A pre-bid meeting will be held on Wednesday, July 14, 2021 at 9:00 a.m. EST via Webex teleconference phone number 1-415-655-0001 and access code number 172 721 9414.

MBE/WBE Requirements and Forms See Pages 849 through 863 to be completed and submitted at the time of Bid Opening.
THIS PROPOSAL FORM INCLUDES AND INCORPORATES ALL DOCUMENTS AND
INFORMATION REFLECTED, LISTED, AND/OR REFERENCED IN THIS
TABLE OF CONTENTS, AND ALL SUCH DOCUMENTS AND INFORMATION ARE PART
OF AND INCORPORATED INTO THE CONTRACT DOCUMENTS.

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SECTION I

INFORMATION FOR BIDDERS

ELECTRONIC SUBMITTAL PROCESS

To be considered, Bids (Section V – Proposal) shall be received by the bid closing date and time to the following email address dpwbid@baltimorecountymd.gov. The contract number and company name should be referenced in the Subject Line of the email. Bids may not be submitted by any other means. Bids that are mailed or otherwise delivered to the Purchasing Division (including emails which indicate links to locations where the bid may be downloaded) and/or emails sent to any other Baltimore County email address will not be accepted.

Late Bids will not be considered. Bidders are strongly encouraged not to wait until the last minute to submit bids. The time stated on the auto-receipt (described below) will be definitive of the time of receipt. Bids received after the deadline will not be accepted. Bidders are advised that the County cannot receive email attachments greater in size than twenty-five (25) megabytes and this size limitation may be further reduced by requirements of the Bidder’s email provider which are beyond the control of the County. Bidder should consider separating any large bid attachment into multiple parts and emailing each part separately. In such case, Bidder will note that each email is 1 of 2, 2 of 2, etc. Multiple part bids will not be considered unless all parts are received by the bid closing date and time.

After submitting a Bid to dpwbid@baltimorecountymd.gov, and upon successful receipt by the County thereof, Bidder will receive an auto-receipt email. This receipt is proof that the bid has been received by the Division of Construction Contracts Administration and should be retained for Bidder’s records. In the case of a bid submitted in multiple parts as described above, an auto-receipt email will be generated for each part. The County has no obligation to consider any Bid for which an auto-receipt was not generated.

As with any system, power outages or technology problems may arise that are outside of the County’s control and could affect your submission. The County will not be held accountable for such issues that may delay the transmission of any Bid.

NOTE: Electronic copy of the Bid Bond will be accepted at bid opening. The apparent low bidder is required to submit the original Bid Bond within ten (10) days after the bid opening to the Division of Construction Contracts Administration, 111 West Chesapeake Avenue, Room 300B, Towson, Maryland 21204.

INSTRUCTIONS AND SPECIFICATIONS

Refer to the enclosed proposal sheets for quantities to be bid upon. All proposals submitted on the attached form must give the price in clear figures for each item of the proposed work and be signed by the bidder with his name and address. Bidders must not change any item in the proposal for which a price has been stipulated by the County. Any change will cause rejection of the proposal.

Revised 5/18/2020
NOTE: STATEMENT UNDER OATH FORM TO ACCOMPANY BID as per Baltimore County Purchasing Act 65-98, Section 15-94 and 15-95 which requires that the enclosed affidavit (see Proposal Affidavit pages in Section V) be completed and submitted as part of the sealed bid.

Proposals made on any other than the attached form will not be considered. All papers included in, bound thereto, or attached to the Proposal Form are necessary parts thereof and shall not be detached, separated, or altered in their intent.

Changes in the phraseology of the proposal, additions, or limiting provisions will render the proposal informal or void and may cause its rejection.

All right is hereby reserved by the Purchasing Agent to reject any or all proposals and to waive formalities and technicalities as the interest of the County may require.

No successful bidder may withdraw his bid within NINETY (90) days after the opening thereof.

The successful bidder will be required to be bonded to Baltimore County, Maryland to the sum of One Hundred per Cent (100%) of the amount of his proposal or proposals according to the form of bond hereto attached for projects in excess of $25,000.00.

This Proposal must be accompanied by a Bid Bond in an amount of 5% of the bid, the exact amount to be determined by the difference between the low bid and the next lowest bid if two or more bids are received, or 5% of the bid if one bid is received. This guarantees payment of the amount thus determined in case of a default in any matter specified as required before award or in any matter resulting in failure to execute and deliver an Agreement, together with Payment and Performance Bonds, after award. The Bid Bond must be in the form accompanying the Proposal executed by a Surety licensed in the State of Maryland. The Surety must be currently rated “B” or better by the A. M. Best Company, and the bid must be in an amount less than, or equal to, the underwriting limitation contained in Department of Treasury Circular 570 as amended at the time of the underwriting.

All work to be performed under this contract shall be done under strict compliance with Baltimore County Department of Public Works February 2000 Standard Specifications for Construction and Materials and April 2007 Standard Details for Construction and any and all proposed revisions thereto as of the date of advertisement and copies of which are on file and available in the Division of Construction Contracts Administration, County Office Building, Towson, Maryland, and all of which are made a part hereof and incorporated herein (collectively, the “Specifications”).

If the bidder to whom an award is made shall fail to execute the contract and bond hereto attached and as herein provided, the award may be annulled and the contract awarded to the lowest responsible bidder who has consented to a time extension, and such bidder shall fulfill every stipulation embraced herein as if he were the original party to whom the award was made, or the Purchasing Agent may reject all of the bids as the interest of the County may require.

