to the channel and suitable for AASHTO HS-20 wheel loads.

316.02.03 Connecting pipe. PVC SCH 40

316.02.04 Joint Sealant. Permanent and suitable for water, ethanol, oil, and gasoline contact.

316.02.05 Bedding Concrete. See Section 520.

316.03 CONSTRUCTION. Install prefabricated trench drains according to the manufacturer's recommendations. Provide bedding concrete so that there is a minimum of 4-inches of concrete under the channel and on all sides. Provide expansion joints to protect the trench drain from the expansion and contraction of the adjacent concrete slabs.

316.03.01 Drain Connectors and Adaptors. Provide PVC connectors and adaptors as necessary to connect trench drains to outfall system. Provide a minimum of 0.5% slope on all drains.

316.04 MEASUREMENT AND PAYMENT. The payment will be full compensation of excavation, backfill, compaction, formwork, bedding concrete, and for all material, labor, equipment, tools, and incidentals necessary to complete the work.

316.04.01 Prefabricated Trench Drains will be measured and paid for at the Contract unit price per linear foot.



**CATEGORY 400
STRUCTURES**

SECTION 429 – FUEL STATION CANOPY

PART 1 - DESCRIPTION

A. SUMMARY

This Section includes a freestanding, pre-engineered Fuel Station Canopy with integral concrete foundation, steel framing, metal roof, roof drains and leaders, vertical fascia and metal ceiling.

B. RELATED DOCUMENTS

Drawings and Contract Provision, Special Provisions, General Provisions, and Terms and Conditions apply to this Section.

Related Sections include the following:

Section 420 "Portland Cement Concrete Structures" for canopy support foundations.
Category 1600 "ELECTRICAL SYSTEMS" for electrical wiring and connections.

C. PERFORMANCE REQUIREMENTS

1. Structural Performance: Provide a pre-engineered Fuel Station Fuel Station metal canopy capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
2. Wind and Snow Loads: Determine loads based on **BOCA National Building Code and Chapter 6 of ASCE 7, "Minimum Design Loads for Buildings and Other Structures"**:
3. Seismic Performance: Provide pre-engineered Fuel Station metal canopy capable of withstanding the effects of earthquake motions determined according to **ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."**
4. Thermal Movements: Provide pre-engineered Fuel Station metal canopy that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of

components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

5. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

D. SUBMITTALS

1. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for pre-engineered Fuel Station metal canopy.
2. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work. Canopy supplier to furnish complete canopy and related foundation drawings signed and sealed by a professional engineer licensed in the state of Maryland.
3. Samples for Initial Selection: For pre-engineered Fuel Station Fuel Station metal canopy with factory-applied color finishes.
4. Submit nine (9) sets of full size prints of shop drawings including CAD files on compact disk.
5. Submit foundation design computations and details sealed by a Maryland Registered Engineer.
6. Welding Qualifications: Submit evidence that welders, tackers, and welding operators have been previously qualified (within the last 9 years) by tests as prescribed in the Structural Welding Code, AWS D1.1 of the American Welding Society to perform the type of work required.
7. Submit AutoCAD compatible DWG files on compact disk of as-built drawings after the final acceptance of the canopy structure and foundation by the Owner.

E. QUALITY ASSURANCE

1. Source Limitations: Obtain pre-engineered Fuel Station metal canopy through one source from a single manufacturer who will manufacture and install the canopy and provide both post-installation inspection and installation inspection report.
2. Welding: Qualify procedures and personnel according to the following:
3. All welding shall be in accordance with ANSI/AWS D1.1, "Structural Welding Code—Steel" with E70XX Electrodes.

4. All structural shop welding shall be done by certified welders.
5. Steel shop connections will be welded and field connections shall be bolted.
6. All slag shall be cleaned from all welds and inspected. Steel to be painted with rust inhibitive primer.
7. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
8. Pre-installation Conference: Conduct conference at Project site.

F. PROJECT CONDITIONS

Field Measurements: The Contractor shall verify actual locations of walls, columns, and other existing construction including underground utilities contiguous with pre-engineered Fuel Station metal canopy by field measurements before fabrication and indicate measurements on Shop Drawings.

G. COORDINATION

The Contractor shall prepare for and pour the concrete footers for the pre-engineered Fuel Station metal canopy. Manufacturer shall furnish recommended footing drawings including rebar details and the foundation bolts. Such items to be delivered to project site in time for installation.

H. WARRANTY

1. The canopy manufacturer shall provide warranty on products of its manufacture to be free of defects in materials, leaks, and workmanship for **one** year from date of shipment. In addition, the manufacturer shall provide a 5-year limited warranty on anodized Aluminum surfaces against oxidation, a 20-year limited warranty against peeling, flaking, and chipping of deck and fascia when properly maintained by owner, and the **5-year** manufacturer's warranty on all accessory items such as, but not limited to, air conditioning, lights, and heating units. No other warranties, either expressed or implied are applicable unless stated in writing. The manufacturer is not responsible for damage caused by improper use, installation, or handling.



PART 2 - MATERIALS

A. MANUFACTURERS

In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

Austin Mohawk and Company, Inc.
McGee Corporation.
Centurion Industries Inc.
Superior Canopy Corporation.

Basis-of-Design Product: The design for each type of pre-engineered Fuel Station metal canopy indicated is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

B. MATERIALS

Structural Steel:

All material and work shall conform to the latest AISC Specifications for Design, Fabrication, and Erection of Structural Steel for Buildings.

Wide flange I beam: Shall conform to ASTM A572 GR.50, $F_y = 50$ ksi. Other rolled sections shall conform to ASTM A36, $F_y = 36$ ksi.

Square and rectangular tubing: Shall conform to ASTM A500, Grade B, $F_y = 46$ ksi.

Plate Steel: Shall Conform to ASTM A36, $F_y = 36$ ksi

All structural steel shall be painted as per Section 435 of the Standard Specifications and shall conform to Paint System B. See Section 912.05 of the Standard Specifications.

Sheet Metal:

Decking: 3" X 16" X 20 gauge smooth white, ASTM A653 GR40, $F_y = 40$ ksi, galvanized steel with baked enamel finish.

Center and Tapered Gutter: 24 gauge hot dipped galvanized steel baked enamel finish.

Perimeter Gutter: 20 gauge hot dipped galvanized steel baked enamel finish.

External downspouts: 3" x 4" x 24 gauge hot-dipped galvanized steel with baked enamel finish.

Manufacturer must be capable of providing seamless gutter profiles up to 40' in length.

C. PRE-ENGINEERED FUEL STATION METAL CANOPY

General: Provide a complete, integrated set of manufacturer's standard, mutually dependent components that form a completely pre-engineered canopy, ready for construction on Project site. Pre-engineered Fuel Station metal canopy shall be capable of withstanding structural and other loads indicated, thermally induced movement, and exposure to weather without failure or infiltration of water.

Canopy Fascia: 2-inch Laminated Foam Core Fascia: Panel face is 24 gauge hot-dipped galvanized steel with a baked enamel finish. All finishes are warranted against cracking, checking, peeling or adhesion failure. Warranties for 5, 10, 20 years are available depending on color selection. The foam core is 2"- 1# expanded virgin polystyrene. The backing is 24 gauge galvanized steel.

Aluminum Composite Panel (ACM): Available with a fluorocarbon paint finish, masked on one side. Warranted for 10 or 20 years depending on color and finish.

Various custom fascia to meet design requirements.

Finishes:

- a. Comply with National Association of Architectural Metal Manufacturers (NAAMM) "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- b. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 – CONSTRUCTION

A. INSTALLATION

A work area is required extending 10 feet beyond buildings and canopies in all directions to the extent practical. The work area shall be flat, comprised of hard packed soil or gravel, asphalt, or concrete, and free of open excavation, debris, construction equipment and construction workers. An additional flat work space a minimum of 25 feet by 25 feet or as practical shall be provided adjacent to the canopy and/or building for unloading and storing materials.

Set pre-engineered Fuel Station metal canopy plumb and aligned. Level base plates true to plane with full bearing on concrete bases.

Fasten pre-engineered Fuel Station metal canopy columns to foundation bolts.
Anchor bolts:

Anchor bolts or foundation bolts are to be set by the Contractor in accordance with approved site specific Manufacturer's drawings. They must not vary from the size and dimensions shown on the erection drawings. Use of a plywood template is recommended. Remove template prior to column erection.

Anchor bolts shall conform to ASTM A307; and shall have a minimum of 7-inches of exposed thread and a 6-inch bottom hook.

Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, aggregate grout, non-corrosive, non-staining, mixed with water to consistency suitable for application and a 30-minute working time.

Bolted Connections:

All structural erection bolts to conform to ASTM A325

A minimum diameter of $\frac{3}{4}$ inch erection bolts shall be used for crossbeam-to-column connections and a minimum of $\frac{5}{8}$ inch diameter bolts for all other connections.

All drilled holes in structural steel shall be deburred.

Flat structural washers (minimum of one) shall be used on all bolted connections.

All bolts shall be tightened using AISC turn-of-the-nut method (unless otherwise specified).

Screws:

Fastening shall be performed per installation prints provided by the manufacturer.

Installation screws shall be furnished with electrode deposited cadmium coating unless otherwise noted.

Self-drilling and self-tapping screws shall have a sufficient cut point and a $\frac{1}{2}$ -inch O.D. dished tapping metal backed neoprene washer.

Provide pedestrian protection and warnings during construction which comply with all local, federal and OSHA codes.

Prior to steel erection of any kind, the Contractor shall grade, back-fill and otherwise prepare the job site to allow for rolling scaffold and ensure safe working conditions including the removal or relocation of overhead power lines.

Any grade or elevation situations which deviate from the approved manufacturer's plans must be conveyed to the manufacturer prior to fabrication.

All anchor bolts and/ or leveling plates shall be set within $\frac{1}{4}$ -inch tolerance on layout and grade level.

Temporary electrical power is to be provided.

Connect electrical power service to power distribution system according to requirements specified in Category 2000.



Dumpster for trash and debris shall be provided by the Contractor.

ADJUSTING AND CLEANING

After completing installation, inspect exposed finishes and repair damaged finishes.

PART 4 - MEASUREMENT AND PAYMENT

FUEL STATION METAL CANOPY

The Fuel Station metal canopy shall not be measured for payment. All work of the Fuel Station metal canopy shall be included in the lump sum price for "Fuel Station Canopy, Lighting and Appurtenances" indicated on the Bid Form. The lump sum price shall include the design, furnishing, and installation of all components of the canopy and all cost related to the construction permit.

END OF SECTION

**CATEGORY 500
PAVING**

**SECTION 520 — PLAIN AND REINFORCED PORTLAND CEMENT CONCRETE
PAVEMENTS**

520.03 CONSTRUCTION.

506 **ADD:** The following after 520.03.16.

520.03.17 Dowel Bar Placement Checks. After the placement of the PCC pavement is complete and cured, the alignment and placement of the dowel bars will be checked by the Administration using a non-destructive test method. A random representative sample of joints will be tested to determine conformance with the following:

- (a) **Vertical Skew.** The vertical skew shall be no greater than 1/2 in. tolerance over a 12 in. length of dowel bar.
- (b) **Horizontal Skew.** The horizontal skew shall be no greater than 1/2 in. tolerance over a 12 in. length of dowel bar.
- (c) **Depth of Dowel Bar.** The dowel bar shall be located within the middle third of the slab thickness.
- (d) **Joint.** The joint saw cut shall be in the middle third of the dowel bar length.

When a dowel bar is tested and does not conform to all of the above, it is then in non-conformance or misaligned. After testing is complete, the percentage of those dowel bars not meeting the above will be determined. Deficiency will be subject to a reduced payment as specified in 520.04. This is in addition to the reduced pay for slab thickness.

520.04 MEASUREMENT AND PAYMENT.

506 **ADD:** The following after 520.04.01.

520.04.02 Dowel Bar Misalignment Price Adjustment. Payment for the percentage of dowel bars accepted at a reduced price for not conforming to the proper alignment will be adjusted by the factors shown in the following table. Alignment is determined by procedures specified in 520.03.17. This shall be a reduced price for the portland cement concrete pavement item in addition to any reduction due to pavement thickness.

| DOWEL BAR PRICE ADJUSTMENT | |
|------------------------------------|--|
| Percent of Misaligned Dowel Bars * | Percent of Payment, Contract Unit Price ** |
| 0.0 to 30.0 | 100 |
| 30.1 to 40.0 | 90 |
| 40.1 to 50.0 | 80 |
| Greater than 50.0 | Corrective action or pay reduction as determined by the Engineer |

*This is the percentage of all dowel bars tested.

**This price adjustment is to the PCC price and not for the dowel bars. This is in addition to any price adjustment for pavement thickness.

**CATEGORY 700
LANDSCAPING**

**SECTION 710 — TREE, SHRUB, AND PERENNIAL INSTALLATION AND
ESTABLISHMENT**

710.03.18 (b) Replacement Plants

598 **DELETE:** Replacement plants shall meet the specifications of 920.07, and be installed and established as specified in Section 710 for 12 months, until Final Acceptance.

INSERT: Replacement plants shall meet the specifications of 920.07, and be installed and established as specified in Section 710 for 24 months, until Final Acceptance.

710.03.22 (a) Period of Maintenance.

599 **DELETE:** Maintain plants for 12 months after installation, until Final Acceptance.

INSERT: Maintain plants for 24 months after installation, until Final Acceptance.

710.03.23 Final Acceptance – In the Requirements Table, under Item 7

601 **DELETE:** Plants are successfully established for 12 months.

INSERT: Plants are successfully established for 24 months and watered as needed.

**SECTION 820 GENERAL ELECTRICAL WORK AND TESTING**

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

820.01 DESCRIPTION

ADD: The following.

- (a) This work includes contacting, coordinating and cooperating with BG&E (or other local utility company) for the changes and additions to the electrical service.
- (b) The Plans show only diagrammatic locations of cables, conduits, and other underground utilities. They are approximate and do not show every detail. The Contractor shall provide working drawings, shop drawings, and catalog cuts, etc., which show final details of the installation.

Codes, Standards, Inspection, and Documentation

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

- ANSI - American National Standards Institute
- ASTM - American Society for Testing and Materials
- IEEE - Institute of Electrical and Electronic Engineers
- NEC - National Electrical Code (NFPA70)
- NECA - National Electrical Contractors Association (NECA 1-2006)
- NEMA - National Electrical Manufacturers Association
- NESC - National Electrical Safety Code
- NFPA - National Fire Protection Association
- UL - Underwriters' Laboratories
- TIA - Telecommunications Industry Association

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



The MDTA Chief Electrical Inspector or his appointed representative will inspect the entire installation. The Contractor shall contact the Electrical Inspector at least 48 hours before needed inspections. All trenches shall be inspected before backfilling. All equipment, conduits, etc. shall be inspected at rough in and prior to concealment. All work shall be inspected prior to power-up. Contact the Chief Electrical Inspector, Douglas Evans, at 410-977- 2687 to arrange necessary inspections. (devans@mdta.state.md.us)

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

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

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

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

Quality Assurance and Quality Control

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

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

CONSTRUCTION

820.03.01 General

ADD: The following.

For the purpose of this specification, "direct supervision" shall mean that the qualified Master Electrician shall be at the job site at all times electrical work is performed. The Master Electrician

cian shall be the single point of contact for inspection and quality control issues related to electrical work and shall be able to effectively manage the electrical work force.

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

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

ADD: The following just prior to paragraph 820.04.

820.03.04 Testing Fiber Optic Cables

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

- (a) All cables shall have ST connectors installed prior to testing. All testing, for purposes of acceptance of the system, shall be conducted on fully installed and assembled fiber optic cables.
- (b) Upon completion of testing, replace or repair any failed cable(s) with a new fiber or cable, and test the new cable to demonstrate acceptability.
- (c) Insertion loss testing shall be performed.
- (d) These tests shall be measured in dB.
- (e) These tests shall use 850 nm and 1300 nm light sources for multimode fiber and 1300 and 1550 nm for single mode fiber.
- (f) Test shall be documented for all wavelengths as noted above.
- (g) Test results shall be documented on paper and stored on a computer diskette and shall be turned over to the electrical inspector after testing is complete. Attachment 820-A to this Section shows a sample fiber optic test report.
- (h) An optical time domain reflectometer (OTDR) approved by the Engineer shall be used to conduct testing. The OTDR shall be calibrated to sheath (jacket) length, not optical

length, by adjusting the unit's index of refraction. Properly trained technicians shall conduct tests.

- (i) All OTDR traces shall maximize both the vertical and horizontal scales to the greatest extent possible and still fit the entire trace on the screen.
- (j) A cable segment shall be deemed a failure if the total loss exceeds the calculated loss for that length of cable as indicated in Attachment 820-A. A cable segment shall fail if any individual splice loss is greater than 0.3dB, or if any mated connector pair loss is greater than 1.0dB, or if there is any point loss (over less than 1' of cable) of more than 1.0dB.
- (k) After the circuit test, a functional test shall be performed. This test shall consist of allowing the system to operate as normal for 30 consecutive days. Any failures shall be repaired by the Contractor at his own expense, and the test restarted.

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

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

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

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

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

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

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

- (a) Lengths not exceeding 3' shall be used to connect transformers over 5KVA and motors.
- (b) Lengths not exceeding 6' may be used for the final connection of light fixtures used in ceilings.
- (c) Lengths not exceeding 6" may be used for the final connection devices that may be subject to minor vibration or minor movement perhaps from temperature expansion and contraction.
- (d) Other lengths as clearly specified on the plans or as approved by the Engineer.

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

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

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

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

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

820.03.17 Panel Board Labeling. All circuits installed or modified by the contractor in any way shall be properly labeled in the associated panel board panel schedule. This work shall include verifying that the existing load on the affected circuit(s) is also correctly identified. The label shall identify the type of load(s) served (e.g.: receptacles, lighting, appliances, motors, pumps, etc..) and the location (e.g.: room 103, sump pit#1, etc...). Where changes are minor (e.g. Two circuits or less being changed), the existing panel schedule may be modified as approved by the Electrical Inspector. Larger changes shall require a new panel schedule typed, neat in appearance. The new schedule may copy the identifying labels of the old schedule provided that the contractor has not made any changes to those circuits. To clarify, replacing a panel board, moving circuits within a panel board, or similar changes shall be considered modifying the circuit



and shall require testing to verify the connections of all such circuits and coordinating the panel schedule with the existing conditions.

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

820.03.19 Construction Stakeout and Coordination

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

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

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

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



**ATTACHMENT 820-A
SAMPLE FIBER OPTIC CABLE TEST REPORT**

(To be filled out after installation is complete)

| | |
|----------------------|---------------|
| Job Name: Job ID: | Fiber Cable: |
| Location (A): | Location (B): |

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

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

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

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

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

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

Splice Loss (SL) = 0.3 db each

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

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



Maryland
Transportation
Authority

SPECIAL PROVISIONS

CONTRACT NO. BB 2042-000-002

Page 8 of 8

| Cable Length | Strand No. | A to B | B to A | Fiber ID |
|---------------|------------|--------|--------|----------|
| Feet | 1 | | | Blue |
| 1300 NM MM | 2 | | | Orange |
| dB | 3 | | | Green |
| | 4 | | | Brown |
| | 5 | | | Slate |
| | 6 | | | White |
| | 7 | | | Red |
| | 8 | | | Black |
| | 9 | | | Yellow |
| | 10 | | | Violet |
| | 11 | | | Rose |
| | 12 | | | Aqua |
| Cable Length | Strand No. | A to B | B to A | Fiber ID |
| Feet | 1 | | | Blue |
| 1550 NM MM | 2 | | | Orange |
| dB | 3 | | | Green |
| | 4 | | | Brown |
| | 5 | | | Slate |
| | 6 | | | White |
| | 7 | | | Red |
| | 8 | | | Black |
| | 9 | | | Yellow |
| | 10 | | | Violet |
| | 11 | | | Rose |
| | 12 | | | Aqua |

Technician: _____ Date: _____

**CATEGORY 900
MATERIALS**

665 **DELETE:** SECTION 902 — PORTLAND CEMENT CONCRETE AND RELATED PRODUCTS in its entirety.

INSERT: The following.

SECTION 902 — PORTLAND CEMENT CONCRETE AND RELATED PRODUCTS

902.01 STORAGE. Storage of materials shall conform to the Contract Documents and as directed by the Engineer.

902.02 CERTIFICATION OF PORTLAND CEMENT AND BLENDED HYDRAULIC CEMENT. The manufacturer shall furnish certification as specified in TC-1.02. The certification shall also include:

- (a) The mill shall report its quality control procedures, and submit a new report whenever there is a procedural change.
- (b) The mill's control laboratory shall be inspected by the Cement and Concrete Reference Laboratory of the National Institute of Standards and Technology on their regularly scheduled visits. The Engineer shall be provided with copies of the reports of these inspections along with an account of the action taken to correct cited deficiencies.
- (c) Records of data accumulated by the quality control procedures shall be produced upon request.
- (d) A certified document shall accompany each shipment stating that the contents conform to all applicable requirements. Additionally, the document shall show the producer's name, mill location, carrier number, date loaded, weight contained in carrier, silo number, consignee, destination, Contract number, and type of cement. The signature and title of the signer shall be shown on the document.
- (e) The mill shall, upon request, supply certified chemical and physical test values that can be associated with any sample representing cement drawn from a particular silo on a given date.
- (f) Acceptance of cement by certification will be terminated if test results differ from mill results by more than the precision limits given in the test method. The acceptance procedure will then revert to storage testing and approval prior to shipment.

902.03 HYDRAULIC CEMENT.

902.03.01 Portland Cement. M 85, with the fineness and the time of setting determined using T 153 and T 131, respectively.

902.03.02 Ground Iron Blast Furnace Slag. M 302, Grade 100 or 120. The Contractor may request to substitute a maximum of 50 percent of the weight of cement with ground iron blast furnace slag. When ground iron blast furnace slag is used, the minimum cement factor and water/cement ratio will be determined on the basis of the combined weight of the portland cement and ground iron blast furnace slag. When ground iron blast furnace slag is used to control alkali silica reactivity, see Table 902 B for percentage.

902.04 BLENDED HYDRAULIC CEMENT. M 240, Type I (PM) or a Type IP containing 15 to 25 percent pozzolan by weight of cement. Maximum loss on ignition is 3.0 percent. Do not use ground iron blast furnace slag for blending. The requirement for a manufacturer's written statement of the chemical composition is waived.

902.05 MASONRY CEMENT. C 91, except the water retention and staining tests are waived.

902.06 CONCRETE ADMIXTURES. Do not use concrete admixtures that contribute more than 200 ppm of chlorides based on the cement content when tested per MSMT 610. Use only prequalified admixtures.

Do not use pozzolan and Type I (PM) or Type IP cement in the same mix. Since the strength gains are delayed with these materials, a longer period of time may be required for curing and form removal.

902.06.01 Air Entraining Admixtures. M 154.

902.06.02 Chemical Admixtures. M 194, Type A, D, or nonchloride C.

902.06.03 High Range Water Reducing Admixtures. M 194, except that it shall be a liquid, the water content shall be a maximum of 85 percent of that of the control, and the durability factor shall be a minimum of 90. Use Type F for early strength, which shall produce a minimum compressive strength in 12 hours of 180 percent of that of the control. Use Type G when early strength is not specified. The manufacturer shall furnish certification as specified in TC-1.02. The certification shall include curves indicating the fluid ounces of admixture per 100 lb of cement as related to water reduction and strength gain for 12 hours when used with a minimum cement factor of 700 lb.

902.06.04 Pozzolans. The use of pozzolans may be requested to control alkali silica reactivity or for other reasons. When a pozzolan is used, determine the minimum cement factor and water/cement ratio on the basis of the combined weight cement and pozzolan. See Table 902 B for percentage of fly ash, and microsilica.

- (a) **Fly Ash.** M 295, pozzolan Class C or F, except that the maximum permissible moisture content shall be 1.0 percent, and when used in concrete Mix Nos. 3 and 6 the maximum loss on ignition 3.0 percent.

(b) **Microsilica.** C 1240, except that the oversize requirement is waived.

902.06.05 Corrosion Inhibitors. Corrosion inhibitors shall be calcium nitrite based and contain a minimum of 30 percent active ingredients by mass. The gallonage of corrosion inhibitor used in the concrete mixture shall be included as water when determining the water/cementitious materials ratio.

902.07 PORTLAND CEMENT CONCRETE CURING MATERIALS. Use burlap cloth, sheet materials, liquid membrane forming compounds, or cotton mats.

902.07.01 Burlap. M 182, Class 1, 2, or 3.

902.07.02 Sheet Materials. M 171 with the following exceptions:

(a) **White Opaque Burlap Polyethylene Sheeting.** Tensile strength and elongation requirements are waived. Use sheeting having a finished product weight of not less than 10 oz/yd².

(b) **White Opaque Polyethylene Backed Nonwoven Fabric.** 902.07.02(a), with the thickness requirement waived. Use material having a finished product weight of not less than 5 oz/yd².

(c) **White Opaque Polyethylene Film.** Tensile strength and elongation requirements are waived.

902.07.03 Liquid Membrane. M 148. Field control testing of the white pigmented curing compounds is on the basis of weight per gallon. The samples shall not deviate more than ± 0.3 lb/gal from the original source sample.

902.07.04 Cotton Mats. Cotton mats consist of a filling material of cotton bats or bats covered with unsized cloth and tufted or stitched to maintain the shape and stability of the unit under job conditions of handling.

Use coverings of either cotton cloth, burlap or jute having the following properties:

(a) Cotton cloth covering shall weigh not less than 6.0 oz/yd² and have an average of not less than 32 threads/in. of warp and not less than 28 threads/in. of filling. Use raw cotton, cotton comber waste, cotton card strip waste, or combinations thereof as the raw material used in the manufacture of the cotton cloth.