The Bid Bond of the three lowest bidders is deemed to be effective until the execution and delivery of the Contract Agreement, together with Payment and Performance Bonds for projects in excess of $25,000.00 or until rejection of all bids, whereupon Surety is deemed relieved of all further obligations under the bid bonds provided.

Revised 5/18/2020
Bidders must examine the drawings and specifications carefully and must make a personal examination of the location and nature of the proposed work. In case doubt shall arise as to the meaning or intent of anything shown on the drawings or comprised in the specification, inquiry shall be made of the Director of Public Works & Transportation at least five (5) days prior to the date of bid opening. The submission of the Proposal shall indicate that the bidder thoroughly understands the drawings and the terms of the Specifications.

To better insure fair competition and to permit a determination of the lowest bidder, unresponsive bids or bids obviously unbalanced may be rejected by the Purchasing Agent.

Bidders are required to fill out the total price column and total their proposals so that the result of the bidding, barring possible arithmetical errors, will be known at once. Any errors in computations will be corrected by the Engineer when the proposals are canvassed. Where the unit price and the total price are at variance, the unit price will prevail.

Bidders must be prepared to complete the work within the time stated in the proposal.

NOTE: ONLY CONTRACTORS FORMALLY PRE-QUALIFIED WITHIN THE ADVERTISED WORK CLASSIFICATION BY THE DIRECTOR OF PUBLIC WORKS & TRANSPORTATION OF BALTIMORE COUNTY 10 CALENDAR DAYS PRIOR TO BID OPENING WILL BE ELIGIBLE TO SUBMIT BIDS.

Contracts for work under this proposal will obligate the contractors and subcontractors not to discriminate in employment practices. Bidders must, if requested, submit a compliance report concerning their employment practices and policies in order to maintain their eligibility to receive the award of the contract. Successful bidders must be prepared to comply in all respects with the Contract Provisions regarding nondiscrimination.

Baltimore County has adopted a Minority Business Enterprise (MBE) program and Women’s Business Enterprise (WBE) Program. The percentage of participation applies to the contract amount awarded to the Contractor. Qualified minority subcontractors are those certified as being a Minority Business Enterprise by the following:

1. Maryland Department of Transportation Certification Committee (MDOT)

2. City of Baltimore, Minority Business Certification Council

Projects funded by the Federal Highway Administration are limited to the certification listed under #1 (MDOT).

More detailed information regarding the County’s MBE/WBE Program can be obtained from the County MBE Office, telephone (410) 887-3407. See Executive Order dated June 4, 2009. MBE/WBE Participation Summary and Forms A, B, C, D and E enclosed in this proposal booklet.

NOTE: If you do not complete and submit the enclosed forms with your bid or offer to the County, the County may, in its sole discretion, deem your bid or offer NON-RESPONSIVE and accordingly the COUNTY WILL NOT CONSIDER YOU FOR CONTRACT AWARD.
The County reserves the right to require the low bidder to produce evidence indicating that the company’s financial condition is equal to, or better than, that enjoyed by the company at the time of prequalification. This additional information may be in the form of a financial statement or other evidence satisfactory to the Office of Budget & Finance.

Bidders’ attention is directed to the requirement that a permit must be obtained from the Baltimore County Bureau of Highways and Bureau of Traffic Engineering prior to cutting any County road for the purpose of obtaining sub-surface soils information, and permission must be obtained from the State Highways Administration prior to making any openings in a State road.

Under no circumstances shall a bidder enter upon any property outside a County or State road for the purpose of securing sub-surface soils information until permission is received from the property owner. The fact that the County has obtained a utility easement does not give the bidder the right to enter upon the property.

Prevailing index price of asphalt cement/ton $510.00.

**INCLEMENT WEATHER POLICY:** If Baltimore County General Government Offices are open or open with liberal leave the day the bids are due, the bids are due as stated in the bid documents (date and time). **ONLY** when the Baltimore County General Government Offices are **OFFICIALLY CLOSED** the day the bids are due, the bid date will be postponed and an Addendum will be issued the next business (or next day buildings are officially open) day the county offices are open with the new bid date and time.

**BID TABULATIONS:** All bid tabulations will be confidential until after final award, at which time the total bid amounts for all bidders, as well as the complete bid tabulations for the top three (3) bidders, can be inspected by others when requested in writing pursuant to the Maryland Public Information Act.

**ALTERNATIVE SOURCES OF CONTRACT BONDS:** In the event your company is unable to qualify for bonding through a traditional commercial surety company, you may qualify for the required bonds through the State of Maryland, Department of Commerce (DOC). The **Maryland Small Business Development Financing Authority (MSB DFA, pronounced Mis-Bid-Fa)**, an agency of DOC, operates a Surety Bond Program designed to assist small businesses, based in Maryland, that are unable to obtain adequate bonding on reasonable terms in the commercial marketplace. MSB DFA provides bid, payment and performance bonds for contracts funded by government agencies, regulated utilities and private entities. The penal sums of the bonds are limited to the aggregate amount of $2,500,000 and companies may pre-qualify for multiple bonds within pre-approved terms and conditions. MSB DFA also provides lines of credit, term loans and loan guarantees to help qualified businesses purchase equipment and real property, make improvements to leased property, refinance existing debt and assist them with their working capital needs. For more information on how to apply, you may contact: Meridian Management Group, Inc. (MMG), (the Program’s Manager), 826 E. Baltimore Street, Baltimore, Maryland 21202, Telephone: (410) 333-4270. Or visit their website at [www.mmggroup.com](http://www.mmggroup.com) for information, applications and a checklist of required documents and reports that must accompany the application.

Revised 5/18/2020
SECTION II

Interim Supplemental Specifications
to the
Standard Specifications for Construction and Materials

This contract shall include by reference the documents known as Supplemental Specifications, the contents of which shall be incorporated in their entirety herein and are in effect for all contracts bid after February 5, 2013:

1. General Conditions Building Projects, last revised March 2010.


3. #1. and #2. are collectively known as the “Supplemental Specifications.”


In the event of a conflict between the Supplemental Specifications and the February 2000 Standard Specifications for Construction and Materials and Standard Details for Construction, the Supplemental Specifications shall control.

These documents are subject to change and amendment. It is the responsibility of the parties to this contract to be aware of these Supplemental Specifications. These documents are available for review either (1) at the Department of Public Works, Division of Construction Contracts Administration, County Office Building, Room 300B, 111 West Chesapeake Avenue, Towson, MD 21204 – Phone (410) 887-3531 or (2) on our website at www.baltimorecountymd.gov/Agencies/publicworks/standardsandspecs/specsanddetails.html
• REVISION to GP-7.11 Preservation and restoration of Property, Paragraph (a) of the Standard Specifications Pages 65 and 66.
  a. The Contractor shall not enter upon public or private property (out-side of the right-of-way or project area) for any purpose without obtaining written permission and he/she shall be responsible for the preservation of all public and private property, trees, monuments, signs and markers and fences thereon, and shall use every precaution necessary to prevent damage or injury thereto. The Contractor shall take suitable precaution to prevent damage to underground or overhead public utility structures. THE CONTRACTOR SHALL PROTECT CAREFULLY FROM DISTURBANCE OF ALL LAND MONUMENTS AND PROPERTY MARKS LOCATED ON THE CONTRACT DRAWINGS OR FOUND IN THE FIELD. IF DAMAGED OR DISTURBED THEY SHALL BE RESET BY A LICENSED SURVEYOR AT THE CONTRACTORS EXPENSE.

• REVISION to GP 7.29 MINORITY BUSINESS ENTERPRISE AND AFFIRMATIVE ACTION of the Standard Specifications Pages 75 to 82 and Pages 10 and 11 of Addendum #3 of the Standard Specifications.

• GP 7.29.01 County Policy: It is the policy of the County that MBE's and WBE's, as defined by the most recent County Executive Order and as further described in the Contract Documents, shall have the maximum opportunity to participate in the performance of capital improvement contracts financed by County capital funds and/or County operating funds, in accordance with the most recent County Executive Order. The Contractor shall comply with all MBE/WBE requirements as set forth in the Contract Documents.

• GP 7.29.02 through 7.29.25: Superceded by Executive Order Dated June 4, 2009.

• ADDITION to Section 303.03, Pipe Culvert Construction of the Standard Specifications, Page 227, requiring inspection of interiors of new sewers 12” or larger in diameter with closed circuit TV cameras:

303.03.10 TV Inspection. Contractors shall be required to conduct closed circuit television (CCTV) internal inspections of all new storm drain and culvert construction 12” and larger in diameter or span. This inspection will document and identify any system defects and provide the County with a record of the condition of the storm drain at completion of construction.

The entire length of the pipe shall be shown, and close-up views taken of the entire inner circumference of each pipe joint. Structures occurring along the pipeline shall also be examined on each interior face. Whenever possible, TV inspection shall be done under conditions of minimum or no flow within the pipe system.

The CCTV inspections shall be performed in accordance with Specification Guidelines: Wastewater Collection Systems Maintenance and Rehabilitation prepared by the National Association of Sewer Service Companies (NASSCO) and the Handbook: Sewer Infrastructure Analysis and Rehabilitation, EPA/625/6-91/030, October, 1991.

The CCTV records, including all logs, photographs and videotape/DVD records, shall be provided to Baltimore County’s Bureau of Engineering and Construction, Storm Drain Design Section, for review prior to final acceptance of the construction. Upon approval, the tapes will be forwarded to the Bureau of Utilities for their use.
• ADDITION to Section 1007.03.02, Acceptance Testing of the Standard Specifications, Page 759, requiring inspection of interiors of new sewers 8" or larger in diameter with closed circuit TV cameras:

(e) TV Inspection. Contractors shall be required to conduct closed circuit television (CCTV) internal inspections of all new sewer construction of 8" and larger pipelines. This inspection will document and identify any system defects and provide the County with a record of the condition of the sewer at completion of construction.

The CCTV inspections shall be performed in accordance with Specification Guidelines: Wastewater Collection System Maintenance and Rehabilitation prepared by the National Association of Sewer Service Companies (NASSCO) and the Handbook: Sewer Infrastructure Analysis and Rehabilitation, EPA/625/6-91/030, October, 1991.

The CCTV records, including all logs, photographs and videotape/DVD records, shall be provided to Baltimore County's Bureau of Engineering and Construction, Sewer Design Section, and the Bureau of Utilities for review prior to final acceptance of the construction.

The following changes are made to page 6 of the Consolidated ADDENDUM (#3) to the Standard Specifications for Construction and Materials dated February, 2007:

Section GP-2.20 Tie Bids, page 34, (b) Award, last sentence, replace County Code Section in brackets with new numbered reference:

For further options on the bids and the definition of a qualified minority, refer to Baltimore County Code, [Section 15-84(6)] Section 10.2-406(d)(1).