(b) Burlap or jute covering for cotton mats shall weigh not less than 6.4 oz/yd² and shall have not less than 8 threads/in. of warp and not less than 8 threads/in. of filling. Use the grade known commercially as "firsts" and they shall be free from avoidable imperfections in manufacture and from defects or blemishes affecting the serviceability.



Use a cotton bat, or bats made of raw cotton, cotton waste, cotton lintens, or combinations thereof, as the filling material for the mats. Mats shall weigh not less than 12 oz/yd².

902.08 FORM RELEASE COMPOUNDS. Use form release compounds that effectively prevent the bond of the concrete to the forms. Form release compounds shall not cause discoloration of the concrete or adversely affect the quality or rate of hardening at the interface of the forms.

The flash point of the form release compound shall not be less than 100 F when tested per T 73.

902.09 PARAFFIN WAX. Use clear paraffin wax for use as a bond breaker for concrete. The flash point shall not be less than 380 F when tested under D 92.

902.10 PORTLAND CEMENT CONCRETE. Section 915 and as specified herein.

902.10.01 Proportioning. Prior to the start of construction, submit to the AME the source and proportions of materials to be used for each concrete mix. The mixture shall meet 902.10.03.

The concrete, with the exception of water and chemical admixtures, shall be proportioned by weight. Water and chemical admixtures may be proportioned by volume or weight. The mix shall be uniform and workable.

902.10.02 Materials.

| | |
|---------------------|-------------------|
| Coarse Aggregate | 901.01 |
| Fine Aggregate | 901.01 |
| Cement | 902.03 and 902.04 |
| Concrete Admixtures | 902.06 |
| Synthetic Fibers | 902.15 |
| Water | 921.01 |

902.10.03 Portland Cement Concrete Mixtures.

The concrete mixes shall conform to the following:



TABLE 902 A

| PORTLAND CEMENT CONCRETE MIXTURES | | | | | | | | | |
|-----------------------------------|--|-----------------------|-------------------|-------------------------|-----------------------------|----------------------------------|----------------|-------------------------|-------------------------|
| MIX NO. | 28 DAY SPECIFIED COMPRESSIVE STRENGTH | STANDARD DEVIATION | CRITICAL VALUE | MIN CEMENT FACTOR | COARSE AGGREGATE SIZE | MAX WATER/ CEMENT RATIO | SLUMP RANGE | TOTAL AIR CONTENT | CONCRETE TEMPERATURE |
| | psi | psi | psi | lb/yd ³ | M 43 / M 195 | by wt | in. | % | F |
| 1 | 2500 | 375 | 2430 | 455 | 57, 67 | 0.55 | 2 – 5 | 5 – 8 | 70 ± 20 |
| 2 | 3000 | 450 | 3010 | 530 | 57, 67 | 0.50 | 2 – 5 | 5 – 8 | 70 ± 20 |
| 3 | 3500 | 525 | 3600 | 580 | 57, 67 | 0.50 | 2 – 5 | 5 – 8 | 70 ± 20 |
| 4 | 3500 | 525 | 3600 | 615 | 57, 67 | 0.55 | 4 – 8 | N/A | 70 ± 20 |
| 5 | 3500 | 525 | 3600 | 580 | 7 | 0.50 | 2 – 5 | 5 – 8 | 70 ± 20 |
| 6 | 4500 | 675 | 4770 | 615 | 57, 67 | 0.45 | 2 – 5 | 5 – 8 | 65 ± 15 |
| 7 | 4200 | 630 | 4420 | 580 | 57 | 0.50 | 1½ – 3 | 5 – 8 | 70 ± 20 |
| 8 | 4000 | 600 | 4180 | 750 | 7 | 0.42 | 2 – 5 | 5 – 8 | 65 ± 15 |
| 9 | 3000 (a) | N/A | N/A | 800 | 57, 67 | 0.45 | 4 – 8 | 5 – 8 | 70 ± 20 |
| 10 | 4500 | 675 | 4770 | 700 | ¾" – No. 4 | 0.45 | 2 – 5 | 6 – 9 | 65 ± 15 |
| 11 | 4200 | 630 | 4420 | — | 57, 67 | 0.45 | 2 – 5 | 5 – 8 | 65 ± 15 |
| 12 | 4200 | 630 | 4420 | — | ¾" – No. 4 | 0.45 | 2 – 5 | 6 – 9 | 65 ± 15 |

Note 1: When concrete is exposed to water exceeding 15,000 ppm sodium chloride content, Type II cement shall be used. In lieu of Type II cement, a Type I cement may be used in combined form with an amount of up to 50 percent replacement with ground iron blast furnace slag, or an amount of up to 25 percent replacement with Class F fly ash. The Contractor shall submit to the Engineer the proposed mix proportions and satisfactory test results per C 1012 showing a sulfate resistance expansion not exceeding 0.10 percent at 180 days

Note 2: The temperature of Mix No. 6 when used for other than superstructure work as defined in TC-1.02 shall be 70 ± 20 F.

Note 3: Type A or D admixture shall be added to bridge, box culvert, and retaining wall concrete.

Note 4: Nonchloride Type C admixtures may be used when approved by the Engineer.

Note 5: Other Slump Requirements:

When a high range water reducing admixture Type F or Type G is specified, the slump shall be 4 to 8 in.

When synthetic fibers are specified, the slump shall be 5 in. maximum.

When concrete is to be placed by the slip form method, the slump shall be 2-1/2 in. maximum.

When the absorption of the coarse aggregate is greater than 10 percent, the slump shall be 3 in. maximum.

Note 6: Mix 9 shall contain a Type F high range water reducing admixture.

Note 7: Mix 10 and 12 shall be proportioned as specified in 211.2 of the ACI's Recommended Practices for Selection Proportions for Structural Lightweight Concrete. The maximum average Density of Cured Concrete shall be 118 lb/ft³. Control testing for Density of Cured Concrete shall be two companion cylinders for each 100 yd³, or fraction thereof, as specified in M 195.

Note 8: Mix 11 and 12 shall also conform to all requirements as specified in Table 902 C.

(a) Acceptance will be based on a minimum compressive strength of 3000 psi in 24 hours. Design approval will be given based on trial batch obtaining a minimum compressive strength of 2500 psi in 12 hours. Testing shall conform to 902.10.08 except that cylinders shall remain in the molds until tests are conducted.

Coarse and fine aggregate having an expansion up to 0.10 percent when tested for alkali silica reactivity (ASR) MSMT 212 may be used without restriction. Aggregates having an expansion greater than 0.10 but less than 0.35 percent are considered reactive and may only be used when one of the options in table 902 B are employed. Those having an expansion of 0.35 percent and greater are prohibited.

TABLE 902 B

| OPTION | ALKALI CONTENT OF CEMENT % max | REPLACE CEMENT WITH | | SPECIFICATION |
|--------|--|-----------------------------------|----------------|---------------------------|
| | | MATERIAL | % BY WEIGHT | |
| 1 | 1.50 | Class F Fly Ash | 15 – 25 | M 295 |
| 2 | 1.50 | Ground Iron Blast Furnace Slag | 25 – 50 | M 302 Grade 100 or 120 |
| 3 | 1.50 | Microsilica | 5 – 7 | C 1240 |
| 4 | — | Blended Cement (a) | 100 | M 240 |
| 5 | 0.60 (b) | Low Alkali Cement | 100 | M 85 |

(a) Pozzolan content of 15 – 25 percent by weight of cement

(b) For mix 9 used for Portland cement concrete pavement repairs; the maximum allowable percentage of alkalis in Portland cement shall be 0.70.

When reactive aggregate is used, designate which option will be used to control the formation of the ASR gel. If an option other than option 5 in Table 902 B above is chosen, conduct tests per MSMT 212 using the reactive aggregate and the proposed cementitious material. The expansion test results shall not be greater than 0.10 percent. When more than one reactive aggregate is used in a concrete mix, each shall be tested individually and the maximum amount of pozzolan required to reduce the expansion of all the aggregates to 0.10 percent or less shall be used. Submit the aggregate source, test results, and the percent and type of replacement cement to the Engineer. The Engineer may withhold source approval pending verification testing.

TABLE 902 C

| MIX PHYSICAL PROPERTIES | | |
|---|-------------|----------------------|
| TEST PROPERTY | TEST METHOD | SPECIFICATION LIMITS |
| Minimum Cementitious Materials Factor, lb/yd ³ | — | 580 |
| Maximum Content of Portland Cement, lb/yd ³ | — | 550 |
| Water/Cementitious Materials Ratio by Wt. | — | 0.45 |
| Corrosion Inhibitor, gal/yd ³ | 902.06.05 | 2.0 |
| Synthetic Fibers, lb/yd ³ | 902.15 | 1.5 |



| | | |
|---|----------------|------|
| Permeability of Field Concrete, moving average of three tests, coulombs max | T 277 Modified | 2500 |
| Permeability of Field Concrete, individual test, coulombs max | T 277 Modified | 3000 |
| Shrinkage at 28 days, microstrains | C 157 | 400 |

Note 1: Only Type I or II Portland cement shall be used.

Note 2: Mixes shall contain ground iron blast furnace slag, fly ash or microsilica.

Note 3: The water to cement ratio shall be based upon the total water to cementitious materials ratio. The gallonage of the corrosion inhibitor shall be included in the water/cementitious materials ratio.

Note 4: The permeability test value of field concrete shall be the average of two test specimens representing production concrete. Test specimens shall be molded on the project site in 4 x 8 in. molds conforming to M 205. Test specimens shall be handled under same conditions as compressive strength test specimens in conformance with C 31 for the first seven days. When seven days old, they shall be cured in a 100 F water bath for the remainder of the 28 day curing. The 28 day rapid chloride permeability of the specimens will be determined in conformance with T 277. Test for the geometry of test specimens will be waived.

Note 5: Shrinkage tests will be performed on trial mixes only.

Note 6: High range water reducing admixture may be used except the water reducing requirements will be waived.

Note 7: A sealer conforming to 902.12 shall be used on the finished surface.

902.10.04 Trial Batch. A trial batch shall be prepared to certify that each mix meets 902.10.05 and 902.10.06. Approval will be given when the test results meets the minimum required average strength.

Make arrangements with the AME at least two weeks in advance, to have an authorized representative present during the batching and testing. Each trial batch shall consist of at least 3 yd³ of concrete. Supply all equipment, and labor required to produce the trial batches and conduct the required tests at no additional cost to the Administration.

The AME may waive the requirement for a trial batch when past performance records show that the required average strength requirement has been met.

902.10.05 Design Required Average Strength.

| Specified compressive strength, f_c' , psi | Required average compressive strength, f_{cr}' , psi |
|--|--|
| $f_c' \leq 5000$ | Use the larger value computed from Eq. (A-1) and (A-2) $f_{cr}' = f_c' + 1.34s$ (A-1) $f_{cr}' = f_c' + 2.33s - 500$ (A-2) |

| | |
|-----------|--|
| Over 5000 | Use the larger value computed from Eq. (A-1) and (A-3) |
| | $f_{cr}' = f_c' + 1.34s$ (A-1) |
| | $f_{cr}' = 0.90 f_c' + 2.33s$ (A-3) |

where:

f_c' = the 28 day specified compressive strength.
 s = the standard deviation as specified in 902.10.06.

A test is defined as the average strength of two companion cylinders.

902.10.06 Standard Deviation.

- (a) When past performance records are available, a standard deviation will be established from documented performance records of the producer consisting of a minimum of 15 consecutive 28 day compressive strength tests obtained within the last 12 months.

The standard deviation will be established as the product of the calculated standard deviation and multiplier.

| NUMBER OF TESTS | MULTIPLIER FOR STANDARD DEVIATION |
|-----------------------|--|
| 15 | 1.16 |
| 20 | 1.08 |
| 25 | 1.03 |
| 30 or more | 1.00 |

Interpolate for intermediate number of tests.

- (b) When past performance records are not available, the required average strength shall meet to the following:

| Specified compressive strength, f_c' , psi | Required average compressive strength, f_{cr}' , psi |
|---|---|
| $f_c' < 3000$ | $f_{cr}' = f_c' + 1000$ |
| $3000 \leq f_c' \leq 5000$ | $f_{cr}' = f_c' + 1200$ |
| $f_c' > 5000$ | $f_{cr}' = 1.10 f_c' + 700$ |

902.10.07 Standard of Control. The average of all sets of three consecutive strength tests shall equal or exceed the critical value as specified in 902.10.03 which shall be computed using the following formula:

$$\text{Critical Value} = f_c' + (1.14 \times S) - 500$$

Failure to conform to this criteria shall be cause for immediate investigation and remedial action up to and including suspension of production. A design standard deviation equal to 15 percent of the specified strength shall be used for calculation until a minimum of 15 test results are obtained.

The actual average strength and standard deviation shall be computed upon the availability of 28 day strength data comprising a minimum of 15 tests. Should this determination indicate an excessive margin of safety, the concrete mix may be modified to produce lower average strength as approved by the Engineer. If these calculations indicate a coefficient of variation greater than 15, the quality of the concrete and testing will be evaluated.

902.10.08 Testing. Sampling per T 141. Testing as follows:

| TEST | METHOD | MINIMUM TEST FREQUENCY | RESPONSIBILITY |
|---|----------------|---|------------------|
| Temperature (e) | T 309 | 1 per 50 yd ³ (or fraction thereof) | Project Engineer |
| Slump (a)(e) | T 119 | 1 per 50 yd ³ (or fraction thereof) | Project Engineer |
| Air Content (a)(e) | T 152 T 196 | 1 per 50 yd ³ (or fraction thereof) | Project Engineer |
| Compression (b)(c)(d) | T 23 | 1 per 50 yd ³ (or fraction thereof) | Project Engineer |
| Compression (b)(c)(d) Mix No. 7 Only | T 23 | 3 per Day | Project Engineer |

- (a) A second test will be made when the first slump or air content test fails. Acceptance or rejection will be based on the results of the second test.
- (b) Compressive strength tests are defined as the average of two companion cylinders.
- (c) The Contractor shall be responsible for the making of all early break cylinders and furnishing the molds, stripping, curing/delivery of all cylinders, including 28 day cylinders, to the testing laboratory.
- (d) The Project Engineer will be responsible for making, numbering and signing the 28 day cylinders.
- (e) When constructing plain and reinforced concrete pavements, the testing frequency for slump, air content, and temperature shall be 1 per 100 yd³ or fraction thereof.

902.10.09 Acceptance. Concrete will be acceptable if both of the following requirements are met:



- (a) The average of all sets of three consecutive strength tests equal or exceed the specified design strength.
- (b) No individual strength test (average of two companion cylinders) falls below the specified design strength by more than 500 psi.

902.10.10 Price Adjustment. A price adjustment will be based on the Contract unit price per cubic yard of concrete. If the unit is a lump sum item, the price per cubic yard for the concrete will be determined by dividing the cubic yards into the Contract lump sum price.

- (a) **Test Results More Than 500 psi Below the Specified Design Strength.** Failing strength tests will be considered individually with a price adjustment being applied on the percentage basis as shown below.

(Price per yd³) X (quantity of yd³ represented by the failing concrete strength) X (percent of failure).

Example:

$$\$400.00 \text{ per yd}^3 \times 50 \text{ yd}^3 \times [1 - (3600 / 4500 \text{ psi})] = \$4,000.00$$

No payment will be allowed when the test results fall below 50 percent of the specified design strength for structural concrete or 40 percent for incidental concrete.

The Engineer will determine when the strength of the concrete represented by the failing tests is sufficient to remain in place or whether it must be removed and replaced with Specification concrete.

- (a) **Test Results 500 psi or Less than the Specified Design Strength.** Strength failures 500 psi or less than the specified design strength will be averaged with the next two consecutive tests. If those two tests include a failure greater than 500 psi, those tests will be evaluated as in 902.10.10(a) and replaced with the next consecutive test. If the resulting average falls below the specified design strength, a price adjustment will be applied as specified in the table below. Any failure will only be included in one grouping.

| STRENGTH BELOW THE SPECIFIED (avg of 3 tests) DESIGN LEVEL, psi | ADJUSTMENT FACTOR |
|---|-------------------|
| MIX NO. 1 THRU MIX NO. 7 | |
| 1 – 100 | 0.005 |
| 101 – 200 | 0.01 |
| 201 – 300 | 0.02 |
| 301 – 400 | 0.04 |
| 401 – 500 | 0.08 |

Adjustment price equals (price per yd³) X (quantity of yd³ represented by the failing cylinders) X (the adjustment factor).

Example:

$$\$400.00 \text{ per yd}^3 \times 50 \text{ yd}^3 \times 0.01 = \$200.00$$

902.11 MORTAR FOR GROUT. Mortar used for grouting anchor bolts, pipe, handrail posts, and miscellaneous items shall be composed in accordance with one of the following:

- (a) One part Portland cement or blended hydraulic cement and one part mortar sand by dry loose volume.
- (b) Prepared bag mixes consisting of Portland cement or blended hydraulic cement and mortar sand. The prepared mixes shall produce a mortar meeting the strength requirements specified in the Contract Documents.
- (c) Use nonshrink grout when specified. The grout shall have a minimum compressive strength of 5000 psi in seven days when tested as specified per T 106, except that the cube molds shall remain intact with a top firmly attached throughout the curing period. The nonshrink grout shall have a minimum expansion of 0.0 percent after seven days when tested as specified per T 160.
- (d) Epoxy grout shall consist of sand and epoxy mixed by volume in per the manufacturer's recommendations. The grout shall be capable of developing a minimum compressive strength of 6500 psi in 72 hours when tested per MSMT 501. Sand for epoxy grout as specified in 901.01.
- (e) An epoxy or polyester anchoring system may be used when approved by the Engineer in accordance with the manufacturer's recommendations. Strength values shall be as specified in the Contract Documents.

902.12 LINSEED OIL. Shall consist of a 50-50 mixture (by volume) of boiled linseed oil meeting Federal Specification TT-L-190 and kerosene per D 3699.

902.13 LATEX MODIFIED CONCRETE. Portland cement concrete containing prequalified Laboratory approved styrene butadiene latex emulsion is defined as Latex Modified Concrete (LMC).

Latex emulsion shall have a minimum of 90 percent of the nonvolatiles as styrene butadiene polymers. The latex emulsion as specified in Table 902.13 A. The material shall be stored in suitable containers and be protected from freezing and exposure to temperatures in excess of 85 F.

LMC shall be proportioned using volumetric mixing and designed as follows:

| <i>LATEX MODIFIED CONCRETE</i> | |
|--|----------------------|
| MATERIAL | SPECIFICATION LIMITS |
| Portland Cement, CWT/yd ³ , min | 6.6 |
| Latex Emulsion/Cement Ratio | 0.31 – 0.34 |
| Water/Cement Ratio, max | 0.22 |
| Entrained Air, % | 6.0 ± 3 |
| Slump, in. | 5 ± 1 |

The physical properties of LMC shall conform to Table 902.13 B. The Contractor shall furnish the necessary 3 X 6 in. molds per M 205 to be used for the fabrication of compressive strength cylinders.

Control and Acceptance Sampling.

- (a) Submit a two qt minimum sample, of the styrene butadiene latex emulsion to the AME daily for each lot of material used in a day's production.
- (b) A batch for LMC is defined as the capacity of the equipment being used on the project. Slump and air samples will be taken and tested before the placement of a batch is permitted. The slump shall be measured four to five minutes after discharge from the mixer. The test material shall be deposited off the deck and not be disturbed during this waiting period. One additional sample for slump and air will be taken randomly during the placement of each batch. For seven day compressive strength, two tests each per batch are required. A test is defined as consisting of two companion cylinders. The samples for these tests will be taken at random while the placement is in progress.

TABLE 902.13 A

| REQUIREMENTS FOR CHEMICAL PROPERTIES OF LATEX EMULSION MATERIALS | | | | |
|--|----------------|------|-------------------------|------------------------|
| | SPECIFICATIONS | | QUALITY ASSURANCE TESTS | |
| | | | PREQUALIFICATION TESTS | CONTROL AND ACCEPTANCE |
| Color | White | — | X | X |
| pH | 9.0 – 11.0 | — | X | X |
| Weight, lb/gal | 8.40 – 8.47 | — | X | X |
| Solids Content, % | 46 – 53 | — | X | X |
| *Butadiene Content, % of polymer | 30 – 40 | — | — | — |
| Viscosity @ 10 rpm-cps | Match Original | ± 20 | X | X |



| | | | | |
|---|----------------|---|---|---|
| *Surface Tension, dynes/cm max | 50 | — | — | — |
| *Mean Particle Size, polymer – Å | 1400 – 2500 | — | — | — |
| Coagulum, % max | 0.10 | — | X | X |
| *Freeze-Thaw Stability, coagulum, % max | 0.10 | — | X | X |
| Infrared Spectra of Latex Film | Match Original | — | X | X |
| Infrared of Alcohol, Soluble Portion of Latex | Match Original | — | X | X |
| Shelf Life, min | 1 yr | — | X | — |

Note 1: Quality assurance tests shall be conducted as specified in MSMT 612 except those denoted by an * shall be conducted as specified in FHWA RD – 78-35.

Note 2: The original or prequalification sample shall be accompanied by the producer's certification on all of the tests and properties noted above and as specified in TC-1.02. The certification shall contain actual test values of the product and the infrared spectrograph.

Note 3: A separate certification is required for each lot of material. The certification shall note the date of manufacture, lot size, and whether or not the material is identical to the formulation of the original sample.

TABLE 902.13 B

| LATEX MODIFIED CONCRETE PHYSICAL PROPERTIES | | | |
|--|-------------|-------------------------|------------------------|
| TEST PROPERTY | TEST VALUES | QUALITY ASSURANCE TESTS | |
| | | PREQUALIFIED TESTS | CONTROL AND ACCEPTANCE |
| 7 Day Compressive Strength, psi min | 3000 | X | X |
| 28 Day Compressive Strength, psi min | 3500 | X | — |
| 42 Day Compressive Strength, psi min | 3500 | X | — |
| 7 Day Flexural Strength, psi min | 550 | X | — |
| 28 Day Flexural Strength, psi min | 650 | X | — |
| 42 Day Shear Bond Strength, psi min | 2000 | X | — |
| Durability Factor, 300 cycles, % min | 85 | X | — |
| Chloride Permeability, Ppm max | 510 | X | — |
| Scaling Resistance, 50 cycles, max | 3 | X | — |

Note 1: Quality assurance tests shall be conducted as specified in MSMT 721.



Note 2: Seven Day Compressive Strength Test will be used for Control & Acceptance of the material. The minimum specified design strength is 3000 psi at seven days. The mix design approval and acceptance will be based on a coefficient of variation of 10 percent with a probability of 1 in 10 tests falling below the specified strength. Only test values 80% or greater than the specified strength will be accepted

902.14 RAPID HARDENING CEMENTITIOUS MATERIALS FOR CONCRETE PAVEMENT REPAIRS. Materials shall be a dry, packaged cementitious mortar having less than 5 percent by weight of aggregate retained on the 3/8 in. sieve and meet the following requirements:

Classification.

Class I — For use at ambient temperatures below 50 F.

Class II — For use at ambient temperatures of 50 to 90 F.

Class III — For use at ambient temperatures above 90 F.

Chemical Requirements. C 928 except that no organic compounds such as epoxy resins or polyesters as the principal binder.

Physical Requirements. Meet the following when tested per MSMT 725:

| <i>COMPRESSIVE STRENGTH, psi min</i> | | | | |
|--------------------------------------|--------|--------|------|---------|
| CLASSIFICATION | < 2 hr | 2-6 hr | 6 hr | 28 days |
| Type I — Slow | — | — | 2000 | 4500 |
| Type II — Rapid | — | 2000 | — | 4500 |
| Type III — Very Rapid | 2500 | — | — | 4500 |

| TEST RESULTS | |
|--|---------------|
| TEST PROPERTY | LIMITS |
| Bond Strength, 7 days, psi min | 2000 |
| Length Change, increase after 28 days in water, based on length at 3 hr, % max | + 0.15 |
| Length Change, decrease after 28 days, % max | - 0.15 |
| Freeze Thaw, loss after 25 cycles in 10% CaCl ₂ solution, % max | 8 |
| Initial Setting Time, minutes min | 10 |

Marking. All packages delivered to the project shall be marked with the following information:

- (a) Date material was packaged.
- (b) Approximate setting time.
- (c) Recommended dosage of water or liquid component.
- (d) Mixing instructions.
- (e) Class or temperature range.

Certification. The manufacturer shall furnish certification as specified in TC-1.02 showing the actual test results for each class and type of material submitted to the Laboratory.

902.15 SYNTHETIC FIBERS. When synthetic fibers are specified in the Contract Documents, the fibers shall be 1/2 to 1-1/2 in. long and conform to C 1116, Type III. The manufacturer shall furnish certification as specified in TC-1.02. The quantity of fibers used and their point of introduction into the mix shall conform to the fiber manufacturer's recommendations.

**CATEGORY 900
MATERIALS**

740 **DELETE:** SECTION 916 — SOIL AND SOIL-AGGREGATE BORROW in its entirety.

INSERT: The following.

SECTION 916 — SOIL AND SOIL-AGGREGATE BORROW

916.01 BORROW EXCAVATION. A soil or soil aggregate mixture meeting the following:

Maximum dry density and optimum moisture content of the material per T 180, Method C unless the material has more than 35 percent retained on the No. 4 sieve, in which case Method D shall be used. Material with a maximum dry density of less than 100 lb/ft³ is unsatisfactory and shall not be used in embankments. Potentially expansive materials, such as steel slag, are prohibited.

Refer to the Recycled Materials Special Provisions located elsewhere in the Contract Documents.

| BORROW REQUIREMENTS | | | | | | |
|--|---|------------------------|------------------------|------------------------------------|---|--|
| Class Borrow | Max Dry Density Minimum P.C.F. T 180 | LL Maximum T 89 | PI Maximum T 90 | Gradation Requirements T 88 | Reference MSMT Soil Classification | Reference AASHTO Classification |
| Select Borrow | 105 | 34 | 7 | 30% max passing No. 200 sieve | A-2,A-3, A-2-4 | A-1-a, A-1-b, A-3, A-2-4 |
| Capping Borrow | 105 | 34 | 7 | 30% max passing No. 200 sieve* | A-2,A-3, A-2-4 | A-1-a, A-1-b, A-3, A-2-4 |
| Modified Borrow | 125 | 30 | 9 | 50% min.retained on No. 4 sieve | Any material except A-5 | A-2-4, A-4** |
| Common Borrow | 100 | N/A | N/A | N/A | N/A | N/A |
| <p>* When material has no liquid and plastic limit, and the amount of material that passes the No 4 sieve and retained on the No. 10 sieve is less that 10 percent of the total sample mass, the material shall have at least 15 percent passing the No. 200 sieve.</p> <p>** When A-4, the material has to be a manufactured product.</p> | | | | | | |

CATEGORY 900
MATERIALS

SECTION 950 - TRAFFIC MATERIALS

950.03 REFLECTORIZATION OF SIGNS AND CHANNELIZING DEVICES.

DELETE: 950.03.03 Type IX Retroreflective Sheeting in its entirety.

INSERT: The following.

950.03.03 Permanent Signs Retroreflective Sheeting. Retroreflective sheeting for permanent signs shall conform to ASTM D 4956-05, except as modified below:

| MINIMUM REFLECTIVE INTENSITY VALUES FOR RETROREFLECTIVE SHEETING Minimum Coefficient of Retroreflection (R_A) $cd/(lx \cdot m^2)$ Per ASTM E-810 (Average of 0 and 90 degree orientation) | | | | | | | | | |
|--|----------------------------|--------------|---------------|--------------------------|-------------------------------------|------------|--------------|-------------|--------------------------|
| Observation Angle° | Entrance Angle° | White | Yellow | Fluor. Yellow | Fluor. Yellow- Green | Red | Green | Blue | Fluor. Orange |
| 0.2 | -4 | 570 | 425 | 340 | 455 | 114 | 57 | 26 | 170 |
| 0.2 | 30 | 215 | 160 | 130 | 170 | 43 | 21 | 10 | 64 |
| 0.5 | -4 | 400 | 300 | 240 | 320 | 80 | 40 | 18 | 120 |
| 0.5 | 30 | 150 | 112 | 90 | 120 | 30 | 15 | 6.8 | 45 |
| 1 | -4 | 120 | 90 | 72 | 96 | 24 | 12 | 5.4 | 36 |
| 1 | 30 | 45 | 34 | 27 | 36 | 9 | 4.5 | 2 | 14 |

INSERT:

950.03.07 Permanent Traffic Signs (PTS) Unless otherwise specified in the Contract Documents, retroreflective sheeting for permanent signs shall conform to 950.03.03.

**SECTION 1000
EQUIPMENT**

SECTION 1002 – FUEL STORAGE AND DISPENSING EQUIPMENT

Part 1 - DESCRIPTION

A. SUMMARY

1. This Section specifies the fuel dispensing equipment and is defined to include, but not necessarily be limited to:
 - a. Provide a complete fuel dispensing equipment system at location indicated on the Contract Drawings;
 - b. Acceptance testing;
 - c. Training of the Maryland Transportation Authority (Authority) personnel; and
 - d. Maintenance of the system during the warranty period.
2. Provide the ConVault Aboveground Tank Systems approved for listing under U.L. Standard 2085, Aboveground Tanks, Protected Type, Secondary Containment with Vehicle Impact and Projectile Resistance. Unit must comply with all provisions of U.F.C. 79-7, Appendix A-II-F. The tank and its enclosure shall be a completed unit at the factory (shop fabricated). The tank system shall be approved for Phase I and Phase II Vapor Recovery by the California Air Resource Board for gasoline and methanol.
3. The work consists of providing one (1) 8,000 gallon steel, concrete encased AST fueling system split internally to two (2) compartments- 2,000 and 6,000 gallons- with factory-installed equipment and appurtenances as specified herein and as shown on the Contract Drawings. The tank system shall be manufactured and assembled by a single manufacturer. This item shall include all labor, equipment, materials, transport, mounting slab, hose fittings, and all other incidentals for providing in-place operational fuel dispensers as specified herein and as shown on the Contract Documents.
4. The work consists of providing one (1) 1,000 gallon steel, concrete encased AST fueling system with factory-installed equipment and appurtenances as specified herein and as shown on the Contract Drawings. The tank system shall be manufactured and assembled by a single manufacturer. This item shall include all labor, equipment, materials, transport, mounting slab, hose fittings, and all other incidentals for providing an in-place operational fuel dispenser as specified herein and as shown on the Contract Documents.
5. The work consists of providing one (1) 4,000 gallon steel, concrete encased aboveground storage tank (AST) and appurtenances as specified herein and as shown on the Contract Drawings.
6. The work consists of providing two (4) submersible pumps in the new 8,000 gallon AST, one (1) submersible pump in the proposed 1,000 gallon AST, and five (5) dispensers as

follows: diesel fuel (two - 2), unleaded gasoline (two - 2) and E-85 (one - 1). This item shall include all labor, equipment, materials, transport, mounting slab, hose fittings, sumps, liquid sensors, and all other incidentals for providing in-place operational fuel dispensers as specified herein and as shown on the Contract Documents.

7. Fuel management system including card readers to control and provide accurate accounting of fuel dispensed.
8. Miscellaneous fuel specialties and accessories including fuel depot safety signs, fire extinguisher, wash bucket and paper towel holder, steel drum trash can and spill containment kit.
9. The work consists of providing above ground piping for the heating oil system (4,000 gallon tank)
10. Provide where shown on the Contract Drawings all equipment, as specified, complete and ready for safe operation. Each item shall be specifically designed for the intended function. Provide necessary accessories, items of equipment, mechanical, electrical, and structural items, whether specified or not in order to provide properly installed and functional equipment.
11. Equipment shall be suitable for installation in the space indicated on the Contract Drawings. Any modification or redesign to the existing structure or utilities required in connection with of an alternate equipment selection by the Contractor shall be provided by the Contractor at no additional cost to the Authority and shall be as approved by the Engineer.
12. The Authority will provide fuel for the new tanks at no cost to the Contractor. Coordinate delivery of unleaded gasoline, E85 and diesel fuel with Owner.
13. The new 8,000 Gallon gasoline and diesel fuel tanks and dispensing equipment at the Police Facility (Site 1) shall be complete and operable prior to removing the existing gasoline and diesel fueling facility at the Administration Facility (Site 2).

B. References

1. American National Standards Institute (ANSI)
 - a. ANSI/ASME A13.1 Scheme for the Identification of Piping Systems.
 - b. ANSI/ASME B1.20.1 Pipe Threads, General Purpose (inch).
 - c. ANSI/ASME B16.10 Face-to-Face and End-to-End Dimensions of Valves.
2. American Petroleum Institute (API)
 - a. API RP 1637 using to API Color-Symbol System to Mark Equipment and Vehicles for Product Identification at Gasoline Dispensing Facilities and Distribution Terminals.

3. American Society for Testing and Materials (ASTM)
 - a. ASTM A36 Standard Specification for Carbon Structural Steel.
 - b. ASTM A48 Standard Specification for Gray Iron Castings.
 - c. ASTM A53 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless.
 - d. ASTM A1011 Standard Specification for Steel, Sheet and Strip, Hot Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
 - e. ASTM B209 Standard specification for aluminum and aluminum-alloy sheet and plate.
 - f. ASTM C335 Steady State Heat Transfer Properties of Horizontal Pipe Insulation.
 - g. ASTM C547 Standard Specification for Mineral Fiber Pipe Insulation.
 - h. ASTM C332 Standard Specification for Lightweight Aggregates for Insulating Concrete.
 - i. ASTM C495 Standard Test Method for Compressive Strength of Lightweight Insulating Concrete.
4. American Welding Society (AWS)
 - a. AWS D1.1 Code for Structural Welding – Steel.
 - b. AWS D10.12M/D10.12 Guide for Welding Mild Steel Pipe.
5. ASME International (ASME)
 - a. ASME B31.9 Specification for Building Services Piping.
6. Code of Maryland Regulations (COMAR)
 - a. COMAR 26:10 Oil Pollution and Tank Monitoring.
 - b. COMAR 26:11 Air Management.
7. Maryland Department of Transportation State Highway Administration (MDSHA)
 - a. Standard Specifications for Construction and Materials, issued January 2001 (the “Blue Book”), with latest revisions apply to work included in this Section.
8. Manufacturers Standardization Society (MSS)
 - a. MSS SP-69-2003 Pipe Hangers and Supports - Selection and Application.
9. National Fire Protection Association (NFPA)
 - a. NFPA 30 Flammable and Combustible Liquids Code.
 - b. NFPA 30A Motor Fuel Dispensing and Repair Garages.
 - c. NFPA 31 Standard for the Installation of Oil-Burning Equipment.
 - d. NFPA 70 National Electrical Code.
 - e. NFPA 704 Standard System for the Identification of Hazards of Materials for Emergency Response.
 - f. NFPA 780 Standard for the Installation of Lightning Protection Systems.

10. National Institute of Standards and Technology.
 - a. Handbook 44-2007 Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices.
11. OSHA: Occupation Safety and Health Act. 29 CFR 1956.
12. Petroleum Equipment Institute (PEI)
 - a. PEI/RP200-03 Recommended Practice for Installation of Aboveground Storage Systems for Motor Vehicle Fueling.
 - b. PEI/RP100-2000 Recommended Practice for Installation of Underground Liquid Storage Systems.
13. UFC: Uniform Fire Code, 2000 Edition.
14. Underwriters Laboratories, Inc. (UL)
 - a. UL-79 Power Operated Pumps for Petroleum Dispensing Products.
 - b. UL-87 Standard for Power-Operated Dispensing Devices for Petroleum Products.
 - c. UL-142 Steel Aboveground Tanks for Flammable and Combustible Liquids.
 - d. UL 353 Limit Controls.
 - e. UL-467 Grounding and Bonding Equipment.
 - f. UL-536 Standard for Flexible Metallic Hose.
 - g. UL-842 Valves for Flammable Fluids.
 - h. UL-568C Power Conversion Equipment.
 - i. UL-971 Nonmetallic Underground Piping for Flammable Liquids.
 - j. UL-2085 Protected Aboveground Tanks for Flammable and Combustible Liquids, Protected Type.
 - k. UL-2244 Aboveground Flammable Liquid Tank Systems.
15. Applicable federal, state, and local codes and regulations.

C. QUALITY ASSURANCE

1. Work shall conform to federal, state, and local governing rules and regulations and ordinances, including OSHA and NFPA requirements, and shall pass inspection by the authorities having jurisdiction.
2. Work shall conform to current versions of locally adopted codes.
3. System Responsibility: Vested responsibility for designing, coordinating, and furnishing the system specified herein, and for initial operation is that of the tank manufacturer or of it qualified, factory authorized representative, herein referred to as the tank supplier.

D. SUBMITTALS

1. Submit shop drawings, catalog cuts, and manufacturer's data covering all equipment covered in this section. Submit the following for review and approval:
 - a. Shop drawings.
 - b. Product data: For each type of product indicated, include construction details, material descriptions, and dimensions of individual components and profiles. The intended use of each component that is listed should be included in the description portion of the submission. Also include, where applicable, rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
 - 1) Piping specialties: Include items such as bulkhead fittings, hose adaptors, swivel pipe adaptors, fill caps adaptor, drop tubes, tank vents, tank bottom protectors, etc.
 - 2) Valves: Include pressure rating, capacity, and electrical connection of selected model where applicable.
 - c. Design calculations.
 - d. Installation instructions.
 - e. Operations and maintenance manuals.
 - f. Training program.
2. Submit pumping equipment manufacturer's certification that the equipment supplied meets or exceeds the requirements of the Contract Documents.

E. JOB CONDITIONS

1. The Contractor's equipment and proposed materials shall be at least of the same level of quality as that indicated and specified.
2. Work includes furnishing and installing of ASTs, submersible turbine pumps, suction piping, sumps, dispensers, liquid sensors, level probes, interstitial sensors, shut-off valves, check valves, separator-lubricator assemblies, distribution piping and fittings, fuel hose reel assemblies including support framing, control handles, meters, pump systems, and all other work and material to provide an approved working installation as specified and as shown in the Contract Documents.
3. The various component parts shall function together as a workable fuel dispensing system, complete with everything necessary for its operation and with all equipment properly adjusted and in working order. Unless otherwise specified, any materials described, shown, reasonably implied, or obviously a part of the system and necessary to its complete finish and perfect operation shall be furnished and installed, without extra charge. The Contract Drawings and the Contract Specifications are intended to supplement each other, and any item set forth in either shall be recognized as the same as if fully set forth in both.

4. The Contractor shall be responsible for establishing all pipe sizes and materials, component locations, type and quantities, mounting requirements and hardware, equipment selection, and all other design parameters necessary to provide a complete operable fuel dispensing system as described in the Contract Documents.
5. Site Information: Subsurface conditions were investigated during the design of the project. Reports of these investigations are available for informational purposes only; data in reports are not intended as representations or warranties of accuracy continuity of conditions (between soil borings). The Authority assumes no responsibility of interpretations or conclusions drawn from this information.

F. DELIVERY, STORAGE AND HANDLING

1. Delivery, storage and handling of all fuel dispensing system components shall be in accordance with manufacturer's written instructions.

G. WARRANTY

1. The Contractor shall guarantee its work, material, and equipment and the other Contract performances, and shall remedy, without cost to the Authority, any defects which may develop therein during a period of one year from the date of the Authority's acceptance of the project. The Contractor shall, at its expense, repair or replace any component or equipment that has malfunctioned or has become defective as a result of improper installation. The Contractor's corrective actions shall ensure continuance of the manufacturer's warranty to include recertifying to the manufacturer's requirements.
2. Provide tank manufacturer's 20-year warranty.
3. Provide dispenser manufacturer's 2-year warranty.

PART 2 - MATERIALS

A. ABOVEGROUND STORAGE TANKS

1. Provide one (1) 8,000 gallon concrete encased AST, one (1) 1,000 gallon concrete encased AST, and one (1) 4,000 gallon concrete encased AST as indicated on the Contract Drawings and specified herein.
2. *Primary Tank:* The primary tank shall be rectangular in shape, constructed with a minimum of 10 gage thick carbon steel, listed in accordance with UL-2085. The 2-hour fire rating shall exceed all requirements of NFPA 30 and 30A for "fire resistant" tanks and meet the requirements of UFC Article 79-7, Appendix A-II-F for "protected" above-ground tanks.

3. *Concrete Encasement:* The concrete encasement shall be 6" thick with a minimum design strength of 4000 psi. Concrete enclosure shall encase and protect both the primary steel tank and the secondary containment. The concrete design shall include the following for long-term durability: less than 3% air entrainment, water-reducing admixture, and steel reinforcing bars. Concrete placement shall be monolithic (without seams) and placement methods shall ensure the absence of voids on all sides and beneath the steel tank. An exterior steel jacket covering the concrete vault will NOT be permitted. The steel tank shall be prestressed at factory by pressurizing the primary steel tank to 5 psi during concrete encasement to allow for expansion and contraction of the primary steel tank. Vault enclosure shall have concrete support legs of unitized monolithic construction raising the concrete enclosure a minimum of 3" above the ground to meet visual inspection requirements. A mid-level seam or other joint construction which could compromise the liquid tightness (secondary containment) and fire protection capability of the vault is not permitted.
4. *Fire Resistance:* The tank system shall be designed and tested to provide 2 hour fire protection for the primary tank as per U.L. 2085 2-hour furnace fire test and 2 hour simulated pool fire test. No steel members shall penetrate the walls or floor of the concrete encasement to assure isolation from pool fire heat.
5. *Thermal and Corrosion Protection:* The tank construction shall include thermal insulation equivalent to .25 inches of polystyrene to protect against temperature extremes, and to protect against corrosion by isolating the steel tank from the concrete or other corrosive material. All steel exterior to the concrete encasement shall be anti-oxidant powder coated to inhibit corrosion and meet A.S.T.M. B117.
6. *Secondary Containment with Leak Monitoring:* The tank system shall include an impervious barrier of 30 mil high-density polyethylene to contain leaks from the primary tank. A monitoring tube shall be located between the inner tank and secondary barrier.
7. *Spill/Overfill Containment:* The tank system shall include a U.L. listed 7-gallon spill/overfill container manufactured as an integral part of the primary tank, surrounding the fill pipe, and protected by 2 hour fire rating of the enclosure. The spill/overfill container shall include a stick port and normally closed valve to release spilled product into the main tank. Exterior steel shall be anti-oxidant powder coated to inhibit rust.
8. *Overfill Protection:* Overfill protection shall be provided by the following methods: a) direct reading level gauge visible from fill pipe access; b) valve rated for pressurized delivery located within fill pipe to close automatically at 95% full level; c) high level alarm.
9. *Exterior Finish:* The tank system shall be a low maintenance exposed aggregate or architectural (STO, Permacrete, Thorocoat) exterior concrete finish. Fiber clad steel, or painted steel vault tanks are not acceptable.

10. *Signage*: Tanks shall be marked on all sides as per state and local codes. Signs will be recessed in concrete exterior to insure against damage during off-loading, refilling or general functions.
11. *Venting*: Tank system shall include a 2" atmospheric vent and emergency venting in accordance with N.F.P.A. 30.
12. The fueling system shall be designed to meet or exceed the minimum requirements of NFPA Sections 30 and 30A, the UFC, and the NEC.
13. Tank dimensions:
 - a. 8,000 Gallon Tank Design Criteria:
 - i. Tank storage volume: 8,000 gallons
 - ii. Maximum tank dimensions: 8'-0-1/2" wide by 8'-9-3/4" high by 23'-1-1/2" long.
 - iii. Approximate weight of empty tank: 72,000 pounds.
 - iv. The tank shall be split internally to provide storage for 2,000 gallons of diesel fuel and 6,000 gallons of unleaded gasoline. An air gap shall separate the two storage compartments.
 - v. Tank shall include 4 dispensers and 4 card readers (2 for diesel and 2 for gasoline) mounted where shown on the plans.
 - b. 1,000 Gallon Tank Design Criteria:
 - i. Tank storage volume: 1,000 gallons
 - ii. Maximum tank dimensions: 5'-0-1/2" wide by 4'-4" high by 11'-0" long.
 - iii. Approximate weight of empty tank: 18,000 pounds.
 - iv. Tank shall be designed to store 1,000 gallons of E-85 ethanol/gas fuel.
 - v. Tank shall include 1 dispenser and one card reader.
 - c. 4,000 Gallon Tank Design Criteria:
 - i. Total tank storage volume: 4,000 gallons.
 - ii. Maximum tank dimensions: 8'-0-1/2" wide by 8'-9-3/4" high by 17'-7-1/2" long.
 - iii. Tank's approximate weight: 48,000 pounds.
 - iv. Tank shall be designed to store 4,000 gallons of heating oil.

B. SUBMERSIBLE TURBINE FUEL PUMPS

1. *Pumps*:

- a. Description: Provide a total of four (4) UL-listed $\frac{3}{4}$ hp submersible turbine pumps for the gasoline and diesel tank (one pump for each dispenser) and a single UL-listed $\frac{1}{3}$ hp submersible turbine pump for the E-85 tank.
- b. The entire pumping assemblies shall have UL listing and shall meet all requirements of UL-79. The entire pumping assembly for the E-85 fuel shall have UL listing for use with E-85 fuel.
- c. Pumps shall be multi-stage, self-lubricating, and easily removed from tank without disconnecting discharge piping, mechanical or electronic leak detectors, or siphon systems. The pump and motor assembly shall be readily separable from the pump column pipe to allow for simple field replacement of the pump and motor.
- d. Impellers shall be splined to the pump shaft to provide positive, non-slip rotation. Diffusers shall be tightly secured to prevent rotation.
- e. The motor assembly height shall be field adjustable utilizing a UL-listed telescoping shaft and set to a minimum of five (5) inches from the bottom of the tank.
- f. Manifold head assembly shall consist of a manifold and extractable packer assembly and shall be completely sealed against product leakage into the ground and exterior water leakage into the storage tank. The discharge outlet shall be a standard 2-inch NPT opening. The manifold shall have a built-in air purge screw, line check valve, and pressure relief valve, and shall support dual vacuum sensor siphon systems.
- g. The contractor's box shall be built into the manifold head assembly and be completely isolated from the fuel path. The extractable packer assembly shall incorporate a lifting eye for safe extraction of the pump motor.
- h. The electrical disconnect shall be an integral part of the manifold assembly. The electrical disconnect shall automatically disconnect and sever electrical connection to the pump motor, without a swing joint, when the extractable packer assembly is removed.
- i. The pumps shall include an integral check valve and line leak detector to hold operating pressure at 30 psi to minimize loss of pressure due to thermal contraction. The line leak detector shall restrict fuel flow if line pressure is lost or line product loss exceeds 3.0 gph. The check valve shall incorporate a feature that mechanically locks the check valve and lifts to provide a larger path to depressurize the line and manifold head assembly, returning fuel to the tank to prevent service spills. The check valve shall provide pressure relief of the product line. The check valve seat shall be constructed of bronze. Contractor shall provide a 3-second on-delay relay for each dispenser solenoid valve to minimize line leak checking intervals.
- j. The vacuum sensor siphon system shall be capable of drawing 25 inches of mercury vacuum through a venturi. The vacuum sensor siphon shall incorporate a one-piece rubber check valve to maintain the siphon system vacuum after the pump has been turned off. Check valves shall be incorporated on the siphon inlet and fuel source inlet to the venturi. The inlet shall incorporate a screen that reduces clogs and failures that can cause false alarms on vacuum monitor systems. The vacuum sensor siphon system shall incorporate a swivel top for easy connection to siphon tubing.

- k. The pump discharge head and manifold assembly shall be manufactured from ASTM A48 Class 30 gray cast iron.
 - l. The pumping unit shall not incorporate any flexible diaphragms and all sealing shall be accomplished with rings constructed of fluorocarbon or UL-recognized fiber gaskets.
 - m. The pump motors shall be 208/230-volt, 60-Hertz, single-phase, 3,450 RPM, permanent split capacitor type continuous duty, rated explosion proof in a Class I, Group D environment as defined in NFPA 70. The motor windings shall be hermetically sealed against leakage of product or moisture, and shall have a thermal overload device with automatic reset built into the motor windings for motor cut-off when motor temperature reaches a level which may cause damage to the motor.
 - n. The motor shall have a quick-disconnect type male/female connector to be readily separable for servicing without cutting or splicing of conducting wires. Wiring connections to the motor shall be disconnected by the quick-disconnect. Reconnecting motor to column pipe shall use an alignment dowel pin for positive realignment of electrical male/female connector.
 - o. The pump motor assembly shall be clearly marked with pertinent information including horsepower, voltage, phase, and manufacturer.
 - p. The pump motor shell and rotor shaft shall be constructed of stainless steel Type 304 (outer) and Type 301 (stator), and motor bearings shall be constructed of carbon.
 - q. All components shall be designed and assembled to facilitate disassembly and servicing from above without disrupting the discharge piping, leak detection equipment and vacuum sensor siphon systems.
 - r. All piping and valves shall comply with NFPA 30 and 30A.
2. *Design Criteria:*
- a. Capacity: $\frac{3}{4}$ hp 65 gpm at 28psi and $\frac{1}{3}$ hp 40 gpm at 31 psi
3. *Controls:* Provide a pump control box for each submersible pump. The pump control box (Red Jacket Model 880-041-9) shall provide inductive motor switching as well as pump permissive for the dispenser, CFN PCU, and the ATG. Pump control panel shall comply with UL-353 and UL-508C.
4. *Acceptable manufacturers:*
- a. E-85 Fuel: Franklin Fueling Systems, Red Jacket Pumps Division of Veeder-Root Company;
 - b. Unleaded and Diesel Fuel: Franklin Fueling Systems, Red Jacket Pumps Division of Veeder-Root Company.
 - c. Or approved equal.

C. DISPENSERS



Provide five (5) UL-listed dispensers to deliver E-85 fuel, unleaded gasoline, and diesel fuel with the following features and capabilities:

1. *Manufacturer:* Pump dispensers shall be the Reliance S1 by Dresser-Wayne or equal.
2. *Compatibility:* For dispensing low viscosity petroleum fuels - diesel, including biodiesel blends up to 20%; E85, and gasoline, including standard oxygenated blends.
3. *Performance:* Up to 22 GPM.
4. *Register:* Non-computer mechanical register with power reset with interlock. Up to 999.9 gallons per delivery. Non-resettable accumulative totalizer up to 9999999.9.
5. *Meter:* Micro-accurate 2-piston positive displacement design. Weights & Measures sealable.
6. *Solenoid Valve:* 1" two-stage valve.
7. *Electrical:* 115VAC, 60 Hz.
8. *Inlet Connection:* 1½" NPT. Bottom access hole sized for 1½" emergency valve installation.
9. *Discharge:* 1" with ¾" reducing bushing.
10. *Mounting:* Tank or shelf-mount.
11. *Cabinet Construction:* All panels shall be fabricated from galvanized steel for corrosion resistance. Front door shall be lockable and removable for service. Sides and top shall be removable for additional service access.
12. *Cabinet Finish:* Durable all weather powder-coated finish.
13. *Nozzle Boot and Hook:* Fits standard U.L. interchangeable nozzles and Dresser Wayne short spout vapor recovery nozzles. Lift-to-start nozzle hook. Fleet Fueling Group
14. *Hose Hanger:* Keeps hose off ground when not in use.
15. *Actual Dimensions:* Approximately 16"W x 14"D x 29"H
16. *Pressure:* Working pressure up to 50 psi.