Revise Section 901.01, Aggregates, page 601:
This section covers the material details, quality requirements and test methods applicable to aggregates. Grading requirements are outlined in Tables 901A and 901C; Physical properties in 901 B and 901 D. Force drying may be used in the preparation of samples for grading tests conducted in the field. Quarrries providing material to Baltimore County Projects must be approved by Maryland State Highway Administration and listed in the current MSHA Aggregate Bulletin.

Revise Section 902.10.03, Portland Cement Concrete Mixtures, page 618:
All Portland Cement Concrete mix designs used on Baltimore County projects must have been approved by the Maryland State Highway Administration (MDSHA). The MSHA mix design approval number must be included on all load tickets. The concrete mixes shall conform to the following:

Revise Section 904.04.02, Mix Design, page 632:
The contractor shall develop a Superpave mix design in conformance with R35. All HMA material used on Baltimore County projects must be Maryland State Highway Administration (MDSHA) approved mixes. HMA Superpave mixes shall conform to the specification for Superpave Volumetric Mix Design, M323, and shall be designed for Equivalent Single Axle Loading (ESAL) range specified in the Contract Documents.

The contractor may elect to use...

Revise Section 915.01.01, Approval, page 676:
The plant from which the Contractor proposes to obtain material [will be approved by the Regional Engineer before starting deliveries.] to be used on Baltimore County projects must have been approved by the Maryland State Highway Administration (MDSHA).

Rev. 11/09
Revise Section 915.02, HOT MIX ASPHALT (HMA) PLANTS, page 678:
All plants providing HMA material to Baltimore County projects must be approved by Maryland State Highway Administration (MDSHA) and conform to M 156 except as modified in 915.01 and the following:

Revise Section 915.03.05, Certified Concrete Plant, page 681:
Concrete plants providing material to Baltimore County Projects must be certified by the Maryland State Highway Administration (MDSHA) and must satisfy all criteria outlined in the Maryland Standard Specifications for Construction and Materials (latest edition). The producer shall be responsible for quality control of plant operations to assure that the material conforms to Specification requirements. The quality control process will be subject to unannounced periodic inspection by representatives of the Regional Engineer. Full participation in the inspection by the plant's certified technician will be required.

The following changes are made to the "Sanitary Sewer Details Index Sheet, Standard Detail S-3, and Roads and Streets Details Index Sheet" of the Consolidated ADDENDUM (#3) to the Standard Details for Construction dated February, 2007.

7 D  Sanitary Sewer Details Index Sheet
7 E  Standard Detail S-3
7 F  Roads and Streets Details Index Sheet

Rev. 11/09
### Sanitary Sewer Standard Details

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Rev. 9/09
NOTE: TWIN CONNECTION MAY BE USED ON TOWNHOUSES ONLY. ANY OTHER USE MUST BE APPROVED BY THE DIRECTOR OF PUBLIC WORKS.
SEE PLATE S-12A & B

LIMIT OF PAYMENT

(LF) 6" D.I.P. & FITTINGS OR (LF) 6" P.V.C. W/ ADAPTOR

2- 1/8 D.I.P. BENDS

6" DUCTILE IRON PIPE & BRACE TO MAKE CONNECTION

D.I.P. "Y" BRANCH

D.I.P. "Y" BRANCH

2- 1/8 D.I.P. BENDS

6" DUCTILE IRON PIPE

D.I.P. "Y" BRANCH

SECTION 'A'-'A'

NOTES:

1. USE ALL DUCTILE IRON FITTINGS INCLUDING 6" DUCTILE IRON PIPE

2. TRENCH WIDTH PAYMENT SHALL BE PAID FROM CENTER LINE OF MAIN LINE TO END OF HOUSE CONNECTION. SEE DETAIL G-6 FOR TRENCH WIDTH.

3. MAIN LINE TO BE DUCTILE IRON PIPE.

4. STACK MUST REMAIN PLUMB DURING BACKFILLING.

5. NO STACK CONNECTIONS TO PVC MAIN. MIX #1 CONCRETE

Stack House Connection

Type "A"

Type "B"

DEPARTMENT OF PUBLIC WORKS SANITARY SEWER DETAILS STACK HOUSE CONNECTIONS

TSSUED: 10/25/90
REVISED: 1/25/91
REVISED: 10/20/91
REVISED: MAY 5, 2014

13
Maryland 24" x 9" Straight Wall Frame with Scalloped Flange & Water Tight BALTIMORE COUNTY County Sanitary Sewer Cover with Cam Lock
CAMPRESSON Assembly

For outside of roadway use.
Or Approved Equal.
Supersedes Detail S-13

PRELIMINARY
Submittal Number
NPR14-854A
Design Features
- Materials
  Frame
  Gray iron (CL35B)
  Cover
  Ductile iron (71-50-05)
- Design Load
  Heavy Duty
- Open Area
  N/A
- Coating
  Undipped
  -V Designates Machined Surface

Certification
- ASTM A48
- ASTM A538
- Country of Origin: USA

Major Components
WT1235901
WT1235904

Drawing Revision
2/10/2014  Designer: MAN
Revised By:

Disclaimer:
This design is in compliance with the Uniform Contact Standards and may be used as a guide. The user is responsible for reviewing the details necessary for the intended purpose.