17. *Pulsers*: Convert register revolutions to electrical pulses for connection to fuel management systems. 10:1 and 100:1 ratio options.
18. *Hose Mast Kit*: Compatible with equipment selected.
19. *External Filter*: Installed on discharge.
20. *Signage*: Each dispenser shall be clearly labeled: Unleaded Gasoline, Diesel, or E-85.

D. FUEL DISPENSING PIPING AND FITTINGS

1. Provide fuel piping as shown on the Contract Drawings and as specified in this Section.
2. All aboveground piping shall be black carbon steel schedule 40 in accordance ASTM A53, Type S, Class B, in the nominal size indicated in the Contract Documents. Hangers, supports and accessories used shall be applied in accordance with the manufacturer's recommendation for type of service and application and in accordance with MSS SP-69-2003. All hangers, supports, and accessories shall be hot-dip galvanized.
3. Plastic to Steel Pipe Transition Fittings: Factory-fabricated fittings with plastic end matching or compatible with carrier piping, and steel pipe end complying with ASTM A53, black steel, Schedule 40, Type E or S, Grade B.
4. Flexible entry termination boots shall be provided where ducting terminates at secondary containments and sumps. All termination boots shall be air testable to confirm leak tight integrity over the life of this component.
 - a. Acceptable manufacturers:
 - 1) APT Division of Franklin Fueling Systems;
 - 2) Or approved equal.
5. Clamshell Secondary Test Boots shall be provided wherever non-ferrous piping penetrates a sump or other secondary containment to permit testing of the interstitial space between the primary and secondary layers of the double-walled pipe.
 - a. Acceptable manufacturers:
 - 1) APT Division of Franklin Fueling Systems;
 - 2) Or approved equal.
6. Joining Materials:
 - a. Joint compound and Teflon tape suitable for fuel.

- b. Acceptable manufacturers:
 - 1) Loctite 567 manufactured by Henkel Technologies;
 - 2) Or approved equal.

E. PIPE SUPPORTS

- 1. Hangers, supports and accessories used shall be provided in accordance with the manufacturer's recommendation for type of service and application. All hangers, supports, and accessories shall be hot-dip galvanized.

F. EMERGENCY SPILL KIT

The Contractor shall provide one emergency spill kit as specified in this Section.

1. *Contents:*

- 50 - Absorbent Pads
- 12 - Absorbent Socks (3"x48")
- 2 - Absorbent Pillows
- 1 - Pair Goggles
- 1 - Pair Nitrile Gloves
- 3 - Disposal bags

2. *Container:*

- Drum size - 21.125"x28.5" 30 gallon Yellow polyethylene container with screw-on lid with gasket, weatherproof, UV inhibitors and is chemical resistant to most materials.
- Absorbs 25 Gallons

3. *Manufacturer/ Supplier:*

AbsorbentsOnline.com
PCI Products Company
4195 Chino Hills Pkwy., #360
Chino Hills, CA 91709

G. AUTOMATIC TANK GAUGING AND LEAK DETECTION SYSTEM

- 1. *Manufacturer:* OMNTEC Manufacturing, Inc., 1993 Pond Road, Ronkonkoma, NY 11779.
- 2. Model OEL8000II.
- 3. *Function:* Monitors product levels, water levels, temperatures, and leaks for up to 8 tanks.

4. *Features:* 4 RS-232 ports, 1 RS-485 port, FAX/modem compatible, 4-line by 40 character backlit LCD display, accepts up to 6 interface boards, battery backup, CITLD upgradeable, UL-listed.
5. *Specifications:* 36-character thermal printer, 100-240 VAC, 50/60 Hz, 50 watts. 14,400 baud modem, audible alarm, 20 key oil resistant tactile key pad, 3 LEDS (OK, Fault, alarm), shielded BX series 22 AWG sensor cable with drain wire, MTG probes, OMNTEC EC-2 shielded Belden #8791 low inductance (< 0.2 microhenries per foot).
6. *Sensors:* OMNTEC, Bright Eye (BX-Series), 4 wire buss, network compatible.

H. FUEL MANAGEMENT SYSTEM

- A. *Description:* The purpose of the system is to control and provide accurate accounting of all fuel and related products being dispensed. The system, in recording each transaction shall identify the driver, the vehicle, the day and time of the transaction, and the type and amount of fuel dispensed. Access to products shall be restricted to persons holding valid cards and who perform a predetermined series of data entry operations. The system provided shall be compatible with existing Authority fuel management system currently in use at other sites and shall be capable of processing dual hose use simultaneously from the same dispenser.
- B. *System Equipment:* The system shall be comprised of the following components:
 1. *The Card Reader:* The card reader shall be the only piece of equipment in the system to which users shall have access. It shall provide clear and concise prompting to the user.
 2. *The Micro-Computer:* The major control component for the system shall be a microprocessor based unit to be designed and constructed with state-of-the-art technology.
 3. *The Control Cabinet:* The control cabinet shall be keyed accessed and located adjacent to the micro-computer cabinet. This cabinet shall house the relays through which electrical power to the pumping devices is controlled.
 4. *Data Terminal:*
 - a. The data terminal shall be the device through which on-site communication with and control of the system shall be effected.
 - b. The data terminal shall be located inside the building and will allow authorized personnel to activate the terminal through the use of a security key.
 5. *Printer:* The printer shall be located adjacent to the data terminal which:

- a. Shall operate as an on-line device to record transaction data in real time as each fuel transaction is completed.
 - b. Shall operate in conjunction with the data terminal as a self-prompting device for on-site data entry and display.
6. Transaction Recorder: A transaction recording device shall be located adjacent to the data terminal and printer which:
- a. Shall record all transaction data in non-volatile solid state memory such that in the event of power failure no data will be lost.
 - b. Shall indicate through a series of LED displays its status and operation mode for diagnostic purposes.

PART 3 - EXECUTION

A. INSTALLATION

1. Manufacturer will have a minimum of 5 years experience in producing specified tank for commercial use and document at least 10 installations in satisfactory operation.
2. The tank system including accessories shall be installed in strict accordance with the manufacturer's recommendations and applicable fire and environmental codes. All state and local permits shall be obtained by contractor prior to installation.
3. Tanks shall be installed on a reinforced concrete base slab designed to support the fully loaded tank. Protective bollards shall be installed where required by state and local codes.
4. Tanks shall be marked on all sides with warning signs: "FLAMMABLE" or "COMBUSTIBLE", "NO SMOKING", product identification, a NFPA rating label, and other signs as required by applicable codes.
5. Electrical work shall be in accordance with applicable codes and shall be rated for hazardous area as required. Electric feed for dispensing pumps shall include an emergency shutoff switch located per code requirements. Tanks shall be electrically grounded in accordance with N.F.P.A. 78.
6. The system installation shall be inspected and approved by the system supplier or its certified contractor. The system supplier shall submit a comprehensive checklist of quality

and safety items critical to the system and verify that the installation has been in accordance with these standards and applicable fire and environmental codes.

7. Any proposed equal alternatives to this specification must be submitted for review and approval prior to bid opening. If the proposed alternative is deemed to present a better solution, review expenses will be waived. If the proposed alternative is denied or deemed to be equal, all expenses incurred for such review is to be paid for by the bidder prior to submittal of bid.

B. EQUIPMENT TEST AND CHECK-OUT

1. The equipment shall be tested in the presence of the Authority's Representative to his/her satisfaction and demonstrated to be correctly connected and installed. Submit a testing schedule to the Authority for approval prior to the start of the equipment test and check-out.
2. Testing and check-out procedures of the manufacturer shall be carried out completely.
3. Equipment tests shall not only be performed to demonstrate that the equipment has been properly installed and connected and operates properly, but also to demonstrate that the equipment performs the work for which it is intended.
4. Tested equipment found to be defective or inoperable to any extent shall be reported to the Authority immediately.
5. Any operating difficulty or defective item shall be repaired or replaced and put into proper operation by the Contractor immediately, at no additional expense to the Authority.
6. Contractor shall protect equipment and surrounding areas from damage resulting from testing operations, and shall clean-up any spills or leakage resulting from testing.
7. Contractor shall bear all expenses of all tests, including the furnishing of all necessary instruments, lubricants, hydraulic fluid, supplies, data recorders, and operation personnel. Provide and bear all expenses for fuel/power required to operate the equipment during the tests.
8. Perform testing of the equipment and system in accordance with the requirements specified in Contract Documents. Perform and document all testing procedures recommended by the manufacturer. Include the following tests:
 - a. Test system performance by measuring quantity of product dispensed over time at each designated "TEST" fluid and semi-solid control handle. Minimum measured output over time shall meet or exceed the "Minimum Delivery Rate" for the corresponding fluid as specified. Tests shall be performed three (3) times within a span of five (5) minutes at each control handle.

- b. Test meter at each metering control handle by measuring volume of product dispensed. Measured volume of product dispensed shall correspond with volume of product indicated on metering control handle within +/-0.65 percent of full dial range.
 - c. Test each hose reel for proper extension and retraction.
9. At the sole discretion of the Engineer, the Contractor may be required to repeat any tests, at no cost to the Authority.
10. Contractor shall perform the following tests to demonstrate fueling system features and compliance:
- a. Piping Tightness: Air test at 50 psig for one hour, soap all joints;
 - b. Tank Tightness: Per manufacturer's written instruction;
 - c. Dispenser meter calibration shall be per NIST Handbook 44;
 - d. Shear Valve: Contractor shall demonstrate no flow when tripped;
 - e. Liquid level gauges: Gauges shall be calibrated per manufacturer's directions and shall be compared with manual gauges;
 - f. Interstitial Sensor: Contractor shall simulate leak and verify alarm response;
 - g. Overfill Prevention Alarm: Contractor shall verify setting at 90 percent of tank capacity;
 - h. Grounding Continuity: From tank ground rod to dispenser nozzle;
 - i. Emergency Stop Switch: Contractor shall activate and verify all circuits are disconnected from the source; and

C. INSPECTION AND TRAINING

1. The system installation shall be inspected and approved by the Engineer. The Engineer shall submit a comprehensive checklist of quality and safety items critical to the system and verify that the installation has been in accordance with these standards and applicable fire and environmental codes.
2. Contractor shall be responsible to repair any quality or safety items, as found by the Engineer, at no cost to the Authority.
3. Contractor shall be responsible to provide as a minimum two (2) 2-hour training sessions of complete system operation and maintenance. The Contractor shall coordinate the session dates with the Authority.

PART 4 - MEASUREMENT AND PAYMENT

A. INSTALLATION OF ABOVEGROUND STORAGE TANKS

1. Installation of 4,000 gallon heating oil AST and modifications to the existing interior piping system in the Administration Building shall not be measured for payment.

2. All work for the installation of 4,000 gallon heating oil AST and modifications to the existing piping system in the Administration building shall be included in the Lump Sum Price for "*4,000 Gallon Aboveground Heating Oil Storage Tank and Appurtenances (Site 2)*" indicated on the Bid Form.
3. Installation of 8,000 gallon (6,000 gal gasoline and 2,000 gallon diesel fuel) AST at the Police facility shall not be measured for payment.
4. All work for the installation of 8,000 gallon AST at the Police facility shall be included in the Lump Sum Price for "*8,000 Gallon Aboveground Fuel Storage Tank With Two Cells, Dispensers, Pumps, and Appurtenances (Site 1)*" indicated on the Bid Form.
5. Installation of 1,000 gallon (E85 Ethanol mix fuel) AST at the Police facility shall not be measured for payment.
6. All work for the installation of 1,000 gallon AST at the Police facility shall be included in the Lump Sum Price for "*1,000 Gallon Aboveground Fuel Storage Tank With Dispensers, Pumps, and Appurtenances (Site 1)*" indicated on the Bid Form.

B. INSTALLATION OF PIPING AND ACCESSORIES

- a. Installation of piping and accessories for the 4,000 gallon heating oil AST at the Administration Building shall not be measured for payment.

All work for the installation of piping both exterior and interior to the Administration Building including wall openings and sleeves, interior supports, reconnections, removal of abandoned pipe, and testing shall be including in the Lump Sum Price for the "*4,000 Gallon Aboveground Heating Oil Storage Tank and Appurtenances (Site 2)*" indicated on the Bid Form.

END OF SECTION

**SECTION 1000
EQUIPMENT**

SECTION 1006 – TESTING AND COMMISSIONING

PART 1 - DESCRIPTION

A. SUMMARY

1. This Section includes acceptance testing, and training requirements for the fuel storage and distribution systems as follows:
 - a. Testing of the following:
 - 1) Leak tightness of all tanks, secondary containments and piping; and
 - 2) Operational functioning of all fuel delivery systems and leak detection monitoring components including the leak detection monitoring and control system.
 - b. Training of Maryland Transportation Authority (Authority) personnel of the operation and maintenance of the system and its separate components.

B. REFERENCES

1. National Fire Protection Association (NFPA):
 - a. NFPA 30 – Flammable and Combustible Liquids Code.
 - b. NFPA 30A – Motor Fuel Dispensing and Repair Garages.
 - c. NFPA 70 – National Electrical Code.

PART 2 - MATERIALS

NOT USED

PART 3 - EXECUTION

A. ACCEPTANCE TESTING

1. General
 - a. After all system components and associated piping are installed, notify the Engineer, in writing, that the systems are ready for inspection prior to acceptance testing and certification.
 - b. Provide copies of the completed Certificates of Installation to the Engineer for review prior to “walk-through” inspection.
 - c. Participate in a "walk-through" inspection with the Engineer and the Authority. The intent of the "walk-through" is to obtain agreement from all parties that systems are ready for functional testing.

- d. Perform acceptance tests and certification only after successful inspection and functional testing of all systems are completed and necessary corrective action has been taken. Acceptance tests are to be witnessed by the Engineer and the Authority. The Contractor shall provide a minimum of two (2) weeks advance notice of the pending tests to the Engineer and the Authority of required personnel and to prevent any disruptions to any other on-site activities.
- e. Decision by witnessing personnel not to witness field acceptance tests or inspections does not relieve the Contractor from full responsibility for the quality and correctness of the work.
- f. Conduct all acceptance tests and certification in accordance with the referenced NFPA Standards and the manufacturer's instructions, where applicable.
- g. Upon successful completion of tests, furnish a complete record of all tests and results to the Engineer. Complete and provide to the Engineer all forms and reports described in the applicable NFPA standards.
- h. Replace parts that are furnished under this Subcontract and found to be defective and not mechanically abused (as determined by the Engineer) at no cost to the Authority.

B. ADJUSTING AND CLEANING

1. Restore, to its original condition, any completed construction or construction work in progress which is not part of the work of this Contract and which is damaged during installation. All such damaged areas that are repaired are subject to the Engineer's acceptance.

C. COMPONENT AND SYSTEM TESTING

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections, and to assist in testing.
2. Tests and Inspections:
 - a. Perform acceptance tests, certification and approval in accordance with the applicable NFPA standards and the manufacturer's instructions, where applicable.
 - b. Functionally test all valves and manual operating devices.
 - c. Provide protective covers for equipment that could be damaged by water during testing.
 - d. Piping: Minimum hydrostatic or pneumatic test-pressures measured at highest point in system:
 - 1) Above ground steel piping: Minimum 50 psig for a minimum hold period of one (1) hour. Apply soapy water solution to all pipe fittings and equipment connections. Check for leaks as indicated by bubbles. All leakage shall be repaired and the test rerun until no leaks are detected.
 - 2) Diesel, Fuel-Oil, and Gasoline Double-Containment Piping:
 - a) Primary (Carrier) Pipe: per manufacturer's recommendations.

- b) Secondary (Containment) Pipe: per manufacturer's recommendations.
 - 3) Suction piping: per manufacturer's recommendations.
 - 4) Isolate storage tanks if test pressure in piping will cause pressure in storage tanks to exceed 5 psig.
 - e. Inspect and test diesel fuel and gasoline piping according to NFPA 31, "Tests of Piping" Paragraph; and according to requirements of authorities having jurisdiction.
 - f. Tanks:
 - 1) Remove plug from reservoir fitting and inspect for monitoring fluid. The reservoir should be about 1/4 full.
 - 2) Inspect tank outer wall closely for traces of monitoring fluid.
 - 3) Pressurize primary tank to manufacturer's recommended pressure and check for leaks.
 - 4) After releasing pressure from the primary tank, look inside tank to make sure that no monitoring fluid has collected in tank bottom.
 - 5) Follow tank manufacturer's recommendations.
 - g. Spill buckets:
 - 1) Fill spill buckets with water and observe level of water. Containers shall hold water level for one hour without change. Any leaks detected are to be corrected and the test rerun.
 - h. Containment sumps:
 - 1) Fill containment sumps with water and observe level of water. Containers shall hold water level for one hour without change. Any leaks detected are to be corrected and the test rerun.
 - 2) Inspect automatic shut off devices to confirm that these devices are properly installed and are functional. Upon initial filling of all UST, confirm that the automatic shut-off device is functioning as required.
 - i. Automatic leak detection devices:
 - 1) Confirm calibration of pressure transmitter
 - 2) Simulate line leakage to confirm leak detection operation.
 - 3) Hydrostatic leak detection:
 - a) After initial fill of interstitial space between USTs is completed, exercise the level sensor manually to initiate an alarm to confirm that these devices are functional.
 - 4) Secondary containment and sump sensors
 - a) Simulate leakage within the sump area with water (sensor are non-discretionary) to confirm that each sensor is initiating an alarm at the existing Veeder Root control panel.
3. Diesel fuel and gasoline piping and equipment will be considered defective if it does not pass tests and inspections.
4. Prepare test and inspection reports.



D. OPERATION AND MAINTENANCE TRAINING REQUIREMENTS

1. **Training Preparation Conference:** Before operation and maintenance training, the Contractor shall convene a training preparation conference to include the Authority's operation and maintenance personnel, the Contractor, and subcontractors. During this training session shall perform the following:
 - a. Review the Commissioning Requirements and Basis of Design;
 - b. Review installed systems, subsystems, and equipment;
 - c. Review instructor qualifications;
 - d. Review instructional methods and procedures;
 - e. Review training module outlines and contents;
 - f. Review course materials (including operation and maintenance manuals);
 - g. Inspect and discuss locations and other facilities required for instruction; and
 - h. Review and finalize training schedule and verify availability of educational materials, instructors, audiovisual equipment, and facilities needed to avoid delays.
2. **Training Modules:** Develop an instruction program that includes individual training modules for each system, subsystem, and equipment.
3. **Authority Personnel Training:**
 - a. Provide training to designated operations and maintenance personnel utilizing the training material prepared above. Training is to include enough time to review all training modules that have been prepared with all Authority personnel.

PART 4 - MEASUREMENT AND PAYMENT

A. TESTING AND COMMISSIONING

1. The item *Testing and Commissioning* shall not be measured.
2. The item Testing and Commissioning shall be included in the Lump Sum Price for "*Testing and Commissioning*" indicated on the Bid Form.

B. OPERATION AND MAINTENANCE TRAINING

1. The item Operating and Maintenance Training shall not be measured.
2. The item Operating and Maintenance Training shall be included in the Lump Sum Price for "*Operating and Maintenance Training*" indicated on the Bid Form.

END OF SECTION

**SECTION 1000
EQUIPMENT**

SECTION 1010 – CHAIN LINK SLIDE GATE

PART 1- GENERAL

A. SECTION INCLUDES

1. Internal roller aluminum cantilever slide gates.
2. Sliding gate operators.

B. RELATED SECTIONS

1. General Electrical: Section 820 SHA Spec, July 2008.
2. Access Control System: Section1012

C. SUBMITTALS

1. Changes in specifications may not be made after the published date of bid. All submittals of substitutions must be approved before bid date.
2. Shop drawings of fences and gates with all dimensions, details, and finishes. Drawings must include post foundations.
3. Gate Product data: Manufacturer's catalog cuts indicating materials and that all conditions of the specifications have been met.
4. Operator Product data:
 - a. Manufacturers.
 - b. Components, materials, colors, attachments, and fittings.
 - c. UL325, I, II, III & IV Listings.



Maryland
Transportation
Authority

D. WARRANTY

SPECIAL PROVISIONS

CONTRACT NO. BB 2042-000-002

Page 2 of 6

1. Manufacturer shall provide a limited warranty against failure for the gate, rollers and other parts for a period of 7 years. Failure being any manufacturing defect that prohibits normal operation.

E. QUALITY ASSURANCE

1. Printed instructions, installation procedures and details of equipment manufacturers and suppliers.
2. Upon completion of installation, check equipment and components to ensure proper and safe function; correct any defects or deficiencies.

PART 2 - PRODUCTS

A. MANUFACTURER

1. Products from other qualified manufacturers who have five years or more experience manufacturing internal roller aluminum cantilever slide gates will be considered by the engineer as equal if approved in writing 10 days prior to bidding, and they meet all specifications for design, size, gauge of metal parts and fabrication.
2. Chain link fences, gates, and operators must be obtained from a single source.
3. Approved Manufacturer:
 - a. Merchants Metals
Phone: (866) 888-5611 Fax: (281) 372-3801
Specification Department
Phone: (888) 260-1600 Fax: (888) 261-3600
tech-info@merchantsmetals.com
 - b. or approved equal product by other manufacturers.

B. INTERNAL ROLLER ALUMINUM CANTILEVER SLIDE GATE

1. Gate Frame: Made in accordance with ASTM F 1184 Type II Class 2. Gate to be made of Aluminum Alloy 6063-T6. All square members are 2" sq. weighing 0.94 lb/ft. Complete frame welded to top one piece track and top frame member. Supply 2 truck assemblies that are swivel type having lubricated and scaled ball bearing wheels

that will align in the track during all normal operations of the gate. An additional 2" sq. horizontal rail welded adjacent to the top member of the gate and a 2" x 4" bottom rail weighing 1.71 lbs/ft.

| Standard Opening | | Standard Support Overhang |
|------------------|--------------------------|---------------------------|
| 10'0" (3048 mm) | | 6'6" (1981 mm) |
| 11'0" (3354 mm) | through 14'0" (4267mm) | 7'6" (2286 mm) |
| 15'0" (4572 mm) | through 22'0" (6706 mm) | 10'0" (3048 mm) |
| 23'0" (7010 mm) | through 30'0" (9144 mm) | 12'0" (3657 mm) |
| 31'0" (9449 mm) | through 40'0" (12192 mm) | 16'0" (4876 mm) |

2. Gates 31'0" (9449 mm) to 40'0" (12192 mm) dual top tracks welded together to form a single top member. The bottom rail 2" x 4" weighing 1.71 lb/ft (2.54 kg/m). Top tracks require two additional truck assemblies. For gates over 40'0" (12192 mm), contact the manufacturer for custom drawings and specs.
3. Gate Finish (Frame)
 - a. Choose one: Natural Aluminum
 - b. Or Polymer Coated in color to match fence
4. Chain Link Filler
 - a. Choose one: Galvanized After Weaving
 - b. or Aluminized
 - c. or Thermally Fused & Bonded PVC
 - d. Available colors — dark green, olive green, brown or black.
 - e. Chain link fabric filler installed using hook bolts that are inserted through pre-drilled holes in the frame. To these hook bolts the fabric will be attached by means of a tension bar which is laced through the last link of the fabric. The hook bolts are 15" (381mm) on center and all four sides of the gate. (No substitution) This assures a drum like tightness to the fabric. This fabric to give additional support to the gate.
5. Diagonal adjustable 1/4" (6 mm) stainless steel truss cables (2) provided inside each panel of the gate. (One each direction).
6. "Secure Trac" is an enclosed combination track and top rail aluminum extrusion weighing 4.66 lb/ft (6.94 kg/m). It will withstand a 2,000 lb (907.2 kg) reaction load.

7. Truck assembly: Swivel type, zinc die cast, with 4 sealed lubricant ball bearing wheels 2" (50 mm) in diameter. The load bearing wheels have an extruded dynamic load rating of 4,500 pounds each and 2 side rolling wheels to ensure truck alignment in track. (No substitution) Truck assemblies are held to post brackets using 5/8" (16 mm) diameter stainless steel bolts which have a load rating of 11,000 pounds. Truck assembly to withstand 2,000 lb (907.2 kg) reaction load.
8. Gate post brackets, latch and keepers are galvanized steel.
9. Gate posts are 4" O.D. (101.6 mm) schedule 40 weighing 9.11 lb/ft (13.6 kg/m).
 - a. Single gates with single tracks require 3 gate posts. (1 latch post and 2 support posts)
 - b. Single gates with dual tracks require 5 gate posts. (1 latch and 2 dual support posts)
 - c. Double gates require twice the number of support posts but do not have a latch post.

C. OPERATORS

1. Electric gate operation:
 - a. Gate to be operated by Model - 222 SS 1 HP, Hydraulic operator. All components of the manual override shall be securely enclosed and locked in a 10 gauge steel enclosure.
 - a. 115/208/230 volt - Single Phase
 - b. Operator tested to UL 325 standards.
 - c. Limit switches readily adjustable with normal hand tools securely locked in place after adjustment – switch contacts rated 6 amps.
 - d. Hand release for manual operation.
 - e. Gate speed – 1 fps.
 - f. Drive rail 6061-T6 aluminum, 3/16" thick.
2. Controls:
 - a. Full Systems Capability
 - b. External Obstruction Sensing
 - c. Obstruction Sensing Alarm
 - d. Master/Slave Operation (required for double gates)
 - e. Gate Movement Warning
 - f. Long Distance Control Wiring
 - g. Delay on Reverse
 - h. On/Off Switch

- i. Limit Switches- Proximity Limit Switches not affected by ice or snow
 - j. Left Hand/Right Hand Selectable
 - k. Automatic Shut Down
 - l. Timer to Close
 - m. Power Train Disconnect
3. Operators are intended for use in controlling vehicular traffic and are not intended to be used by pedestrians or to control pedestrian traffic. Always install a separate pedestrian man gate if warranted- refer to plans for direction.