Contact
ROG 1064832
416-287-7111
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<td>Rural Commercial Entr</td>
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<td>Valley Gutter-90Deglinter</td>
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<td>Accel.Lane(Min-Widening)</td>
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<td>Accel.Lane(Widened to PL)</td>
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<td>R-36A</td>
<td>Ped.Ramp/Median/Depressed</td>
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<td>Truncated Pedestrian Ramp</td>
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<td>Detectable Warnings</td>
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<td>R-36E</td>
<td>Pedestrian Bump-Out</td>
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<td>7&quot;Valley Gutter/Perp.Pkg</td>
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<td>Flexible Pkg.of Trenches</td>
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<td>Pavement Failure Repairs</td>
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<td>Hot-Mix Asphalt Paving</td>
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**REPAVING QUANTITIES SHOWN IN TONS PER LINEAR FOOT**

Graded Aggregate Base = 150 Lb./Cu.Ft.

Hot Mix Asphalt = 160 Lb./Cu.Ft.

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<tr>
<th>PIPE DIAMETER (INCHES)</th>
<th>12 INCH GRADED* AGGREGATE BASE (TONS / LINEAR FOOT)</th>
<th>2 INCH HOT MIX* ASPHALT PAVING (TONS / LINEAR FOOT)</th>
<th>3 INCH HOT MIX ASPHALT PAVING ** (TONS / LINEAR FOOT)</th>
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<tr>
<td>6&quot;</td>
<td>0.225</td>
<td>0.04</td>
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<td>8&quot;</td>
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<td>0.073</td>
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<td>108&quot;</td>
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**BRACING ADDITIVES**

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<th>SINGLE TIER</th>
<th>DOUBLE TIER</th>
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<tr>
<td>TRENCH WIDTH (W)</td>
<td>ADD 0.15</td>
<td>ADD 0.027</td>
</tr>
<tr>
<td>FINISHED PAVING WIDTH (P)</td>
<td>ADD 0.30</td>
<td>ADD 0.053</td>
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</tbody>
</table>

* BASED ON TRENCH WIDTH (W)
** BASED ON FINISHED PAVING WIDTH (P)
If the Contractor elects to bridge a trench or open cut excavation within paved areas of the Construction area with steel plates, it shall notify the Engineer forty-eight (48) hours in advance of placement of any steel plate(s). If multiple plate(s) are required to cover an open cut excavation, the Contractor shall also submit a detailed plan to the Engineer showing the placement of all steel plate(s), as well as any support system required, and this detailed plan shall be approved by the Engineer prior to any installation or use of steel plate(s) by the Contractor. If deemed necessary by the County, this plan may need to be sealed by a professional engineer, licensed in the State of Maryland.

The Contractor shall place proper signs at the locations of all steel plate(s) and such signs shall conform to MUTCD specifications. Spacing of any signs shall be determined by the field conditions and shall be approved by the Engineer.

All steel plates must be flat, at least one inch (1") thick, and held in place with pins. Steel plate(s) must be large enough to allow a minimum of one foot (1’) of bearing on three (3) sides of the trench or open cut excavation. Steel plate(s) are to be set as flush as possible with the road surface so there is no movement of the steel plate(s) when traversed by vehicles.

Bituminous concrete cold mix must be used on all edges of the steel plate(s) to minimize the hazard to the motoring public. Cold mix must be tapered from the height of the steel plate(s) to the existing road surface to provide a smooth transition for traveling vehicles.

If the steel plate(s) are to be left in any roadway longer than seven (7) calendar days, the steel plate(s) must be recessed as to be flush with the riding surface.

The Contractor must provide the Engineer with at least two (2) contact persons and corresponding phone numbers to respond to any emergencies or problems with any steel plate(s) and/or support system. Should an emergency or problem occur that requires immediate action, County forces shall correct such emergency or problem, and the County shall charge the Contractor for any costs incurred by the County.

Steel plates are considered incidental to any Contract Construction and/or Work. No County payment shall be made to the Contractor for the use or installation of any steel plate(s) or support system, or for any additional permanent or temporary trench repair required by the County.

Rev. 5/12
The new General Provisions (GP) and Terms and Conditions (TC) supersedes the Standard Specifications dated February 2000 and Addendums
GENERAL PROVISIONS

GP - SECTION 1
DEFINITIONS AND TERMS

GP-1.01 GENERAL

This volume is based on the Maryland Department of Transportation, State Highway Administration Standard Specifications for Construction and Materials dated July 2008, as amended in this volume. It has been prepared as the Manual of Standard Specifications under the authority of Section 32-4-404 of the Baltimore County Code, 2003, as amended from time to time.

Baltimore County has adopted a set of Standard Detail Drawings as its Manual of Standard Details that is published separately under the authority of Section 32-4-404 of the Baltimore County Code, 2003, as amended from time to time.

GP-1.02 ORGANIZATIONAL STRUCTURE

Reference to Specifications or procedures beginning with the letters M, R, or T shall be understood to be AASHTO.

Reference to Specifications or procedures beginning with the letters A, B, C, D, E, F, G, ES or P shall be understood to be ASTM.

GP-1.03 LANGUAGE

It shall be understood that when all such expressions such as “directed, specified, authorized, permitted, approval, acceptable or satisfactory” are used they are implicitly followed by the words “by the Engineer” or “to the Engineer”.

GP-1.04 ABBREVIATIONS

Wherever in these General Provisions or in other Contract Documents the following abbreviations are used, the meaning shall be as follows:

- **AAN**  
  American Association of Nurserymen

- **AAPA**  
  American Association of Port Authorities

- **AAR**  
  Association of American Railroads

- **AASHTO**  
  American Association of State Highway and Transportation Officials

- **ACI**  
  American Concrete Institute

- **AIA**  
  American Institute of Architects
AIEE   American Institute of Electrical Engineers
AISC   American Institute of Steel Construction
AIIS   American Iron and Steel Institute
ANSI   American National Standards Institute
ARA    American Railway Association
AREA   American Railway Engineering Association
ASCE   American Society of Civil Engineers
ASHRAE American Society of Heating, Refrigeration and Air-Conditioning Engineers
ASLA   American Society of Landscape Architects
ASME   American Society of Mechanical Engineers
ASTM   American Society for Testing and Materials
ATA    American Transit Association
AWWA   American Water Works Association
AWS    American Welding Society
AWPA   American Wood Preservers Association
AWG    American Wire Gauge
AGC    Associated General Contractors of America
bccmp  bituminous-coated corrugated metal pipe
bccmpa bituminous-coated corrugated metal pipe arch
B&S    Brown & Sharpe Wire Gauge
BOCA   Building Officials Code Administrators International
cip    cast iron pipe
cipx   cast iron soil pipe, extra strength
cmp    corrugated metal pipe
CPVC   Chlorinated Poly Vinyl Chloride
CSPA   Clay Sewer Pipe Association
COMAR  Code of Maryland Regulations
CRSI   Concrete Reinforcing Steel Institute
dip    ductile iron pipe
DIPRA  Ductile Iron Pipe Research Association
EEI    Edison Electric Institute
EIA    Electronic Industries Association
EPA    Environmental Protection Agency
FAA    Federal Aviation Administration, U.S. Department of Transportation
FCC    Federal Communications Commission
FHWA   Federal Highway Administration, U.S. Department of Transportation
FRA    Federal Railway Administration, U.S. Department of Transportation
FSS    Federal Specifications and Standards, General Services Administration
FTA    Federal Transit Administration
IEEE   Institute of Electrical and Electronic Engineers
IES    Illuminating Engineers Society
IMSA   International Municipal Signal Association
IPCEA  Insulated Power Cable Engineers Association
IRT    Institute for Rapid Transit
MBE    Minority Business Enterprise
MBMA   Metal Building Manufacturers Association

Revised
October 11, 2013
MDOT Maryland Department of Transportation
MSMT Maryland Standard Method of Tests (as developed by the State Highway Administration)
MUTCD Manual on Uniform Traffic Control Devices
MdMUTCD Maryland Manual on Uniform Traffic Control Devices
MdSHA Maryland State Highway Administration
NBFU National Board of Fire Underwriters
NBS National Bureau of Standards
NCHRP National Cooperative Highway Research Program
NEC National Electric Code
NESC National Electric Safety Code
NEMA National Electrical Manufacturers Association
NFPA National Fire Protection Association
NIST National Institute of Standards and Technology
OSHA Occupational Safety and Health Administration
PCA Portland Cement Association
pccep prestressed concrete cylinder pipe
PCI Precast Concrete Institute
PVC Poly Vinyl Chloride
QPL Qualified Products List
rccp reinforced concrete culvert pipe
rcep reinforced concrete sewer pipe
RLMI Reflector and Lamp Manufacturers’ Institute
RMA Rubber Manufacturers Association
SAE Society of Automotive Engineers
SAWP Society of American Wood Preservers
SHA State Highway Administration
SSPC Steel Structures Painting Council
ucpx unglazed clay pipe, extra strength
UL or ULI Underwriters Laboratories, Incorporated
UMTA Urban Mass Transportation Administration, U.S. Department of Transportation
USSG United States Standard Gauge
USSWG United States Steel Wire Gauge
WBE Women’s Business Enterprise

**GP-1.05 DEFINITIONS**

Wherever in these General Provisions or in other Contract Documents the following terms are used, the meaning shall be as follows:

**Additional Work** - Work not required or provided for in the original Contract.

**Administration** - Baltimore County, Maryland, a body corporate and politic.

**Administrator** - The Director of the Department.
Advertisement - The public announcement, as required by law, inviting any and all prequalified contractors to submit a Bid for Work to be performed or provided.

Agreement - The written agreement executed between the County and the successful Bidder covering the performance of the Work by which the Contractor is bound to perform the Work and by which the County is obligated to compensate the Contractor thereafter at a mutually established and accepted rate or price. The Agreement shall include all the documents listed under “Contract Documents”, as well as any written Contract Modification that is required to complete the Construction and completion of the Work in an acceptable manner, including any authorized extension thereof, all of which constitute one instrument and agreement. The Agreement shall be executed by the Contractor and the County as indicated by the signature of the Contractor’s duly and legally authorized representative and the County Executive or his/her legally authorized designee, with evidence thereof of review for legal sufficiency by the County’s Office of Law.

Alley - An established passageway for vehicles and pedestrians affording a secondary means of access in the rear to properties abutting on a street or Highway.

Approved Source of Supply - Listing prepared by the Department on a periodic basis and available on the Department’s website.

Architect and/or Design Engineer - The Maryland licensed and registered architect and/or design engineer under separate contract with the County to prepare the Plans and Contract Documents.

As-Built Drawings - A complete set of sealed and signed as-built Mylar record Contract Drawings that are based on the marked-up prints or red-lined drawings received from the applicable contractor, the shop drawings, any addenda, any change orders, any requests for information, and any other data utilized by the Contractor so as to provide a complete and accurate as-built record.