PART 3 - EXECUTION

A. POST INSTALLATION

1. Make field measurements and verify locations before installation.
2. Install posts per manufacturer's recommendation.
3. Set posts in concrete. Dig holes having a diameter 4 times the diameter of the post, and 6" (152 mm) deeper than the bottom of the post. Posts set a minimum depth of 36" (914 mm) for all cantilever gates.
4. Check each post for vertical and top alignment.

B. GATE INSTALLATION

1. Install gate. Make sure that gate rolls free of binding.
2. Attach latch and make sure that gate is received by latch in a secure manner.

C. OPERATOR INSTALLATION

1. Install in a workmanlike manner in conformance with manufacturer's printed instructions and details.
2. Anchor or install electric operator on a concrete foundation. Using 1/2x41/2 Hilti Quick bolt concrete stud type anchors.
3. Have at least 2 years previous experience in gate operator installations.

4. Installer must provide service after the sale and be able respond in a reasonable time should trouble occur.
5. Must provide drawings showing layout and typical locations for all equipment that is being supplied.
6. License electrician must perform all electrical connections.

D. CLEANING

1. Clean up debris and remove from the site.

PART 4 - MEASUREMENT AND PAYMENT

A. CHAIN LINK CANTILEVER SLIDE GATES

1. The item chain link cantilever slide gates shall be measured for payment.
2. All work for the chain link cantilever slide gates shall be included in the Lump Sum Price for "*Chain Link Slide Gate*" indicated on the Bid Form. The lump sum price shall include the furnishing and installing of the gates and operators.

END OF SECTION

**CATEGORY 1000
EQUIPMENT****SECTION 1012 — ACCESS CONTROL, INTERCOM AND CCTV SYSTEM**

1012.01 DESCRIPTION. The purpose of this work is to furnish, install, integrate, test, commission, and warrant an Access Control System (ACS), Intercom System, and Closed-Circuit Television (CCTV) System for the chain link cantilever slide gates installed as part of this project. The primary entry control system shall be an AMAG ACS with proximity type card readers. All components of the system shall be compatible with the Authority's existing AMAG ACS.

The Contractor shall provide the following at the West gate entrance:

1. Access control card reader;
2. Intercom with built-in camera and card reader;
3. Field controller for access control and integration with gate controller;
4. Card reader pedestal with gooseneck pole, foundation, and mounting plate;
5. NEMA 4X cabinet;
6. Outdoor PTZ dome camera;
7. Power and communication cables;
8. Conduit, trenching and boring as required;
9. Laptop software, cables, and documentation;
10. One static sign to inform authorized employees of hours of operation.

The Contractor shall provide the following in the WPL Police/Automotive building:

1. Intercom master stations;
2. Intercom central exchange unit;
3. Digital video recorder.

Figure 1 below provides an illustration of the access control system.

It is important to note that the Authority requires the installer to be an AMAG certified installer, distributor, and reseller. The Contractor must provide proof of this certification prior to performing any installation work involving AMAG equipment. **Under no circumstances should the Contractor use a non-certified AMAG installer for the installation of any access control related equipment on this project.**

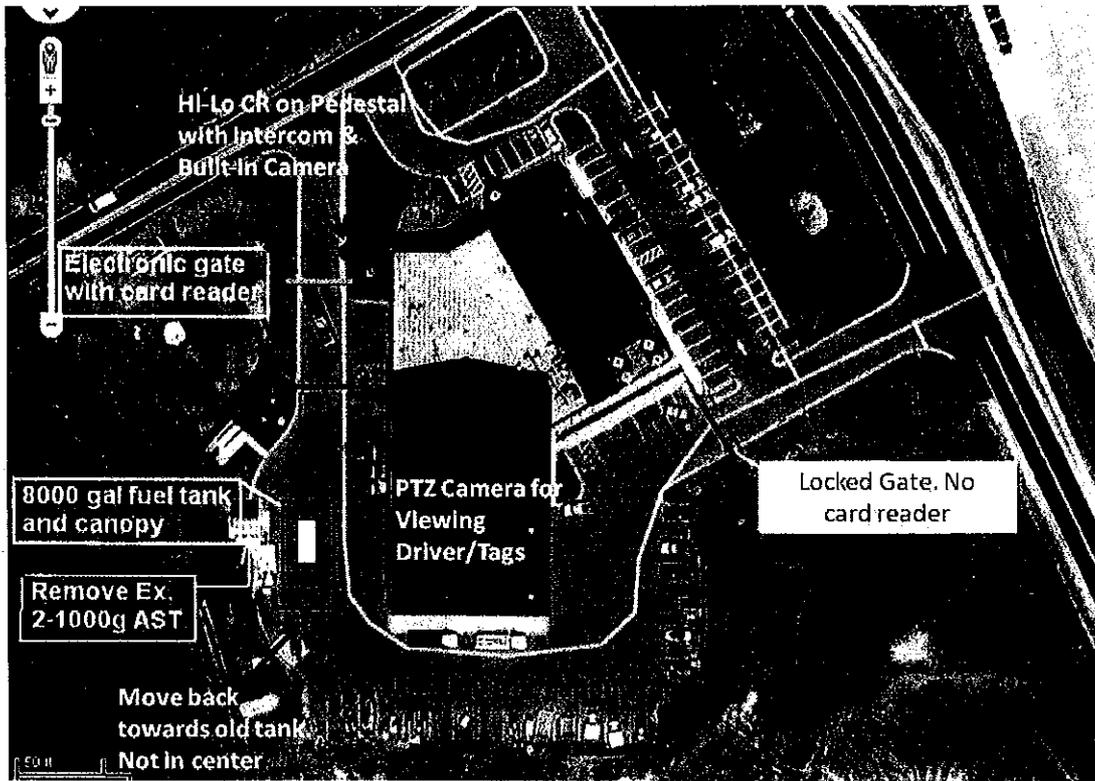


Figure 1: Illustration of the Access Control System

1012.02 MATERIALS.

1012.02.01 Primary Entry Control. This section includes a security access control system which shall be fully compatible with the existing MdTA access control system as manufactured by AMAG Technology. The existing access control system is presently installed at all MdTA buildings. The existing AMAG Central Station Server is located at the Baltimore Harbor Tunnel (BHT) Administration Building.

The new card reader and AMAG controller located at the West gate location shall communicate to the AMAG Central Station Server through network connections. The card reader and AMAG controller shall be compatible with the Authority's existing AMAG access control system. This system uses AMAG Technology's Symmetry Enterprise Security Management System, version 6.1 (or later), AMAG M2100 access control panels, AMAG Client Software entitled AMAG Admin/Comms version 6.1 (or later), Symmetry Edge Network Controllers, AMAG 690 readers, and HID ISOprox 26-bit proximity cards. The existing equipment provides an additional layer of security to the Transportation Authority by utilizing unpublished proprietary protocols. However, the existing equipment supports additional interfaces that allow compatible equipment to be added to further extend the capabilities of the overall security management system. Certain Wiegand interface modules can be added to door/gate controllers to support industry standard Wiegand reader interfaces, and software solutions can interface with the Symmetry database and services through XML integration modules.

1012.02.02 Equipment and Functional Requirements. The Contractor shall provide the following equipment at the West gate entrance where shown on the plans:

1. **Card Reader.** The Contractor shall furnish, install, integrate, test, commission, and warrant one (1) card reader mounted on the high post (for trucks) prior to the west gate. This unit shall meet the following criteria:
 - a. the high card reader shall be installed at a height of 72” from the pavement to allow access from large trucks;
 - b. the card reader shall be installed flush on the mounting plate which is attached to a pedestal gooseneck pole;
 - c. the unit shall be compatible with the MdTA’s existing ACS;
 - d. the card reader color shall be black;
 - e. the unit shall have an LED indicator for card accepted (green) or rejected (red);
 - f. the unit shall have a manufacturer Lifetime warranty;
 - g. the unit shall have read range of 4”;
 - h. the unit shall be rated for outdoor use with minimum operating range of -13°F to +158°F and 0% to 95% relative humidity, non-condensing;
 - i. the Contractor shall install 6 conductor #22 gauge wire from the ACS controller (described below) to each card reader;
 - j. the unit shall be HID ISOprox 26-bit proximity card compatible;
 - k. the proximity card reader shall be AMAG model 690; Refer to Figure 2 below for an illustration of the proximity card and card reader that will be used.



Figure 2: Illustration of Proximity Card and Card Reader (CR shown in white not black)

Refer to Figures 3 and 4 below for an illustration of the card reader location.

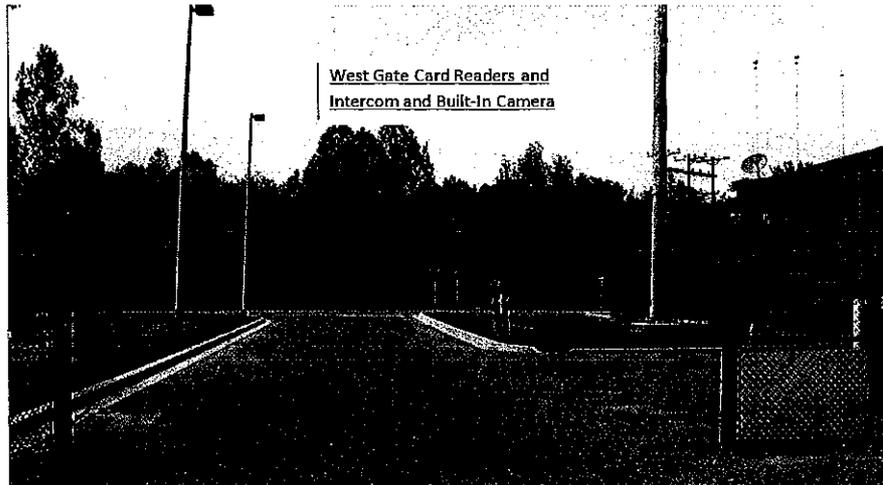


Figure 3: West Gate Card Reader Location (Back View)



Figure 4: West Gate Card Reader Location (Side View)

2. **Intercom, Camera, Card Reader Combo.** The Contractor shall furnish, install, integrate, test, commission, and warrant one (1) intercom, camera and card reader combo unit mounted on the low post (for cars) prior to West gate. Note: this location is commonly referred to as a door station in intercom terminology. This unit shall meet the following criteria:
 - a. this unit shall be installed at a height of 42" from the pavement to allow access from cars and small trucks;



- b. the high card reader (described above) and the low card reader shall be co-located on the same pedestal;
- c. the card reader portion of this combo unit shall be compatible with the MdTA's existing ACS;
- d. the card reader portion of this combo unit shall be HID ISOprox 26-bit proximity card compatible; the unit shall have an embedded HID card reader with a standard Wiegand output to an access control panel;
- e. the card reader portion of this combo unit shall have an LED indicator for card accepted (green) or rejected (red);
- f. the card reader portion of this combo unit shall have read range of 4";
- g. the unit shall have white illumination LEDs to see the driver's face in low light conditions;
- h. the intercom unit shall have a manufacturer 2 year warranty;
- i. the intercom unit shall be rated for outdoor use with minimum operating range of -13°F to +158°F and 0% to 95% relative humidity, non-condensing;
- j. the Contractor shall install 6 conductor #22 gauge wire from the ACS controller (described below) to each card reader;
- k. the intercom unit shall be connected using outdoor rated CAT5E flooded cable to the central exchange unit which is located in the WPL Police/Automotive Building's Electric/Computer Room;
- l. the intercom unit shall be vandal resistant;
- m. the unit shall have an integrated color video CCD camera;
- n. the unit's faceplate shall be stainless steel;
- o. the camera shall be protected with a clear Lexan lens cover;
- p. the intercom unit shall have a speaker and microphone for communication;
- q. the intercom unit shall have an illuminated call directory;
- r. the intercom unit shall support 8 masters, 4 remotes stations;
- s. the intercom unit shall support distances of up to 980 feet per run;
- t. the intercom unit shall support two talk channels;
- u. the intercom unit shall support hands free talk operation;
- v. the intercom unit shall support priority call-in;
- w. the intercom unit shall support communication privacy;
- x. the Contractor shall supply all required power supplies and required wiring for this unit;
- y. the unit shall be an Aiphone model AX-DV-P (or equal) video door station with camera and carder; the Contractor shall select the appropriate surface mount or flush mount option based on mounting plate configuration. Refer to Figure 5 below for an illustration of the unit.

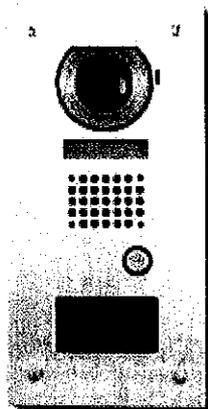


Figure 5: Illustration of Intercom, Camera, Card Reader Combo

3. **ACS Controller.** The Contractor shall furnish, install, integrate, test, commission, and warrant one (1) Symmetry Edge Network Controllers, model AMAG EN-1DBC, at the West gate location. This unit shall meet the following criteria:
 - a. the controller shall support Power-over-Ethernet (PoE);
 - b. the controller shall also provide external power using a 12VDC power supply; This is required to drive the contacts to the gate controller;
 - c. the controller shall be a single door PoE controller, and the Contractor shall provide one network controller per card reader;
 - d. the Contractor shall install these unit in a Hoffman NEMA 4X enclosure (described below) mounted at each card reader/pedestal location;
 - e. the controller shall have memory for up to 5,000 card holders, and 10,500 offline transactions;
 - f. the controller shall support flash memory to enable downloading of firmware;
 - g. the controller shall have a selectable switch for secure Symmetry 20mA or Wiegand reader communications;
 - h. the unit shall have a manufacturer 2 year warranty;
 - i. the unit shall be rated for outdoor use with minimum operating range of 32°F to +122°F and 15% to 90% relative humidity, non-condensing; Note: as specified in the cabinet section the Contractor is to provide a heater and cooling fan in the cabinet;
 - j. the Contractor shall install 6 conductor #22 gauge wire from the ACS controller to each card reader;
 - k. the Contractor shall install outdoor rated CAT5E flooded cable from the ACS controller to the existing Cisco Ethernet Switch in the WPL Police/Automotive Building's Electric/Computer Room; This will enable network connectivity to the existing AMAG Central Station Server at the BHT Administration Building;

- l. the Contractor shall install a 4 conductor #14 gauge wire, flooded and outdoor rated, from the ACS controller to gate controller and connect using dry contacts (8 total, 4 for each reader) to signal the gate controller to open/close;
- m. the Contractor shall ensure the gate controller is able to accept commands from the AMAG EN-1DBC to keep the gates open according to the AMAG central software schedule (e.g., Gates Open from 6AM – 10PM by default);
- n. the Contractor shall provide the required technical support from an AMAG certified installer to ensure the new controllers are integrated properly into the Authority's existing AMAG system; **Under no circumstances should the Contractor use a non-certified AMAG installer for the installation of any access control related equipment on this project.**
- o. the controller reader and gate/door release outputs shall support 700mA combined current at 12Vdc. The Contractor shall ensure ample current to effect the gate opening and closing; Any adjustments required to effect the reliable operation of the gates, through the ACS, will be considered incidental to this project;
- p. the ACS controller shall support the following reader ports:
 - i. Switch selectable 20mA current loop or Wiegand;
 - ii. Door monitor inputs 2/3/4 - state supervision;
 - iii. Exit Request inputs 2/3/4 - state supervision;
 - iv. Door Release relay outputs rated at 28VDC, 3A max;
 - v. Bypass / shunt relay outputs rated at 28VDC, 3A max;
- q. the controller be provided with a sealed lead acid battery for backup power operation.

Refer to Figure 6 below for an illustration of the ACS controller.

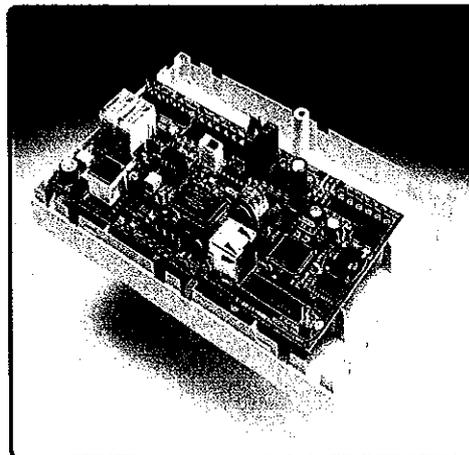


Figure 6: ACS Controller

4. **Pedestal, Foundation, Pole, Mounting Plate.** The Contractor shall furnish, install, integrate, test, commission, and warrant one (1) card reader pedestal at the West gate location. The pedestal shall meet the following criteria:

- a. be supported with a poured concrete foundation sized 36"L x 36"W x 6"D;
- b. the top of the foundation shall be a minimum 4" above grade;
- c. the foundation shall be poured around the card reader gooseneck pole;
- d. the foundation shall be poured with conduit lead-ins for the gooseneck pole and the NEMA 4X cabinet;
- e. the foundation shall be poured with anchor bolts to support the cabinet;
- f. the card reader gooseneck pole shall have mounting plates for the high card reader and low intercom/camera/card reader combo unit. Refer to Figure 7 below which provides a conceptual illustration of the card reader pedestal. Mounting plate dimensions and screw locations to be adjusted to meet materials supplied.

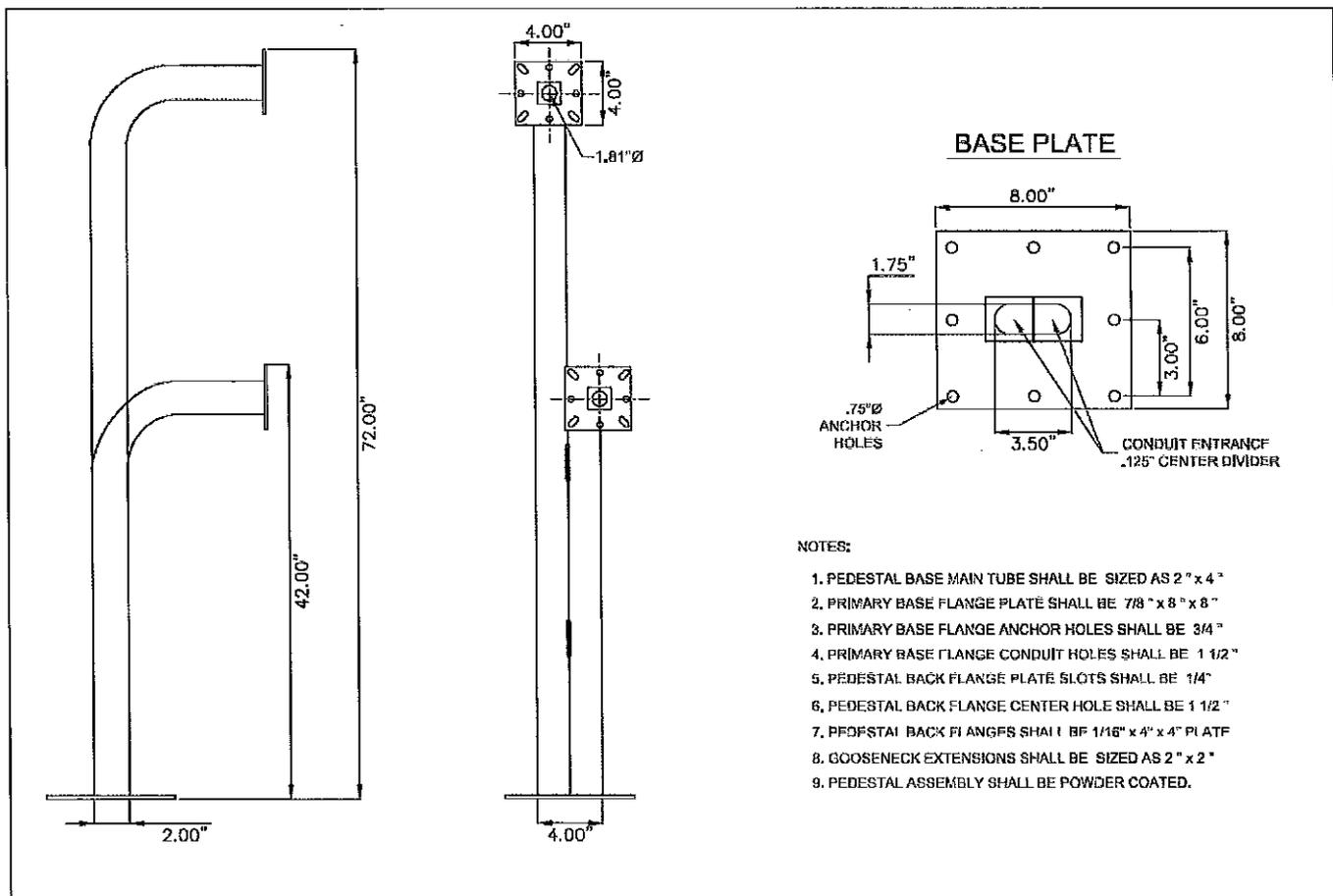


Figure 7: Conceptual Illustration of Card Reader Pedestal

5. **Cabinet.** The Contractor shall furnish, install, integrate, test, commission, and warrant one (1) NEMA 4X stainless steel enclosure at the West gate location which meets the following criteria:
 - a. the enclosure shall include a 60 watt accessory heater;

- b. the enclosure shall include a cooling fan kit;
- c. the Contractor shall install a 120V receptacle in the pedestal cabinet at the West gate location.
- d. the enclosure shall be NEMA 4X certified;
- e. the enclosure shall be sized 24”L x 24”W x 12”D;
- f. the enclosure shall be mounted to the card reader pedestal using anchor bolts and the top portion secured to the pedestal gooseneck pole;
- g. the enclosure shall be mounted such that the bottom of the enclosure shall be ¼” off the concrete foundation (not mounted flush to come in contact with lying water);
- h. the enclosure shall be constructed of 14 gauge Type 304 stainless steel bodies and doors;
- i. the enclosure shall seams be continuously welded and ground smooth, no holes or knockouts;
- j. the enclosure shall include a watertight gasket and dust tight seal;
- k. the enclosure shall include a rolled lip around the three sides (top and 2 sides) of the door and all sides of the enclosure opening to eliminate liquids and contaminants from entering;
- l. the enclosure shall include a bonding provision on the door and grounding stud on body;
- m. all penetrations to the cabinet shall be sealed with putty and steel wool;
- n. the unit shall have a manufacturer 2 year warranty;
- o. the enclosure shall include an internal 3-point latch and Type 316L stainless steel padlocking POWERGLIDE handle;
- p. the Contractor shall provide surge and lightning protection for all equipment in the cabinet;
- q. the NEMA 4X Enclosure shall be manufactured by Hoffman, model number A24H2412SS6LP3PT (or equal). Refer to Figure 8 below for an illustration.

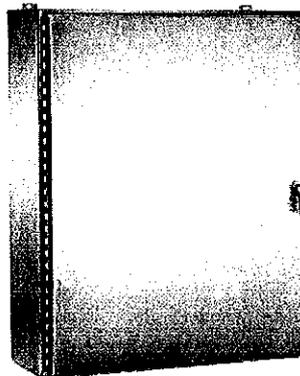


Figure 8: Hoffman Enclosure Illustration

- 6. **PTZ Camera.** The Contractor shall furnish, install, integrate, test, commission, and warrant one (1) outdoor rated pan/tilt/zoom (PTZ) dome camera at the West gate location, installed to view the front of the vehicle approaching the entry. The camera must be located in a position

where the front of the vehicle can be seen and the vehicle tag can be read by the operator through the use of PTZ functions, presets, and an auto-home capability. The camera shall meet the following criteria:

- a. the camera/dome assembly shall be a color/black&white (day/night) camera;
- b. the camera shall have 35X optical zoom;
- c. the camera shall have 360 degree continuous pan;
- d. the camera shall have tilt +2° to -92°;
- e. the camera shall have pan speed .1° to 80°/second;
- f. the camera shall have tilt speed .1° to 40°/second;
- g. the camera shall support up to 256 presets;
- h. the camera/dome assembly shall have a manufacturer 2 year warranty;
- i. the camera/dome assembly shall be rated for outdoor use with minimum operating range of -40°F to +122°F and 15% to 90% relative humidity, non-condensing;
- j. the dome shall have a smoked color lower dome sealed lens/bubble;
- k. the dome shall support up to 7 alarm inputs;
- l. the camera shall be a autofocus;
- m. the camera shall be high resolution day/night camera with 540 TVL;
- n. the camera shall provide a Wide Dynamic Range (WDR) capability;
- o. the camera shall provide Electronic Image Stabilization;
- p. the camera shall provide a 20 user-definable character title overlay;
- q. the camera shall provide an on-screen compass and tilt display;
- r. the camera shall provide password protection;
- s. the camera shall provide built-in surge and lightning protection;
- t. the camera shall provide an integrated passive unshielded Twisted Pair (UTP) Circuit;
- u. the camera shall meet NEMA4X and IP66 requirements;
- v. the camera shall be connected with the new DVR;
- w. the camera shall be connected with the existing Pelco KBD-300 PTZ keypad/joystick in the Duty Officer's area; The Contractor shall be required to test new cameras for PTZ control, while ensuring PTZ of the existing cameras remains;
- x. the Contractor shall install a 2nd Pelco KBD-300 PTZ keypad/joystick in the Telecommunication Officer area to control the 2 new cameras and the 2 existing cameras;
- y. the Contractor shall install all necessary outdoor rated RG6 coax cable, and the appropriate RS-422 communication and power cables, as well as any necessary video or control signal splitters, necessary to view high quality video and enable PTZ functions from the Duty Officer's area and the Telecommunication Officer's area;
- z. the Contractor shall supply all required power supplies for the camera/dome;
- aa. the Contractor shall run all necessary RG6 coax cable and install terminators, splitters, and bullets as required to display video on existing NTSC monitors;
- bb. the Contractor shall configure the presets as requested by MdTA and configure the auto-home position to provide a view of the front of the vehicle at a zoom-level that makes it easy to read the license plate;

- cc. the Camera shall be a Spectra IV SE Series Dome (or equal). The West gate camera shall include the wall mount option (and all required accessories, e.g., arm, mounting plate, brackets, etc.) and the camera model # shall be Pelco SD435-PGE0 (or equal). The West gate camera shall be wall-mounted where shown on the plans.

Refer to Figures 9 and 10 below for an illustration of the West gate camera location and mount, respectively.



Figure 9: West Gate Camera Location

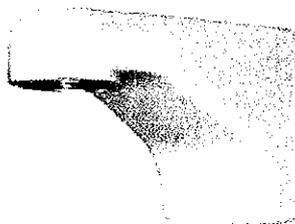


Figure 10: West Gate Camera Mount

Refer to Figure 11 below for an illustration of the Spectra IV SE Dome.



Figure11: Illustration of PTZ Dome Camera

7. **Cables.** The Contractor shall furnish, install, integrate, and test all power and communication cables, terminal blocks, etc. necessary to provide a fully functionally access control system, intercom system, and camera system, including the following:
 - a. wiring and integration between the Card Reader, AMAG EN-1DBC single door PoE controllers, gate controller, intercom/camera/card reader combo units, central exchange unit, intercom master stations, existing NTSC monitors, and the existing CISCO Ethernet switch;
 - b. wiring between the camera, DVR, existing PTZ keypad/joystick, new PTZ keypad/joystick, and existing monitors;
8. **Conduit, Trenching, and Boring.** The Contractor shall furnish and install conduit and perform any necessary trenching, and boring as required to connect the access control, intercom, and camera system to the WPL Police/Automotive building. The amount of boring is expected to be limited to none, as existing manholes/conduits are already in place. Refer to the plans for additional information.

Refer to Figure 12 below for an illustration of the West gate conduit location.

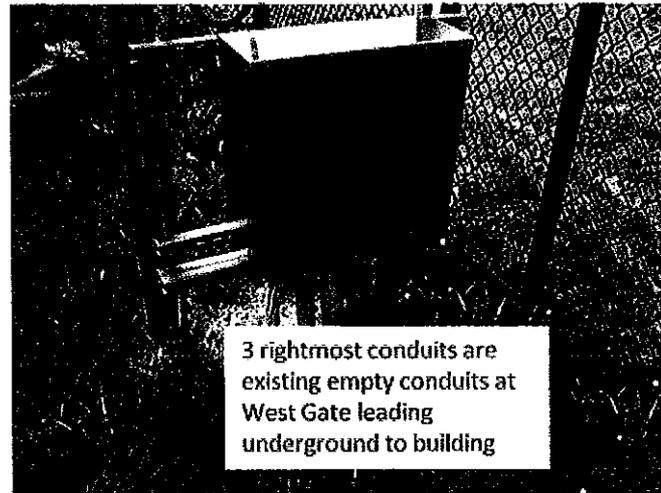


Figure 12: West Gate Conduit Location

9. **Laptop Software.** The Contractor shall furnish, install and test laptop software and cables, and provide procedures, and training to configure the controller locally from the field. Note: this is for backup control only, primary control is from the Authority's existing AMAG central software. The Authority's existing AMAG central software will be used to monitor access requests, alarms, and to define the open/close schedules for the gate. All access right privilege assignments for card holders will be performed by MdTA. However, the Contractor will be required to support MdTA in proving the ACS can be programmed to function using the existing ACS. It is the Contractor's responsibility to ensure the gate ACS is compatible with and able to integrate with the existing Authority ACS.

The Contractor shall perform the following:

- a. the Contractor shall provide a software license to enable field programming of the ACS controllers at the West gate location;
- b. the software shall be installed on an existing MdTA laptop computer; The laptop will be furnished by the MdTA;
- c. the software shall be AMAG Enterprise Security Management System, Version 6.1 (or later) or AMAG PRO-32-V6/S1 compatible, that can execute in a standalone fashion on a laptop that connects to the field controller;
- d. the Contractor shall provide the necessary cables for connecting the laptop with the network interface card within the ACS controller at pedestal cabinet;
- e. the Contractor shall provide written step-by-step procedures and on-site training for MdTA personnel with regard to adding, changing and deleting access rights; normal operation of the system, troubleshooting, and preventive maintenance;
- f. the Contractor shall provide one (1) on-site 4-hour training course to explain how to operate, program, and maintain the ACS.

10. **Signage.** The Contractor shall furnish and install one (1) sign installed on the card reader pole (facing traffic) at the West gate location. The sign will read "After Hours Access to this Area Restricted. Press Intercom to Talk to Attendant." All signs shall meet SHA standards and be retroreflective sheeting sized 2'x2' and with minimum 2" letters. Refer to Section 813 in the Maryland Department of Transportation, State Highway Administration Standard Specifications of Construction and Materials, dated July 2008. The MdTA shall approval all final signage wording prior to the Contractor fabricating the sign.

The Contractor shall provide the following in the WPL Police/Automotive building:

1. **Intercom Master Stations.** The Contractor shall furnish, install, integrate, test, commission, and warrant two (2) interior master station intercoms, one (1) installed in the Telecommunication Officer (TCO) area and one (1) installed in the Duty Officer's area. The master stations shall meet the following criteria:
 - a. the master station shall support two-way master-to-master and master-to-intercom (door station) voice communication;
 - b. the master shall have a call-in indicator;
 - c. the master station shall have a call button for each intercom (door station);
 - d. the master station shall support PTT or VOX operation;
 - e. the master station shall support electronic access control integration via RS-232;
 - f. the master station shall have a release mechanism to remotely open the gate;
 - g. the master station shall support CCTV system integration via RS-232;
 - h. the master station shall support CO line interface using Viking K-1900-5;
 - i. the master station shall support a selective call priority feature;
 - j. the master station shall include a 3-1/2" color TFT LCD for view video from each intercom (door station);
 - k. the master station shall include a call tone volume control;
 - l. the master station shall accept a composite video output from CEU/intercom (door station);
 - m. the master station shall be compatible with the central exchange unit;
 - n. the master station shall support scan monitoring of each intercom (door station) with a programmed time;
 - o. each intercom shall support an "All-Call" button;
 - p. the master station shall support footswitch operation of TALK switch;
 - q. the master station shall support a computer style headset which can be connected to station for voice communication; The Contractor shall supply one (1) headset for each master station;
 - r. each master station shall support communication with up to eight (8) intercoms (door stations);
 - s. the master station shall have a manufacturer 2 year warranty;
 - t. the master station shall be rated for indoor usage;
 - u. the master station shall be connected using CAT5E cable to the central exchange unit which is located in the WPL Police/Automotive Building's Electric/Computer Room;

- v. each master station shall have a UL-listed power supply model # AIPHONE PS-24-20s;
- w. the master station shall be an Aiphone model AX-8MV (or equal). Refer to Figure 13 below for an illustration of the unit.

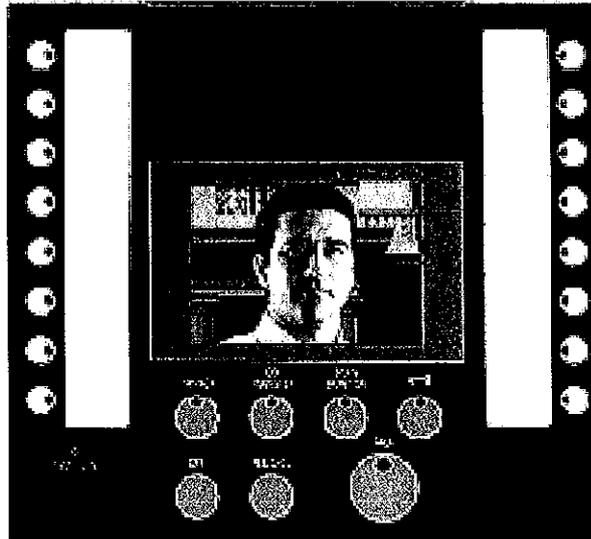


Figure 13: Illustration of Master Station

2. **Intercom Central Exchange Unit.** The Contractor shall furnish, install, integrate, test, commission, and warrant one (1) intercom central exchange unit installed in the WPL Police/Automotive Building's Electric/Computer Room. The intercom central exchange unit shall meet the following criteria:
- a. the central exchange unit shall support PC based programming and event logging;
 - b. the central exchange unit shall allow all connected master stations and door stations to be programmed;
 - c. the Contractor shall provide the intercom system software and configure as required to meet the approval of the MdTA Engineer;
 - d. the central exchange unit shall support rack mount (19", 2U) or wall mount configurations; The Contractor shall provide all the rack mounted kits and mount in an existing MdTA-approved rack;
 - e. the central exchange unit shall be compatible with the Contractor-installed intercom (door stations) and master stations;
 - f. the central exchange unit shall support scan monitoring of door stations with a programmed time;
 - g. the central exchange unit shall support up to 4 master stations and 8 intercoms (door stations);
 - h. the central exchange unit shall support two talk channels;
 - i. the central exchange unit shall support two-way master-to-master and master-to-intercom (door station) calling;
 - j. the central exchange unit shall have a manufacturer 2 year warranty;

- k. the central exchange unit shall be rated for indoor usage;
- l. the central exchange unit shall be connected using CAT5E cable to the intercoms (door stations) and master stations;
- m. the central exchange unit shall have a release mechanism to remotely open the gate; The Contractor shall wire the central exchange unit to the gate controller as required.
- n. the central exchange unit shall support CCTV system integration via RS-232;
- o. the Contractor shall supply all required power supplies for this unit;
- p. the central exchange unit shall be an Aiphone model AX-084C (or equal). Refer to Figure 14 below for an illustration of the unit.

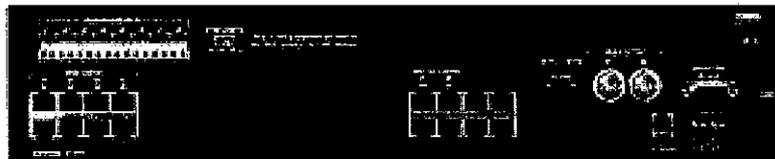


Figure 14: Illustration of Central Exchange Unit

3. **Digital Video Recorder.** The Contractor shall furnish, install, integrate, test, commission, and warrant one (1) Digital Video Recorder (DVR). The DVR shall meet the following criteria:
- a. the DVR shall provide 4 terabytes (TB) of storage;
 - b. the DVR shall provide a 10/100/1000 megabit Ethernet connection;
 - c. the DVR shall utilize the Windows XP embedded operating system;
 - d. the DVR shall have 16 channels allowing 16 analog NTSC coax cameras to be connected;
 - e. the DVR shall have a looping output for each analog input;
 - f. the DVR shall provide a maximum recording rate of 480 IPS at 1 CIF;
 - g. the DVR shall provide a maximum recording rate of 240 IPS at 2 CIF;
 - h. the DVR shall provide a maximum recording rate of 120 IPS at 4 CIF;
 - i. the DVR shall provide 2 USB 2.0 ports on the front of the unit and 4 USB 2.0 ports on the rear of the unit;
 - j. the DVR shall support 8 alarm inputs;
 - k. the DVR shall support 8 alarm/relay outputs;
 - l. the DVR shall support 2 audio inputs;
 - m. the DVR shall have an adjustable frame rate and image quality for motion, alarm, and pre-alarm recording;
 - n. the DVR shall support up to 60 seconds of pre-alarm and post-alarm recording;
 - o. the DVR shall be able to be viewed (i.e., live video) remotely and configured remotely using the Pelco 8100 client software;
 - p. using the Pelco client, the DVR video shall be able to be displayed in a 4x4 quad mode;
 - q. the DVR shall be rack mounted and installed in MdTA's existing DVR rack in the WPL Police/Automotive building;

- r. the Contractor shall provide the necessary keyboard, video, and mouse cables and connections for the DVR to be displayed and controlled locally at the DVR cabinet using the existing 15" LCD monitor in the cabinet;
- s. the DVR shall support a minimum of one (1) VGA monitor output and one (1) composite output;
- t. the DVR video shall be able to be displayed locally, one video at a time, or in a 2x2, 3x3, or 4x4 quad;
- u. a KVM-device shall be furnished and installed to allow the DVR to be displayed and controlled from the Telecommunication Officer's area;
- v. a KVM-device shall be furnished and installed to allow the DVR to be displayed and controlled from the Duty Officer's area;
- w. a Pelco PMCL219 19" flat panel LCD monitor shall be furnished and installed in the Duty Officer's area by the Contractor to display video from the DVR;
- x. two (2) Pelco PMCL219 19" flat panel LCD monitor shall be furnished and installed in the Telecommunication Officer's area by the Contractor; One of the monitors shall be configured to display video from the DVRs, the other monitor shall be configured to display video from the existing Pelco switch;
- y. the DVR shall provide on-screen PTZ camera control;
- z. the DVR shall provide user-definable PTZ presets, patterns, and preset tours;
- aa. the DVR shall provide an instant playback capability;
- bb. the DVR shall allow live video and audio to be transmitted over the network;
- cc. the DVR shall provide online help;
- dd. the DVR shall provide thumbnail, pixel, and ATM/POS search modes;
- ee. the DVR shall allow searches by date/time, timeline, and types of video;
- ff. the DVR shall provide a 6x digital zoom on playback;
- gg. the DVR shall provide network bandwidth throttling;
- hh. the DVR shall support an import and export of the DVR configuration;
- ii. the DVR shall support a scheduled backup capability;
- jj. the DVR shall support a multi-level password and user configuration capability;
- kk. the DVR shall support an unlimited number of web clients for live view only in multicast enabled networks;
- ll. the DVR shall provide the ability to print still images from video;
- mm. the DVR shall provide the ability to export video and still images in multiple formats including: AVI, ASF, BMP, TIFF, and JPEG;
- nn. the DVR shall have a built-in DVD-R burner to write data to CD-R and DVD-R media;
- oo. the DVR shall provide an API for development and integration of third-party applications and XPortal applications;
- pp. the DVR shall provide NTP Time Server synchronization; The Contractor shall configure the system such that the time on the DVR is synchronized with the time from the AMAG system (i.e., by using a common NTP server);
- qq. the DVR shall provide Pelco KBD300 keyboard support for camera selection and PTZ control;
- rr. the DVR shall support motion detection or 24x7 recording;

- ss. the DVR shall support recording according to a pre-defined schedule or record/no-record dates and times;
- tt. the Contractor shall wire the **new** Spectra IV video feed into new DVR;
- uu. the Contractor shall wire the **existing** Spectra video feeds into new DVR using a video splitter;
- vv. the DVR shall provide RS-422 PTZ camera control of the new Pelco Spectra IV camera included on this project and the two (2) existing Spectra cameras;
- ww. as part of this work, the Contractor shall also integrate and test the new Spectra IV cameras with the **existing** KBD-300 PTZ keypad/joystick; to accomplish this the Contractor shall provide an 1-to-2 RS-422 line splitter and other serial port sharing communication devices as required to enable this capability;
- xx. the Contractor shall provide all necessary RG6 coax and RS-422 cables, connectors, splitters, terminators, etc. required to provide a fully functional CCTV system;
- yy. the unit shall be rated for indoor use with minimum operating range of 50°F to +95°F and 0% to 80% relative humidity, non-condensing;
- zz. the DVR shall have a manufacturer 2 year warranty;
- aaa. the DVR unit shall be a Pelco 8116-3000 (or equal). Refer to Figure 15 below for an illustration of the unit.



Figure 15: Illustration of DVR

Figure 16 provides an illustration of the equipment for the ACS, Intercom and CCTV System. Figure 17 shows a block diagram indicating how the system shall be connected. These figures are conceptual only and should be validated by the Contractor. The Contractor is required to wire the system to meet the functional requirements of this specification.

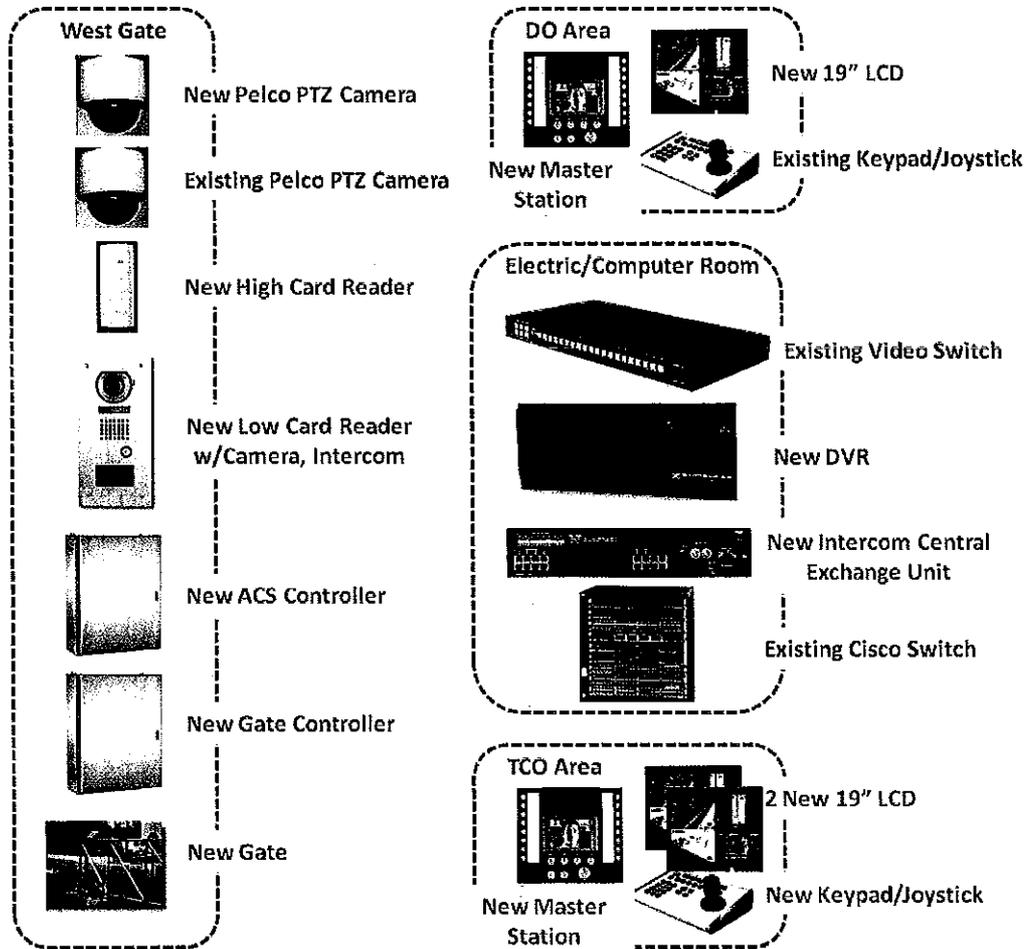


Figure 16: ACS, Intercom and CCTV Equipment

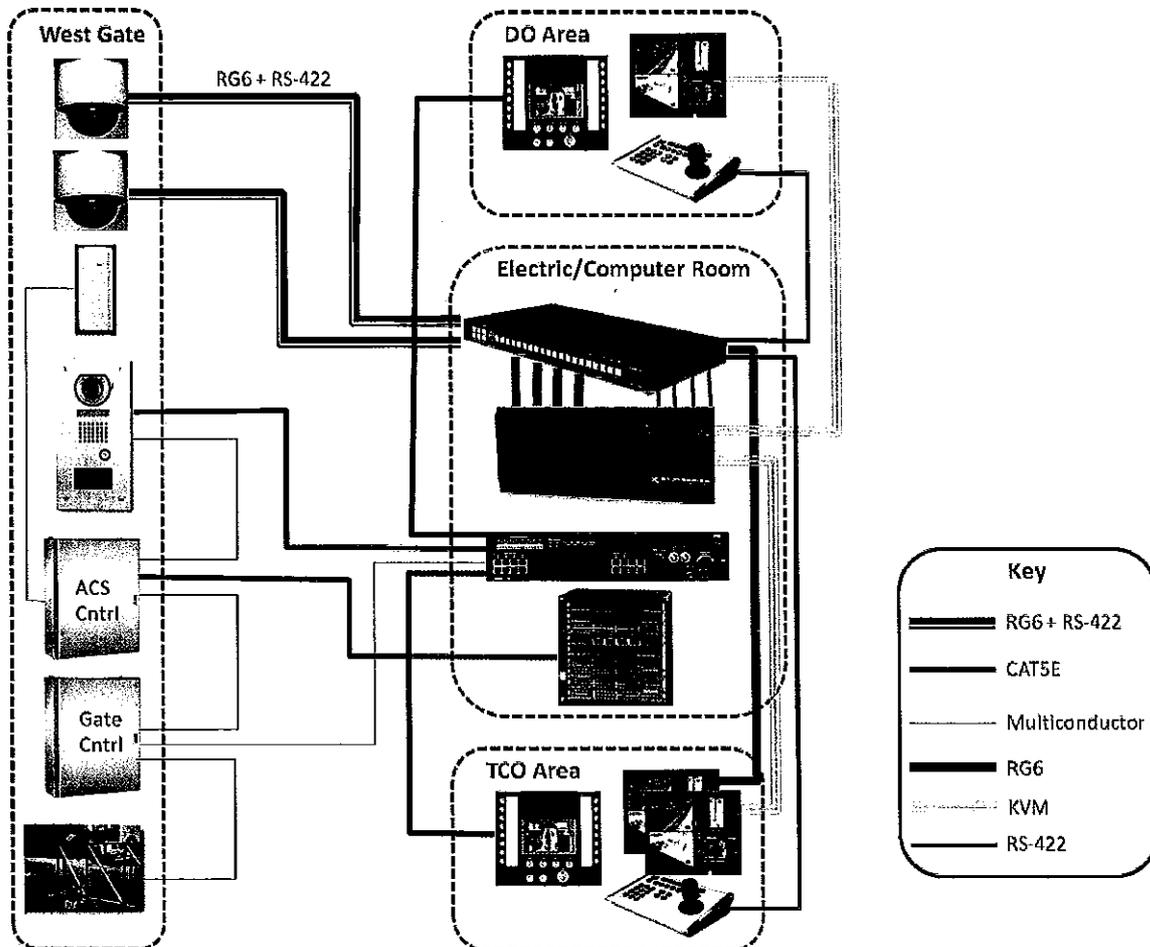


Figure 17: ACS, Intercom and CCTV Block Diagram

1012.02.03 Secondary Entry Control. The secondary entry control system shall use a manual hand-release emergency release mechanism. The manual release mechanism is enclosed in the gate control cabinet.

1012.02.04 Acceptance Testing. The Contractor shall perform the necessary steps to successfully accomplish acceptance testing as described below.

- I. The Contractor shall supply a test procedure submittal to the Engineer for approval. There shall be one test procedure for ACS, one for Intercom, and one for CCTV, each with multiple tests. The test procedure must be detailed, step-by-step, and provide testing of all functional requirements. A testing traceability matrix shall be required that maps each test procedure to the requirements in this specification. A written test procedure must be provided to the MdTA Engineer for approval prior to execution, and after execution signed by the tester and the MdTA witness at each facility. In addition to the functional requirements, tests must be added to ensure the following:



- i. all voice communications are clear and crisp. Acceptance testing will include the ability to communicate effectively using the intercom in the presence of the ambient noise. Critical factors include the ability to achieve sufficient output volume and microphone placement.
- ii. all video signals, must be 30 FPS, clear, jitter-free, and of broadcast quality. Video signals will be tested in all weather conditions and at various times of day.
- iii. all control signals (e.g., master station release of gate, card reader operation and release of gate, PTZ of cameras from the KBD-300 and DVR) must be reliable and error-free.
- iv. the time on the DVR is synchronized with the time from the AMAG system;

II. The Contractor shall perform the required tests from the West gate location and control point locations (i.e., TCO area, DO area) and document the results in the test report. The Authority requires the completion of acceptance testing, and a signed test report, prior to final payment.

1012.02.05 Warranty. Unless stated otherwise, the Contractor shall provide a warranty of all parts for a minimum period of two (2) years from completed installation and successful system acceptance. The warranty shall cover the cost of parts and labor at no additional expense to the Authority. If any component of the system fails during the warranty period, it must be replaced by the Contractor at his expense.

For failures that occur during the warranty period, an on-site Contractor technician is expected to be on-site within 4 business hours from the time they are notified by the Authority. All after hour communications will be coordinated with the Duty Officer at the facility. The Contractor must provide a telephone number for the Technician on-call, and if that contact number changes the Duty Officer at must be contacted with the new number.

1012.02.06 Spares. The Contractor shall provide the following spare parts:

- a. one (1) master intercom station Aiphone model AX-8MV (or equal);
- b. one (1) intercom (door station) Aiphone model AX-DV-P (or equal);
- c. one (1) card reader AMAG model 690;
- d. one (1) Symmetry Edge Network Controllers, model AMAG EN-1DBC.

1012.02.07 Documentation. The Contractor shall provide the following documentation:

- a. submittals of catalog cut sheets for MdTA approval prior to procuring all equipment;
- b. submittals of 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;
- c. submittals of all test procedures;



- d. submittals of all training materials;
- e. submittals of all shop drawings for camera mounts, mounting plates, as required.
- f. submittals of all as-built wiring diagrams and schematics for all components of the ACS, intercom and CCTV system, including an overall one-line block diagram; Deliver two (2) hard copies and 2 electronic copies on CD-ROMs.

In addition the Contractor shall ensure all cables (coax, CAT5E, serial) are professionally labeled on each end.