Award - The decision and notice given by the County of the acceptance of a Bid or Proposal. The successful Bidder understands and expects the County to substantially, materially and justifiably rely upon its Bid from the date of Award pending execution of the Agreement.

Baltimore County - Baltimore County, Maryland, a body corporate and politic.

Base Course - The one or more layers of specified material and thickness placed on a Subbase or a Subgrade to support a Surface Course.

Bid - A written submission including, but not limited to, price, terms of sale, and description of work technical expertise, work experience, and any other information requested in the Bid Package, offered by a Bidder to the County in response to the County’s Bid Package or request for Proposal.
Bid Bond - The security required and described in the Bid Package and GP-2.07 to be included in the Proposal and furnished by the Bidder as a guaranty of good faith to enter into a Contract with the County if the Work is Awarded to the Bidder.

Bid Form - The approved form included in the Bid Package and/or Proposal Form, on which the Administration requires the Bid to be set forth and submitted.

Bid Item - An item of Work specifically described and for which a price, either unit or lump sum, is required. It includes the performance of all Work described herein or described in any Supplemental Specifications or Special Provisions.

Bid Package – Includes, but is not limited to, the Standard Specifications and any Contract Document included and/or incorporated by reference therein, used by the County for soliciting and procuring Bids by competitive sealed Bid and/or requests for Proposals and/or small procurement procedures including, but not limited to, requests for quotations, requests for Bids, etc.

Bidder - A Person formally submitting a Bid for the Work, acting directly or through a duly and legally authorized representative.

Bridge - A structure including supports erected over a depression or an obstruction, such as water, Highway, or railway, and having a track or passageway for carrying traffic or other moving loads, and having an opening measured along the center of the Road of more than 20 feet between undercopings of abutments or spring lines of arches, or extreme ends of openings for multiple boxes; it may also include multiple pipes, where the clear distance between openings is less than half of the smaller contiguous opening. For lengths, all dimensions shall be parallel to the center line of the Road. The dimensions of handrails will not be taken into account in measuring bridge lengths. Any Bridge or Highway grade separation structure includes the connecting Highways, Substructure, Superstructure, Road approaches, entrance plazas, interchanges, overpasses, underpasses, and other Structures which the Administration may deem necessary together with all property rights, Easements, franchises, and interests acquired by the Administration for the Construction and operation of the Bridge.

Business - A corporation, partnership, individual, sole proprietorship, joint venture, or any other legal entity through which commercial activity is conducted.

Business Day - Every day shown on the calendar except Saturdays, Sundays and Holidays.

Calendar Date – The specific calendar date by which Contractor must achieve Full and Final Completion of the Work and all requirements under the Contract.

Calendar Day - Every day shown on the calendar, Saturdays, Sundays and Holidays included.

Certification - A document which states that the Material and/or Work complies with the applicable specifications and includes the actual test results to confirm the statement. The contents of the Certification shall be on the contractor’s/vendor’s/manufacturer’s letterhead or...
approved document and shall be duly signed by a legally and duly authorized officer. Certifications for metal products, when required, shall include a statement that the metal product was melted and manufactured in the United States.

**Change Order** - A written order amending the Contract and signed by the responsible Engineer, authorizing and requiring changes to the original Contract, with or without the consent of the Contractor. Each Change Order shall be executed by the Contractor and the County as indicated by the signature of the Contractor’s duly and legally authorized representative and the County Executive or his/her legally authorized designee, with evidence thereof of review for legal sufficiency by the County’s Office of Law.

**Completion Date** - The number of Working Days, Calendar Days, or Calendar Date shown in the Contract indicating the time allowed for the Full and Final Completion of the Work contemplated in the Contract.

**Construction** - To build, alter, Repair, improve and/or demolish any structure, building, or other improvement to real property and/or fixtures.

**Construction Strip** - An area contiguous to a permanent fee area or Easement, temporarily acquired for the use of the Contractor during the execution of the Work. This area exists only when shown on the Plans.

**Contingent Item** - Any Bid Item listed in the Contract Documents and included in the Bid for the purpose of obtaining a Contract price. Such Bid Item(s) constitutes tender of an exercisable option to and for the benefit of the County to incorporate such Bid Item(s) into the Work in accordance with the stated Bid prices.

**Contract** - The written agreement executed between the County and the successful Bidder covering the performance of the Work by which the Contractor is bound to perform the Work and by which the County is obligated to compensate the Contractor therefor at a mutually established and accepted rate or price. The Contract shall include all the documents listed under “Contract Documents”, as well as any written Contract Modification that is required to complete the Construction and completion of the Work in an acceptable manner, including any authorized extension thereof, all of which constitute one instrument and agreement. The Contract shall be executed by the Contractor and the County as indicated by the signature of the Contractor’s duly and legally authorized representative and the County Executive or his/her legally authorized designee, with evidence thereof of review for legal sufficiency by the County’s Office of Law.

**Contract Bond** - Means Bid Bond, Payment Bond, Performance Bond and/or Proposal Guaranty, as applicable.

**Contract Documents** - The Contract executed between the Administration and the successful Bidder, covering the performance of the Work by which the Contractor is bound to perform the Work, and by which the Administration is obligated to compensate Contractor therefor at the mutually established and accepted rate or price. The Contract Documents shall include, but not be limited to, the Bid Package (which includes, but is not limited to, the instructions to bidders
document, the information for bidders document and the specifications), Extra Work Order, Proposal Form, Proposal, Contract Bond, General Provisions, Contract Drawings, Special Provisions, Technical Provisions, all Plans and Notices to Proceed, also any Change Order, Contract Modification and Supplemental Agreement that are required to complete the Work in an acceptable manner, including County-authorized extensions of time for completion thereof, the Award, and the Agreement.