1012.02.08 Training. The Contractor shall provide training courses to the Authority for the ACS, intercom and CCTV system. The training shall include how to operate, maintain, and trouble shoot the system. A training submittal shall be submitted for approval 30 days prior to performing any training. The Authority must approve the training material in advance of the training. Copies of all approved training materials must be provided by the Contractor to all trainees. The Contractor shall provide an operator training class and a separate class for maintenance training. 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 MdTA. Under no circumstances shall generic training be required. The training must be specific to the Authority's configuration.

The Contractor shall perform the following training tasks:

- I. The Contractor shall conduct two (2), 1-day maintenance and troubleshooting training classes for up to 6 electronics technicians at the WPL Police/Automotive facility. The 1st training class will be conducted within 1 week of successful acceptance testing of the system. The last training class will be conducted as a make-up or refresher class on an as-needed basis;

The training shall cover module replacement, programming, configuration, troubleshooting, testing, and other items as necessary to maintain the ACS, intercom, and CCTV system in operational condition. Training must be provided to the Authority to allow Authority personnel to program/enable any programmable capability provided by the system. 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. Detailed procedures providing step-by-step instructions for configuring and maintaining the system shall be provided along with the training materials. Exercises shall be provided for all operations and maintenance functions. The Contractor shall include this information in the training package for each trainee. 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, one full copy of the binder shall be left in each WPL Police/Automotive Building Electric/Computer room. This manual is for use by on-call Electronics Technicians and must contain all information necessary to repair/reinstall/reprogram any aspect of the system.

- II. In addition to the above, the Contractor shall provide a 1-page laminated instruction set for users of the intercom and CCTV system. The Contractor shall provide 5 copies of the



laminated material. The manual should provide all instructions and codes for the configured functions (e.g., volume, alarms, all call broadcasts, calls to masters, video routing, PTZ-ing video, door release, etc.). The Contractor shall provide at least two (2), 15-minute training sessions with the Duty Officer, Telecommunication Officer and his/her designees. The 1st training class will be conducted within 2 days of successful acceptance testing of the system. The last training class will be conducted as a make-up or refresher class when needed;

As part of Item I above, the following training shall be provided:

1. **Intercom System.** The Contractor shall provide a 2-hour training course (2 sessions, 1 after acceptance testing, and 1 as a make-up session) to the Authority to explain how to operate, program, and maintain all aspects of the Intercom System. The Contractor shall configure the system as required by MdTA to include the following:
 - a. intercom (door station) call-in time out length;
 - b. Call-in priority levels;
 - c. Scan monitoring inclusion;
 - d. Door release relay activation and timing.
2. **ACS.** The Contractor shall provide a 3-hour training course (2 sessions, 1 after acceptance testing, and 1 as a make-up session) to the Authority to explain how to operate, program, and maintain all aspects of the ACS. The Contractor shall provide written step-by-step procedures and on-site training for MdTA personnel with regard to adding, changing and deleting access rights; normal operation of the system, troubleshooting, and preventive maintenance of the ACS controller and card readers.
3. **CCTV System.** The Contractor shall provide a 3-hour training course (2 sessions, 1 after acceptance testing, and 1 as a make-up session) to the Authority to explain how to operate, program, and maintain all aspects of the CCTV and DVR system. The Contractor shall provide written step-by-step procedures and on-site training for MdTA personnel with regard to all training exercises. The training shall include how to operate, configure, and maintain the DVR and how to operate, control, and maintain the cameras.

1012.03 MEASUREMENT AND PAYMENT. Components of the system will not be measured separately, but instead will be paid as a lump sum for the entire ACS, intercom, and CCTV as described herein. The lump sum shall include all materials, labor, and equipment necessary to furnish and install a complete, operational, and acceptable system as specified herein. The lump sum payment shall also include all testing, training, documentation, spares, and warranty required by the specifications and special provisions. Any requirements of the specifications or special provisions not specifically detailed or mentioned in a pay item shall be considered incidental to the pay items.

**CATEGORY 1500
MECHANICAL SYSTEMS**

SECTION 15510 - BASIC MECHANICAL REQUIREMENTS

PART 1 - GENERAL

A. SCOPE OF WORK

1. The scope of Work under Division 15 includes all labor, materials, equipment, services, and incidentals necessary to complete the installation of the mechanical system.

B. MATERIALS, EQUIPMENT AND WORKMANSHIP

1. Install equipment in strict accordance with manufacturer's instructions for type and capacity of each piece of equipment. Obtain these instructions from the manufacturer and such instructions shall be considered a part of these Specifications. Type, capacity and application of equipment shall be suitable and capable of satisfactory operation.
2. All equipment or apparatus of any one system must be the product of one manufacturer or equivalent products of a number of manufacturers, which are suitable for use in a unified or assembled system.

C. STANDARD OF QUALITY

1. Manufacturer's names and model numbers are given for purpose of establishing a standard of quality, style, size and type and shall not be construed to exclude equipment or materials of other manufacturers.
2. When more than one manufacturer is listed, design is based upon equipment supplied by first manufacturer listed, and additional manufacturers can comply with the specifications with either standard or optional equipment and specialties or modifications thereto.
3. Perform all architectural, structural, mechanical, and electrical changes and coordination required by manufacturers other than the basis of design at no change in Contract Amount.

D. RESPONSIBILITY OF BIDDERS

1. Examine all Drawings and Specifications issued and visit the site of work. Bidders must be familiar with codes, rules, and regulations in effect at site of the work to determine existing conditions that affect their installation. No extra compensation will be allowed for any error resulting from failure to visit job site.
- 2 Contractor is assumed to be skilled in the trade and is solely responsible for compliance with OSHA regulations, performing the work in a safe and competent manner, and in installation procedures required for this work.

E. SOURCE QUALITY CONTROL

- 1W. The term "Manufacturer" as used throughout these Specifications is understood to apply to a company of established reputation in the manufacture of the particular materials, equipment or apparatus from products of their own make, or products of others, and who assumes full responsibility for products used in said outfits which are not manufactured completely by them, and with replacement parts available.

F. SUBMITTALS

1. Submit for approval shop drawings and product data for all products and materials to be installed on the project.
2. Submit shop drawings and product data grouped to include complete submittals of related systems, products, and accessories in a single submittals.
3. Mark dimensions and values in units to match those specified. Include contract drawing identification, type quantities, capacities, accessories, rough-in dimensions, manufacturer's name, model number, connection sizes, wiring diagrams, installation instructions, motor horsepower, voltage, phase and amperage, colors, finishes, and other pertinent data.
4. The supplier, by submitting, certifies that materials or equipment proposed are satisfactory for application intended, and that materials and equipment are in current production with no known plans to cease production.
5. Contractor agrees that submittals processed by the Architect and Engineer are not change orders; that the purpose of submittals by Contractor is to demonstrate that Contractor understands the design concept; that he demonstrates this understanding by indicating which equipment and materials he intends to furnish and install and fabrication and installation methods he intends to use.
6. Contractor further agrees that if deviations, discrepancies, or conflicts between Shop Drawing Submittals and Contract Documents in the form of design drawings and

specifications are discovered either prior to or after Shop Drawing Submittals are processed by the Engineer, the design drawings and specifications shall control and shall be followed.

7. All shop drawings submitted shall bear the stamp of approval of Contractor as evidence that drawings have been checked. Any drawings submitted without this stamp of approval will not be evaluated and will be returned to the Contractor for proper resubmission. Material and equipment reviews by Architect and Engineer are only for conformance with the design concept of the project and compliance with information given in the contract documents. Dimensions shall be confirmed and correlated at the job site by the installing Contractor and installation shall be coordinated with other trades.

G. PRODUCT OPTIONS

1. Products specified by reference standards or by description only: Any Product meeting those standards or description.
2. Products specified by naming one or more manufacturers: Products of manufacturers named and meeting specifications allowed.
3. Products specified by naming one or more manufacturers with a provision for substitutions: Submit a request for substitution for any manufacturer not named.
4. The first manufacturer named was used as the basis of design for the project. This equipment has been checked for installation in the space indicated on the drawings. Other manufacturers listed are known to provide equipment that is similar in operation to the basis of design. This equipment has not been checked for installation. The Contractor shall be responsible to confirm installation requirements.

H. SUBSTITUTIONS

1. Supplementary Conditions and/or Division 1 specify time restrictions for submitting requests for Substitutions during bidding period.
2. Substitutions will be considered when a Product becomes unavailable through no fault of the Contractor.
3. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.
4. A request constitutes a representation that the Contractor:



- a. Has investigated proposed Product and determined that it meets or exceeds quality level of specified Product.
 - b. Will provide the same warranty for Substitution as for specified Product.
 - a. Will coordinate installation and make changes to other work which may be required for Work to be complete with no additional cost to Owner.
 - c. Waives claims for additional costs or time extension which may subsequently become apparent.
 - d. Will reimburse Owner for review or redesign services associated with re-approval by authorities.
5. Final acceptance of Substitutions is reserved by Architect and Engineer.

I. PERMITS AND FEES

1. Give all notices, file all plans and obtain all necessary approvals from authorities having jurisdiction required and for the use by the Architect at the completion of construction. All certificates of inspection, test results and approvals shall be turned over to the Owner and Architect prior to the final acceptance of the project by the Architect.
2. Secure and pay for all required permits, inspections and licenses necessary for, and incidental to the installation of the work when completed.
3. Pay all costs incurred for tests to be performed that are necessary for and incidental to the installation of the work when completed.

J. INSPECTIONS

1. Work shall not be permanently concealed before inspection and approval by the Architect, and all inspectors and authorities having jurisdiction.
2. Replace any unacceptable, imperfect or condemned material, equipment or workmanship so as to comply with the intent of the Contract Documents and satisfaction of the Architect and Inspection Authorities without extra cost.
3. Work installed under this Contract that is covered before inspection and approval of the appropriate inspecting authority, this Contractor shall pay all costs of uncovering and reinstalling said Work.

K. CERTIFICATES OF APPROVAL

1. Upon completion of all Work, furnish the Architect, in duplicate, certificates of inspection or approval from state and local inspection authorities having jurisdiction.



2. Furnish the Architect, in duplicate, notarized letters from the manufacturer of the required systems stating that authorized factory engineers have inspected and tested the installation of their respective systems and/or equipment and found same to be in perfect operating condition. All discrepancies and defective materials, if any are to be rectified and replaced before the above requested letters are notarized.

L. GUARANTEES

1. Guarantee all equipment, materials, and workmanship for a period of one year, beginning with date of acceptance of the project. Special warranties will be called for under some sections of EQUIPMENT. Warranty shall be in writing and shall include written copies of factory warranties with expiration dates on items of equipment where warranty date might differ from the acceptance date, such as five-year warranty on sealed refrigeration systems. No warranty shall start before date of acceptance in writing by the Architect.

M. REGULATORY REQUIREMENTS

1. Mechanical: Conform to current mechanical code enforced by the local Authority Having Jurisdiction. In the absence of local enforcement, conform to the 2006 International Mechanical Code.
2. Obtain permits, and request inspections from authority having jurisdiction.
3. Underwriters' Laboratories (UL) listings and National Electrical Manufacturer's Association's (NEMA) stamps or seals shall be evidenced where applicable to electrical apparatus forming parts of the mechanical equipment.
4. Conform to applicable regulations of Department of Environmental Resources, Department of Labor and Industry, OSHA.
5. Updated Standards: At the request of Architect/Engineer, Contractor or governing authority, submit a change order proposal where an applicable industry code or standard has been revised and reissued after the date of contract documents and before performance of the Work affected. The Architect/Engineer will decide whether to issue a change order to proceed with the updated standard.

N. PROJECT/SITE CONDITIONS

1. Install Work in locations shown on Drawings, unless prevented by Project conditions.

2. Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other sections. Obtain permission of Architect/Engineer before proceeding.

O. EXAMINATION OF DRAWINGS, SPECIFICATIONS AND ACTUAL CONDITIONS

1. Before commencing work, examine Architectural, Structural, Mechanical, Plumbing, and Electrical Drawings; report discrepancies to Architect, in writing, and obtain written instructions as to the manner in which to proceed. Verify and be responsible for accuracy of all site measurements.
2. No extra compensation will be allowed for a difference between actual dimensions and those indicated on the Drawings.

P. PROTECTION

1. Effectively protect materials, equipment, and work liable to injury during construction period and during delivery, handling, and storage to avoid shock or damage to items such as pipe, fittings, and polished, plated, machined, or unpainted surfaces of equipment.
2. Protect motors, pumps, heaters, and similar items of equipment from construction debris and weather.

Q. DRAWINGS AND SPECIFICATIONS

1. The drawings are generally diagrammatic and indicative of the work to be installed. Exact locations of equipment and points of termination shall be approved by the Architect/Engineer. Should it be found that any system or equipment cannot be installed as shown on the drawings, Architect shall be consulted before installing or making changes to layout. Coordinate work with that of other Trades for proper securing and anchoring of all work included in this Contract at time of installation in order to avoid conflict with other equipment or Architectural or Structural features. In case of interference, Architect shall decide which work is to be relocated, regardless of which was first installed. Any changes required due to such interference's shall be made without additional expense to Owner.

PART 2 - PRODUCTS

A. MATERIALS

1. Materials shall be new without imperfections or blemishes and shall be protected from the elements prior to installation.

PART 3 - EXECUTION

B INSTALLATION

1. Install piping and equipment to preserve access to equipment installed under this project.

C. WORKMEN QUALIFICATIONS

1. In acceptance or rejection of in-place work, no allowance will be made for lack of skill on the part of Contractor's forces performing the work.

D. CUTTING AND PATCHING

1. All openings and recesses necessary for the installation of all work associated with this contract will be provided by this contractor.
2. Where piping is run concealed in masonry walls, each Contractor shall be responsible for installing his work in place for the mason to wall-in as he carries up the walls; otherwise he will be responsible as stated in preceding paragraph.
3. No metal, wood, or concrete beam, girder, or column, or other structural member bearing building stresses shall be cut or drilled except with the previous approval of the Engineer.
4. All surfaces such as floors, walls, ceilings, or other surfaces disturbed or damaged during the course of construction shall be restored to original condition.
5. Exterior surfaces, including pavements, sidewalks, curbs, grass areas or special finishes, cut into or damaged shall be repaired using materials conforming with those originally used and as required to match present surroundings.
6. Perform cutting and repairing required for installation of work under this contract, unless noted otherwise on Drawings. Perform finishing and roof flashing, in areas of existing building or roof not being disturbed under General Construction, for installation of work under this contract.
7. Obtain approval from Owner's representative before cutting existing work.
8. Where openings are to be made in existing roof, obtain bonding company approval, if roof bond is still in effect, before such openings are made.

9. Repair and finish to match adjacent surfaces, disturbed areas, drives, roads and streets and restore all grass areas where these surfaces have been disturbed by installation of work under this contract unless these areas are also being disturbed by work under General Contract.
10. Repair paved surfaces off-site which are disturbed in accordance with Department of Transportation recommendations and obtain approval from same.

E. HANDLING OF MATERIALS

1. Receive and accept at the site, properly handle, house and protect from injury and the weather until ready for installation, the following materials.
 1. Materials, equipment and apparatus furnished under this contract.
 2. Equipment furnished under other portions of the Specifications and to be installed under this contract.
2. Equipment damaged in the course of handling, installation or test shall be replaced under this contract or repaired to the satisfaction of the Architect without any additional charge.
3. Trailers for storage of materials and equipment shall be provided under this contract. Trailers shall be located in designated staging areas at the site.

F. CLEANING

1. The completion of the daily Work, this Contractor shall remove from the property all rubbish or waste materials belonging to him. Keep the job site free from accumulation of waste materials and rubbish.
2. At completion of work, clean all parts of installation thoroughly. Clean interior of equipment casings, ductwork, etc. of dirt and refuse.
3. Any stoppage in piping or discoloration or other damage to any part of building, its finish or furnishings, due to failure to properly clean piping or equipment and/or duct system, shall be repaired by Contractor without cost to Owner.

G. RENOVATIONS

1. Drawings indicate work necessary to remove or to relocate existing equipment.
2. Materials and equipment being removed shall become property of Contractor, unless noted otherwise, and shall be legally disposed of off the site.

3. Where materials and equipment are to be connected to existing systems, new fittings, valves and appurtenances shall be used. Connections to existing systems shall be accomplished in most practical manner.

H. HAZARDOUS MATERIALS

1. Should hazardous or toxic materials be encountered in any existing work, Contractor shall be responsible for proper handling of any such material that may be disturbed. Remove hazardous or toxic materials in strict accordance with all applicable local, State and Federal regulations. Notify Architect and Owner if hazardous material is discovered before proceeding with removal of hazardous/toxic materials.

I. PAINTING

1. Prepare for painting exterior surfaces of unfinished material, equipment, ironwork and piping exposed in finished areas by cleaning surface of foreign matter, grease, dirt and dust.
2. Paint exposed items or equipment, and all structural steel or miscellaneous metal, installed under this portion of the Specifications.
3. Surfaces shall be primed and finish painted with two (2) coats of oil paint. Each coat shall be a different shade, with final coat of color as selected by the Architect.
4. Touch-up paint on factory-finished equipment chipped or scrapped during installation. Color to match factory finish.

J. INTERRUPTION OF SERVICES

1. Owner will occupy the building during the entire construction period. Schedule work to allow normal operation of Owner occupied areas of the building. Provide temporary equipment, piping, controls, etc to maintain normal operation of the systems.
2. Schedule work to avoid any major interruption of any utility services. Interruption of services shall be done during overtime if necessary at no additional cost to the Owner.
3. Notify Owner's representative three (3) days prior to any interruption of services.

K. SEQUENCING



SPECIAL PROVISIONS

CONTRACT NO. BB 2042-000-002

Page 10 of 10

1. Confer with all other trades as to the exact locations of their equipment and services before beginning work in order to avoid conflict between the various items or systems. Any materials or equipment improperly placed because of failure to obtain this information shall be relocated without additional cost to the Owner.

PART 4 - MEASUREMENT AND PAYMENT

Not applicable

END OF SECTION 15510

**CATEGORY 1500
MECHANICAL SYSTEMS**

SECTION 15550 - BASIC MATERIALS AND METHODS

PART 1 - GENERAL

A. SECTION INCLUDES

1. Electrical requirements.
2. Identification.
3. Equipment supports and anchors.
4. Control wiring.
5. Miscellaneous steel.

B. SYSTEM DESCRIPTION

1. Provide complete and fully operational systems with facilities and services to meet requirements indicated and in accord with applicable codes and ordinances.

C. SUBMITTALS

1. Submit for approval, shop drawings and/or catalog data for all materials to be installed on this project.
2. Submit shop drawings and product data grouped to include complete submittals of related systems, products, and accessories in a single submittal.

PART 2 - PRODUCTS

A. ELECTRICAL REQUIREMENTS

1. Furnish motors, starters, disconnects, and controls for equipment under this Division, unless otherwise noted.
2. Where noted, furnish and turn over starters, disconnects, and overload protectors for installation by the Electrical Contractor.

3. Provide all necessary conduit and control wiring to pushbuttons, thermostats, pilot lights, interlocks and similar equipment.
4. Provide flow control switches, thermostats and similar mechanical-electrical devices necessary for proper operation of mechanical systems.
5. Where the starter and/or safety switch is an integral part of the equipment assembly, the assembly shall be furnished with the wiring complete between starter, controller and motor.
6. If motor control center is furnished (and installed) by Electrical Contractor for specific motors, the Mechanical Contractor shall not furnish starters for those specific motors, however the Mechanical Contractor shall furnish Electrical Contractor with starter requirements to insure proper operation of those motors.
7. All motors and motor control equipment and wiring shall meet the requirements of the NEC, and shall comply with the requirements of the Public Utility Company furnishing service and with the rules and regulations of all authorities having jurisdiction.
8. VERIFY SPECIFIED VOLTAGE AND COORDINATE WITH ELECTRICAL CONTRACTOR BEFORE ORDERING ANY ELECTRICAL EQUIPMENT.

B. MECHANICAL IDENTIFICATION

1. Plastic Nameplates: Laminated three-layer plastic with engraved black letters on light background color.
2. Plastic Valve Tags: Laminated three-layer plastic with engraved black letters or numbers on light background color, minimum 1-1/2 inch diameter.
3. Plastic Valve or Equipment Markers (For Equipment or Valves above ceiling): Plastic face with metal tack. Color per chart:
4. Valve Chart: Chart shall include valve identification letters or numbers, location, and purpose. Mount chart in aluminum frame with plexiglass cover secured on wall in mechanical room or in location as directed by Architect. Second chart to be placed in maintenance manual.
5. Piping Markers: Conform to ANSI A13.1

C. EQUIPMENT SUPPORTS

1. Materials and Finishes: Provide adequate corrosion resistance.
2. Provide materials, sizes, and types of anchors, fasteners and supports to carry the loads of equipment and conduit. Consider weight of wire in conduit when selecting products.

D. ANCHORS AND FASTENERS

1. Concrete Structural Elements: Use precast insert system, expansion anchors, powder actuated anchors and preset inserts.
2. Steel Structural Elements: Use beam clamps, steel ramset fasteners, and welded fasteners.
3. Concrete Surfaces: Use self-drilling anchors and expansion anchors.
4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts and hollow wall fasteners.
5. Solid Masonry Walls: Use expansion anchors and preset inserts.
6. Sheet Metal: Use sheet metal screws.
7. Wood Elements: Use wood screws.

E. CONTROL WIRING

1. All wiring and conduit shall be according to the latest edition of the NED. All control wiring shall be installed in EMT, applicable portions of the NEC and of "DIVISION 16 – ELECTRICAL".
2. Low voltage control wiring in air plenums shall be a UL approved conductor for application.

F. MISCELLANEOUS STEEL

1. Steel angles, channels, beams, hanger rods and attachments for mechanical equipment requiring support or suspension from building structure.
2. Pre-engineered electro-galvanized steel support systems; Unistrut, Kindorf or equivalent.
3. Furnish and install miscellaneous steel necessary for proper support of equipment.

PART 3 - EXECUTION

A. INSTALLATION

1. Install materials in accordance with manufacturer's instructions.
2. Install plastic nameplates with adhesive.
3. Install plastic tags with corrosion resistant metal chain.
4. Install plastic valve or equipment markers with metal tack.
5. Identify unit heaters with plastic nameplates.
6. Install plastic pipe markers in accordance with manufacturer's instructions.
7. Identify valves in main and branch piping with tags.
8. Piping: Identify piping, concealed or exposed, with plastic pipe markers and plastic tape pipe markers. Tags may be used on small diameter piping. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and "T", at each side of penetration of structure or enclosure, and at each obstruction.
9. Install mechanical equipment requiring electricity in accordance with National Electric Code.

B. VALVE CHART AND SCHEDULE

1. Provide valve chart and schedule in aluminum frame with clear plastic shield. Install at location as directed.

C. CONTROL WIRING

1. Workmanship on all phases of control wiring shall be equal to that of the Electrical Contractor and shall be performed by competent workmen.
2. Horizontal cable runs shall be made level. Vertical cable runs shall be made plumb. Exposed cable runs shall run parallel or perpendicular to walls and ceilings. No unsightly diagonals or bends.

3. In building equipment spaces, cables may be run along and strapped to the surface of walls using mechanical fasteners with wire ties.
4. Horizontal cable runs shall be supported every 12 inches, and vertical cable runs shall be supported every 24 inches. Cables will be run in a workmanlike manner parallel to the floor with all droops removed by pulling taut but without exceeding the tensile strength of the conductors.
5. Cable runs may NOT be run along or fastened to: any telephone cable superstructure, including those supported from the ceiling, from the wall, or on top of the telephone equipment frames; any air handling ductwork beyond fifteen feet from the supply or return fan; any fluid or gas piping.
6. Cables shall be concealed unless permission is otherwise solicited from the Professional and granted in writing.

PART 4 - MEASUREMENT AND PAYMENT

Not applicable

END OF SECTION 15550

**CATEGORY 1500
MECHANICAL SYSTEMS**

SECTION 15580 - PIPING

PART 1 - GENERAL

A. SUBMITTALS

1. Product Data: Provide data on piping, fittings and valves.

PART 2 - PRODUCTS

A. PIPE HANGERS

1. Manufacturers:
 - a. Hunt Manufacturing
 - b. Anvil International
 - c. Substitutions: Under provisions of Section 15510.
2. Carbon steel with zinc plated finish. UL listed and FM approved. Clevis hanger to allow vertical adjustment by the use of hanger rod and nuts.
3. Vertical pipe hanger to be used for vertical pipe risers.
4. Provide all required clamps, rods, and nuts for installation of hangers.

B. LP GAS PIPING, ABOVE GRADE

1. Steel Pipe: ASTM A53, Schedule 40 black, with malleable iron or forged steel fittings, screwed or welded.

C. LP GAS PIPING, BURIED

1. Steel Pipe: ASTM A53, Schedule 40 black, with polyethylene jacket and welded joints.

D. FUEL OIL PIPING ABOVE GROUND

1. Copper Tubing: ASTM B88, Type K, annealed with brass flare fittings.

E. BALL VALVES

1. Manufacturers:

- a. Crane
 - b. Nibco
 - c. Jenkins
 - d. Substitutions: Under provisions of Section 15510.
2. Up to 2": Bronze body, stainless steel ball, teflon seats and stuffing box ring, lever handle, solder or threaded ends.
 3. 2" and larger: Cast steel body, stainless steel ball, teflon seat and stuffing box seals, lever handle, flanged.

F. GAS COCKS

1. Manufacturers:
 - a. Milwaukee Valve Co.
 - b. DeZurik
 - c. Crane
 - d. Nibco
 - e. Substitutions: Under provisions of Section 15510.
2. Up to 2": Bronze body, stainless steel disc non-lubricated, teflon packing, threaded ends.
3. 2" and larger: Cast iron body and plug, non-lubricated, teflon packing, flanged ends.

G. PIPE SUPPORT SYSTEM

1. Manufacturers:
 - a. Erico Pipe Pier
 - b. Substitutions: Under provisions of Section 15510.
2. Polyethylene foam block with an integral strut channel for receiving standard strut clamps and accessories.
3. Piers shall be installed per manufacturer's recommendations. Pipe supports shall be installed to allow for expansion and contraction.

PART 3 - EXECUTION

H. PREPARATION

1. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
2. Remove scale and dirt, on inside and outside of piping before assembly.



3. Prepare piping connections to equipment with flanges or unions.
4. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.
5. Verify adjacent construction is ready to receive rough-in work of this Section.
6. Obtain written approval from propane company prior to and after installing gas pipe.

I. INSTALLATION

1. Provide dielectric connections wherever joining dissimilar metals.
2. Install piping to conserve building space and not interfere with use of space. Group piping whenever practical at common elevations.
3. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
4. Install specialties in accordance with manufacturer's instructions.
5. Gas piping exposed on ground shall be supported by polyethylene foam block with an integral strut channel for receiving standard strut clamps and accessories (Erico model Pipe Pier or approved equal). Pipe supports shall be installed per local code or every ten feet. All gas/fuel oil piping exposed to outside shall be painted.

J. APPLICATION

1. Use dielectric connections only in accessible locations.
2. Install unions downstream of valves and at equipment or apparatus connections.

K. TESTS

1. **GAS PIPING**
 - a. Conform to Authority Having Jurisdiction and/or the Propane Company.
 - b. In absence of specific test code, perform the following:
 - i. Test at 120 psig.
 - ii. Maintain pressure for length of time required to inspect each joint without introduction of additional air.

PART 4 - MEASUREMENT AND PAYMENT

Not applicable

END OF SECTION 15580

**CATEGORY 1500
MECHANICAL SYSTEMS
SECTION 15620 - FURNACES**

PART 1 - GENERAL

A. SUBMITTALS

1. Submit under provisions of Section 15510.
2. Shop Drawings: Indicate dimensions, connections, arrangement, accessories, and controls.
3. Product Data: Provide manufacturer's installation instructions.
4. Operating and Maintenance Instructions: Include relevant instructions.

B. WARRANTY

1. Provide five-year manufacturer's warranty under provisions of Division 1 including coverage for heat exchangers.
2. Provide five-year manufacturer's warranty under provisions of Division 1 including coverage for refrigeration compressors.

PART 2 - PRODUCTS

A. GAS FIRED UNIT HEATERS

1. Manufacturers:
 - a. Modine
 - b. Sterling
 - c. Hastings
 - d. Substitutions: Under provisions of Section 15510.
2. Type: Horizontal, self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, fan, heat exchanger, gas burner, and controls including electronic pilot ignition.
3. Capacities and electrical characteristics indicated on the drawings.

4. Cabinet: Galvanized steel with baked enamel finish, glass fiber insulation and reflective liner.
5. Supply Fan: Propeller type, rubber mounted with direct drive motor.
6. Nozzle/Louvers: 30 degree downturn nozzle with horizontal and vertical louvers.
7. Heat Exchanger: Stainless steel, welded construction.
8. Gas Burner: Atmospheric type with combination gas valve and pressure regulator, manual shut-off, pilot valve, electronic pilot ignition, and thermocouple pilot safety device.
9. Operating Controls: Low voltage, adjustable room thermostat controls burner; high limit control with fixed stop de-energizes burner on high bonnet temperature. Control supply fan in accordance with bonnet temperature. Include manual switch for continuous fan operation.

PART 3 - EXECUTION

A. INSTALLATION

1. Install in accordance with manufacturer's instructions.

PART 4 - MEASUREMENT AND PAYMENT

- A. Furnishing and installing gas fired heating units shall be measured on the basis of per each installation. Payment shall be made at the unit price per unit installed. Payment shall include furnishing, installing, testing, and balancing.

END OF SECTION 15620

**CATEGORY 1600
ELECTRICAL SYSTEMS**

SECTION 16050 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

A. DEFINITIONS

1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

B. SUBMITTALS

1. Product Data: For sleeve seals.

C. COORDINATION

1. Coordinate arrangement, mounting, and support of electrical equipment:
 - a. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
 - b. To provide for ease of disconnecting the equipment with minimum interference to other installations.
 - c. To allow right of way for piping and conduit installed at required slope.
 - d. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.
2. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
3. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Frames."
4. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."."

PART 2 - PRODUCTS

A. SLEEVES FOR RACEWAYS AND CABLES

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
2. Sleeves for Rectangular Openings: Galvanized sheet steel.
 - a. Minimum Metal Thickness:
 - i. For sleeve cross-section rectangle perimeter less than 50 inches and no side more than 16 inches, thickness shall be 0.052 inch.
 - ii. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches and 1 or more sides equal to, or more than, 16 inches, thickness shall be 0.138 inch.

B. SLEEVE SEALS

1. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - i. Advance Products & Systems, Inc.
 - ii. Calpico, Inc.
 - iii. Metraflex Co.
 - iv. Pipeline Seal and Insulator, Inc.
 - b. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
 - c. Pressure Plates: Stainless steel. Include two for each sealing element.
 - d. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

C. GROUT

1. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

A. COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

1. Comply with NECA 1.
2. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
3. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
4. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
5. Right of Way: Give to piping systems installed at a required slope.

B. SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

1. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
2. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
3. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
4. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
5. Cut sleeves to length for mounting flush with both surfaces of walls.
6. Extend sleeves installed in floors 2 inches above finished floor level.
7. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable, unless indicated otherwise.
8. Seal space outside of sleeves with grout for penetrations of concrete and masonry

Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

9. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants."
10. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."
11. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
12. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
13. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

C. SLEEVE-SEAL INSTALLATION

1. Install to seal exterior wall penetrations.
2. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

D. FIRESTOPPING

1. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

PART 4 - MEASUREMENT AND PAYMENT

Not applicable

END OF SECTION 16050

**CATEGORY 1600
ELECTRICAL SYSTEMS**

SECTION 16060 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

A. SUBMITTALS

1. Product Data: For each type of product indicated.
2. Informational Submittals: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:
 - a. Ground rods.
 - b. Ground rings.
 - c. Grounding arrangements and connections for separately derived systems.
 - d. Grounding for sensitive electronic equipment.
3. Qualification Data: For qualified testing agency and testing agency's field supervisor.
4. Field quality-control reports.

B. QUALITY ASSURANCE

4. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
5. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 – PRODUCTS

A. CONDUCTORS

1. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
2. Bare Copper Conductors:
 - a. Solid Conductors: ASTM B 3.
 - b. Stranded Conductors: ASTM B 8.

- c. Tinned Conductors: ASTM B 33.
- d. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
- e. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
- f. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
- g. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

3. Bare Grounding Conductor and Conductor Protector for Wood Poles:

- a. No. 4 AWG minimum, soft-drawn copper.
- b. Conductor Protector: Half-round PVC or wood molding; if wood, use pressure-treated fir, cypress, or cedar.

B. CONNECTORS

1. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
2. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, pressure type with at least two bolts.
 - a. Pipe Connectors: Clamp type, sized for pipe.
3. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

PART 3 - EXECUTION

A. APPLICATIONS

1. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
2. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.
3. Conductor Terminations and Connections:

- a. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
- b. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
- c. Connections to Ground Rods at Test Wells: Bolted connectors.
- d. Connections to Structural Steel: Welded connectors.

B. GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

1. Comply with IEEE C2 grounding requirements.
2. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.
3. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.

C. EQUIPMENT GROUNDING

1. Install insulated equipment grounding conductors with all feeders and branch circuits.
2. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
 - a. Feeders and branch circuits.
 - b. Single-phase motor and appliance branch circuits.
 - c. Three-phase motor and appliance branch circuits.
 - d. Flexible raceway runs.
 - e. Armored and metal-clad cable runs.
 - f. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.

3. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.
4. Signal and Communication Equipment: In addition to grounding and bonding required by NFPA 70, provide a separate grounding system complying with requirements in TIA/ATIS J-STD-607-A.
 - a. For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
 - b. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

D. INSTALLATION

1. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
2. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
 - a. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 - b. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
 - c. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
3. Grounding and Bonding for Piping:
 - a. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main

water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

- b. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
 - c. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
4. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

E. LABELING

1. Comply with requirements in Division 16 Section "Identification for Electrical Systems" Article for instruction signs. The label or its text shall be green.
2. Install labels at the telecommunications bonding conductor and grounding equalizer and at the grounding electrode conductor where exposed.
 - a. Label Text: "If this connector or cable is loose or if it must be removed for any reason, notify the facility manager."

F. FIELD QUALITY CONTROL

1. Tests and Inspections:
 - a. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
 - b. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
 - c. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at individual ground rods. Make tests at ground rods before any conductors are connected.
 - i. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - ii. Perform tests by fall-of-potential method according to IEEE 81.



- d. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations

of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

2. Grounding system will be considered defective if it does not pass tests and inspections.
3. Prepare test and inspection reports.
4. Report measured ground resistances that exceed the following values:
 - a. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 25 ohms.
5. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

PART 4 - MEASUREMENT AND PAYMENT

Not applicable

END OF SECTION 16060

**CATEGORY 1600
ELECTRICAL SYSTEMS**

SECTION 16073 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

A. DEFINITIONS

1. EMT: Electrical metallic tubing.
2. IMC: Intermediate metal conduit.
3. RMC: Rigid metal conduit.

B. PERFORMANCE REQUIREMENTS

1. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
2. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
3. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
4. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

C. SUBMITTALS

1. Product Data: For the following:
 - a. Steel slotted support systems.
 - b. Nonmetallic slotted support systems.
2. Shop Drawings: Show fabrication and installation details and include calculations for the following:
 - a. Trapeze hangers. Include Product Data for components.
 - b. Steel slotted channel systems. Include Product Data for components.

- c. Nonmetallic slotted channel systems. Include Product Data for components.
- d. Equipment supports.

3. Welding certificates.

D. QUALITY ASSURANCE

- 1. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- 2. Comply with NFPA 70.

E. COORDINATION

- 1. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.
- 2. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

PART 2 - PRODUCTS

A. SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- 1. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
 - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - i. Allied Tube & Conduit.
 - ii. Cooper B-Line, Inc.; a division of Cooper Industries.
 - iii. ERICO International Corporation.
 - iv. GS Metals Corp.
 - v. Thomas & Betts Corporation.
 - vi. Unistrut; Tyco International, Ltd.
 - vii. Wesanco, Inc.
 - b. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.

- c. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 - d. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 - e. Channel Dimensions: Selected for applicable load criteria.
2. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16-inch diameter holes at a maximum of 8 inches o.c., in at least 1 surface.
 - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - i. Allied Tube & Conduit.
 - ii. Cooper B-Line, Inc.; a division of Cooper Industries.
 - iii. Fabco Plastics Wholesale Limited.
 - iv. Seasafe, Inc.
 - b. Fittings and Accessories: Products of channel and angle manufacturer and designed for use with those items.
 - c. Fitting and Accessory Materials: Same as channels and angles, except metal items may be stainless steel.
 - d. Rated Strength: Selected to suit applicable load criteria.
3. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
4. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
5. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
6. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
7. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

- a. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - i. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Hilti Inc.
 - 2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 3) MKT Fastening, LLC.
 - 4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.
 - b. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
 - i. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Cooper B-Line, Inc.; a division of Cooper Industries.
 - 2) Empire Tool and Manufacturing Co., Inc.
 - 3) Hilti Inc.
 - 4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 5) MKT Fastening, LLC.
 - c. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
 - d. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
 - e. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
 - f. Toggle Bolts: All-steel springhead type.
 - g. Hanger Rods: Threaded steel.
- B. FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES
- 1. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
 - 2. Materials: Comply with requirements in Division 05 Section "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

A. APPLICATION

1. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
2. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
3. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 - a. Secure raceways and cables to these supports with two-bolt conduit clamps.
4. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

B. SUPPORT INSTALLATION

1. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
2. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.
3. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
4. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - a. To Wood: Fasten with lag screws or through bolts.
 - b. To New Concrete: Bolt to concrete inserts.

- c. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - d. To Existing Concrete: Expansion anchor fasteners.
 - e. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
 - f. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
 - g. To Light Steel: Sheet metal screws.
 - h. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.
5. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.
- C. INSTALLATION OF FABRICATED METAL SUPPORTS
- 1. Comply with installation requirements in Division 05 Section "Metal Fabrications" for site-fabricated metal supports.
 - 2. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
 - 3. Field Welding: Comply with AWS D1.1/D1.1M.
- D. CONCRETE BASES
- 1. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
 - 2. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Division 03 Section "Cast-in-Place Concrete."
 - 3. Anchor equipment to concrete base.



- a. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

E. PAINTING

1. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - a. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
2. Touchup: Comply with requirements in Division 09 painting Sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
3. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

PART 4 - MEASUREMENT AND PAYMENT

Not applicable

END OF SECTION 16073

**CATEGORY 1600
ELECTRICAL SYSTEMS**

SECTION 16075 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

A. SUBMITTALS

1. Product Data: For each electrical identification product indicated.
2. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.
3. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

B. QUALITY ASSURANCE

1. Comply with ANSI A13.1 and IEEE C2.
2. Comply with NFPA 70.
3. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
4. Comply with ANSI Z535.4 for safety signs and labels.
5. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

C. COORDINATION

1. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.
2. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
3. Coordinate installation of identifying devices with location of access panels and doors.
4. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

A. POWER RACEWAY IDENTIFICATION MATERIALS

1. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.
2. Colors for Raceways Carrying Circuits at 600 V or Less:
 - a. Black letters on an orange field.
 - b. Legend: Indicate voltage.
3. Self-Adhesive Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
4. Snap-Around Labels for Raceways Carrying Circuits at 600 V or Less: Slit, pre-tensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
5. Write-On Tags: Polyester tag, 0.010 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
 - a. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
 - b. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

B. ARMORED AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

1. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
2. Colors for Raceways Carrying Circuits at 600 V and Less:
 - a. Black letters on an orange field.
 - b. Legend: Indicate voltage.
3. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

1. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
2. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
3. Write-On Tags: Polyester tag, 0.010 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
 - a. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
4. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

D. CONDUCTOR IDENTIFICATION MATERIALS

1. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 wide.
2. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
3. Snap-Around Labels: Slit, pre-tensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
4. Write-On Tags: Polyester tag, 0.010 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
 - a. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

E. FLOOR MARKING TAPE

1. 2-inch- wide, 5-mil pressure-sensitive vinyl tape, with black and white stripes and clear vinyl overlay.

F. UNDERGROUND-LINE WARNING TAPE

1. Tape:

- a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
- b. Printing on tape shall be permanent and shall not be damaged by burial operations.
- c. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

2. Color and Printing:

- a. Comply with ANSI Z535.1 through ANSI Z535.5.
- b. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE,.
- c. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE.

3. Tag: Type I:

- a. Pigmented polyolefin, bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
- b. Thickness: 4 mils.
- c. Weight: 18.5 lb/1000 sq. ft.
- d. 3-Inch Tensile According to ASTM D 882: 30 lbf, and 2500 psi.

G. WARNING LABELS AND SIGNS

1. Comply with NFPA 70 and 29 CFR 1910.145.

2. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

3. Baked-Enamel Warning Signs:

- a. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
- b. 1/4-inch grommets in corners for mounting.
- c. Nominal size, 7 by 10 inches.

4. Warning label and sign shall include, but are not limited to, the following legends:

- a. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
- b. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

H. INSTRUCTION SIGNS

1. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. inches and 1/8 inch thick for larger sizes.
 - a. Engraved legend with black letters on white face.
 - b. Punched or drilled for mechanical fasteners.
 - c. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.
2. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch.

I. EQUIPMENT IDENTIFICATION LABELS

1. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

J. CABLE TIES

1. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.
 - a. Minimum Width: 3/16 inch.
 - b. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
 - c. Temperature Range: Minus 40 to plus 185 deg F.
 - d. Color: Black except where used for color-coding.
2. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking.
 - a. Minimum Width: 3/16 inch.
 - b. Tensile Strength at 73 deg F, According to ASTM D 638: 7000 psi.
 - c. UL 94 Flame Rating: 94V-0.
 - d. Temperature Range: Minus 50 to plus 284 deg F.
 - e. Color: Black.

K. MISCELLANEOUS IDENTIFICATION PRODUCTS

1. Paint: Comply with requirements in Division 09 painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).
2. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

A. INSTALLATION

1. Verify identity of each item before installing identification products.
2. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
3. Apply identification devices to surfaces that require finish after completing finish work.
4. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
5. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
6. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
7. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.
8. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:
 - a. Outdoors: UV-stabilized nylon.
 - b. In Spaces Handling Environmental Air: Plenum rated.
9. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.
10. Painted Identification: Comply with requirements in Division 09 painting Sections for surface preparation and paint application.

B. IDENTIFICATION SCHEDULE

1. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30A, and 120V to ground: Identify with self-adhesive vinyl label. Install labels at 10-foot maximum intervals.
2. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:
 - a. Emergency Power.
 - b. Power.
 - c. UPS.
3. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
 - a. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded branch-circuit conductors.
 - i. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
 - ii. Colors for 208/120-V Circuits:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - iii. Colors for 480/277-V Circuits:
 - 1) Phase A: Brown.
 - 2) Phase B: Orange.
 - 3) Phase C: Yellow.
 - iv. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
4. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.
5. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

- a. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
 - b. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
 - c. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.
6. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.
- a. Limit use of underground-line warning tape to direct-buried cables.
 - b. Install underground-line warning tape for both direct-buried cables and cables in raceway.
7. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.
- a. Comply with 29 CFR 1910.145.
 - b. Identify system voltage with black letters on an orange background.
 - c. Apply to exterior of door, cover, or other access.
 - d. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:
 - i. Power transfer switches.
 - ii. Controls with external control power connections.
8. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
9. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
- a. Labeling Instructions:
 - i. Indoor Equipment: Self-adhesive, engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where two lines of text are required, use labels 2 inches high.

- ii. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
 - iii. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
 - iv. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.
- b. Equipment to Be Labeled:
- i. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer.
 - ii. Enclosures and electrical cabinets.
 - iii. Access doors and panels for concealed electrical items.
 - iv. Enclosed switches.
 - v. Enclosed circuit breakers.
 - vi. Enclosed controllers.
 - vii. Contactors.
 - viii. Remote-controlled switches, dimmer modules, and control devices.

PART 4 - MEASUREMENT AND PAYMENT

Not applicable

END OF SECTION 16075

**CATEGORY 1600
ELECTRICAL SYSTEMS**

**SECTION 16120 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND
CABLES**

PART 1 - GENERAL

A. DEFINITIONS

1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

B. SUBMITTALS

1. Product Data: For each type of product indicated.
2. Qualification Data: For testing agency.
3. Field quality-control test reports.

C. QUALITY ASSURANCE

1. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
 - a. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
2. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
3. Comply with NFPA 70.

D. COORDINATION

1. Set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

PART 2 - PRODUCTS

A. CONDUCTORS AND CABLES

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Alcan Products Corporation; Alcan Cable Division.
 - b. American Insulated Wire Corp.; a Leviton Company.
 - c. General Cable Corporation.
 - d. Senator Wire & Cable Company.
 - e. Southwire Company.
2. Copper Conductors: Comply with NEMA WC 70.
3. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN for indoor use and XHHW for outdoor and underground use.
4. Multiconductor Cable: Comply with NEMA WC 70 for metal-clad cable, Type MC with ground wire.

B. CONNECTORS AND SPLICES

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. AFC Cable Systems, Inc.
 - b. Hubbell Power Systems, Inc.
 - c. O-Z/Gedney; EGS Electrical Group LLC.
 - d. 3M; Electrical Products Division.
 - e. Tyco Electronics Corp.
2. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

C. SLEEVES FOR CABLES

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
3. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch thickness as indicated and of length to suit application.
4. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

D. SLEEVE SEALS

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Metraflex Co.
 - d. Pipeline Seal and Insulator, Inc.
2. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.
 - a. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
 - b. Pressure Plates: Plastic. Include two for each sealing element.
 - c. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

PART 3 - EXECUTION

A. CONDUCTOR MATERIAL APPLICATIONS

1. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
2. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE
APPLICATIONS AND WIRING METHODS

1. Exposed Branch Circuits, Including in Crawlspace: Type THHN-THWN, single conductors in raceway.
2. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway or Metal-clad cable, Type MC.
3. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW, single conductors in raceway.
4. Class 1 Control Circuits: Type THHN-THWN, in raceway.
5. Class 2 Control Circuits: Type THHN-THWN, in raceway.

C. INSTALLATION OF CONDUCTORS AND CABLES

1. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
2. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
3. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
4. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
5. Support cables according to Division 16 Section "Hangers and Supports for Electrical Systems."
6. Identify and color-code conductors and cables according to Division 16 Section "Identification for Electrical Systems."

D. CONNECTIONS

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
2. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
 - a. Use oxide inhibitor in each splice and tap conductor for aluminum conductors.
3. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

E. SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

1. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."
2. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
3. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
4. Rectangular Sleeve Minimum Metal Thickness:
 - a. For sleeve rectangle perimeter less than 50 inches and no side greater than 16 inches, thickness shall be 0.052 inch.
 - b. For sleeve rectangle perimeter equal to, or greater than, 50 inches and 1 or more sides equal to, or greater than, 16 inches, thickness shall be 0.138 inch.
5. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
6. Cut sleeves to length for mounting flush with both wall surfaces.
7. Extend sleeves installed in floors 2 inches above finished floor level.
8. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
9. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.
10. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and cable, using joint sealant appropriate for size, depth, and location of joint according to Division 07 Section "Joint Sealants."
11. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at cable penetrations. Install sleeves and seal with firestop materials according to Division 07 Section "Penetration Firestopping."
12. Roof-Penetration Sleeves: Seal penetration of individual cables with flexible boot-type flashing units applied in coordination with roofing work.
13. Aboveground Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeves to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
14. Underground Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch annular clear space between cable and sleeve for installing mechanical sleeve seals.

F. SLEEVE-SEAL INSTALLATION

1. Install to seal underground exterior-wall penetrations.
2. Use type and number of sealing elements recommended by manufacturer for cable material and size. Position cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

G. FIRESTOPPING

1. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Division 07 Section "Penetration Firestopping."

H. FIELD QUALITY CONTROL

1. Perform tests and inspections and prepare test reports.
2. Tests and Inspections:
 - a. After installing conductors and cables and before electrical circuitry has been energized, test for compliance with requirements.
 - b. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
3. Test Reports: Prepare a written report to record the following:
 - a. Test procedures used.
 - b. Test results that comply with requirements.
 - c. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
4. Remove and replace malfunctioning units and retest as specified above.

PART 4 - MEASUREMENT AND PAYMENT

Not applicable

END OF SECTION 16120

**CATEGORY 1600
ELECTRICAL SYSTEMS**

SECTION 16410 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

A. DEFINITIONS

1. NC: Normally closed.
2. NO: Normally open.
3. SPDT: Single pole, double throw.

B. PERFORMANCE REQUIREMENTS

1. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

C. SUBMITTALS

1. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
 - a. Enclosure types and details for types other than NEMA 250, Type 1.
 - b. Current and voltage ratings.
 - c. Short-circuit current ratings (interrupting and withstand, as appropriate).
 - d. Include evidence of NRTL listing for series rating of installed devices.
 - e. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
 - f. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

2. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.
 - a. Wiring Diagrams: For power, signal, and control wiring.
3. Manufacturer's field service report.
4. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
 - a. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
 - b. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

D. QUALITY ASSURANCE

1. Testing Agency Qualifications: Member company of NETA or an NRTL.
 - a. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.
2. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.
3. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
4. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
5. Comply with NFPA 70.

E. PROJECT CONDITIONS

1. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 - a. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.



- b. Altitude: Not exceeding 6600 feet.

2. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

- a. Notify Owner no fewer than seven days in advance of proposed interruption of electric service.
- b. Indicate method of providing temporary electric service.
- c. Do not proceed with interruption of electric service without Owner's written permission.
- d. Comply with NFPA 70E.

F. COORDINATION

- 1. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

G. EXTRA MATERIALS

- 1. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - a. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
 - b. Fuse Pullers: Two for each size and type.

PART 2 - PRODUCTS

A. FUSIBLE SWITCHES

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - b. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - c. Siemens Energy & Automation, Inc.
 - d. Square D; a brand of Schneider Electric.

2. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
3. Accessories:
 - a. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 - b. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 - c. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
 - d. Lugs: Mechanical type, suitable for number, size, and conductor material.

B. NONFUSIBLE SWITCHES

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - b. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - c. Siemens Energy & Automation, Inc.
 - d. Square D; a brand of Schneider Electric.
2. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
3. Accessories:
 - a. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 - b. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 - c. Lugs: Mechanical type, suitable for number, size, and conductor material.

PART 3 - EXECUTION

A. EXAMINATION

1. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

B. INSTALLATION

1. Install individual circuit breakers with tops at uniform height unless otherwise indicated.
2. Comply with mounting and anchoring requirements specified in Division 16 Section "Vibration and Seismic Controls for Electrical Systems."
3. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
4. Install fuses in fusible devices.
5. Comply with NECA 1.

C. IDENTIFICATION

1. Comply with requirements in Division 16 Section "Identification for Electrical Systems."
 - a. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 - b. Label each enclosure with engraved metal or laminated-plastic nameplate.

D. FIELD QUALITY CONTROL

1. Tests and Inspections:
 - a. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - b. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 - c. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
2. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.



3. Prepare test and inspection reports. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

E. ADJUSTING

1. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

PART 4 - MEASUREMENT AND PAYMENT

Not applicable

END OF SECTION 16410