**Contract Drawings** - The official drawings issued by the Administration as part of the Contract Documents, including those incorporated in the Contract Documents by reference.

**Contract Item or Pay Item** - An item of Work specifically described and for which a price, either unit or lump sum, was provided in the form of a County-approved Bid Item and incorporated into the Contract, unless expressly stated to the contrary by the County. It includes the performance of all Work described therein.

**Contract Modification** - Any written change to the Contract including, but not limited to, delivery point, date of delivery, Contract period, price, quantity, or other provision of any original and/or existing Contract, whether accomplished in accordance with a Contract provision, or by mutual written action of legally and duly authorized representatives of the parties to the Contract including, but not limited to, any Change Order, Extra Work Order, Supplemental Agreement, and/or other form of Contract Modification. Each Contract Modification shall be executed by the Contractor and the County as indicated by the signature of the Contractor's duly and legally authorized representative and the County Executive or his/her legally authorized designee, with evidence thereof of review for legal sufficiency by the County's Office of Law.

**Contract Number** - The eight-place combination of numerals and letters by which all Contracts are identified:

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96000 XX0
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The first two digits indicate the year. The next three digits indicate the sequential numbering; the first Contract of each year is numbered 001, the second Contract 002 etc., regardless of the division of the Contract.

The three-space alpha-numeric combination (XX0 above) indicates the general nature of the Work and the division of the Contract for accounting purposes. The two letters (XX) indicate the general nature of the Work. The last digit indicates the numerical division of the Contract. A zero as the last digit indicates that the Contract will be accounted as a whole.

**GENERAL NATURE OF THE WORK**

<table>
<thead>
<tr>
<th>First X</th>
<th>Second X</th>
</tr>
</thead>
<tbody>
<tr>
<td>B - Bridge</td>
<td>D - Development (Public)</td>
</tr>
<tr>
<td>C - Culvert</td>
<td>F - Fire Station</td>
</tr>
<tr>
<td>D - Storm Drain</td>
<td>L - Library</td>
</tr>
<tr>
<td>G - Grading or miscellaneous</td>
<td></td>
</tr>
</tbody>
</table>
P - Public Building
R - Road
(except when used with RA, indicates Right-of-Way Improvement)
S - Sewer
W - Water
U - Utility
O - Operating Building
P - Police Station
X - Capital Improvement
S - Development (Private other than UA or RA)
A - Agreement (for Private UA and RA)

Contruct Time - The number of Working Days, Calendar Days, or a Calendar Date specified in the Contract Documents indicating the time period allowed for the Full and Final Completion of the Contract Work.

Contractor - The party of the second part to the Contract; the Person undertaking the execution of the Work under the terms of the Contract and acting directly or through his, their, or its agents or employees. If the party of the second part is comprised of one or more Persons, each shall be jointly and severally responsible for the performance of the entire Contract and jointly and severally liable to the County.

Controlling Operation - An operation that at the particular time under consideration has a controlling effect on the progress of the project as a whole.

County – Baltimore County, Maryland, a body corporate and politic.

County Roads - Any public Road in the County, excluding State Roads, fee title to which, or Easement for the use of which, is vested in the County by grant of condemnation, dedication, conveyance or by operation of law.

Culvert - Any structure not classified as a Bridge that provides an opening under any Roadway.

Day - Calendar Day unless otherwise designated.

Department - The Department of Public Works of Baltimore County, unless another County department or office is expressly identified and designated by the County.

Domestic Manufacture - When referring to metallic items such as structural steel, pipe, reinforcement, bridge rails, etc., the term Domestic Manufacture means those metal products that have been melted and manufactured within the United States.

Drainage Ditch - In general, any open water course other than gutters, constructed as indicated in the Contract Documents.

Easement - A grant of a) an interest in property and b) a right of use of property of an owner for a certain purpose at the will of the grantee.
Engineer – Unless an official is expressly identified in writing by the County or expressly stated in the Contract Documents, Engineer means any one of the following:

- Director of the Department, or his authorized delegated representative,
- Deputy Director of the Department (if applicable),
- Chief, Division of Construction Contracts Administration of the Department, or
- Chief, Bureau of Engineering & Construction of the Department.

Any delegation of the Engineer’s authority must be authorized in writing by any one of the above listed officials or expressly stated in the Contract, and such delegation of authority will pertain only to the specific Contract and/or Contracts as expressly stated in the authorization.

If the Engineer’s authority is delegated as specified above to another County department or office, “Department” shall mean the County department or office delegated such authority, and any references to a director, deputy director, chief, division, or bureau shall mean the corresponding official, employee, division, bureau or office of the County department delegated such authority, as applicable and appropriate; provided that, any references to “Department” rules, lists, or published and/or adopted materials shall continue to refer to the County Department of Public Works.

Equipment - All machinery, tools, and apparatus necessary for the proper Construction and acceptable completion of the Work, together with the necessary supplies for upkeep and maintenance.

Extra Work - Work that was not required or provided for in the original Contract.

Extra Work Order - A written document amending the Contract by adding, deleting, or modifying the Contract to include price, time and/or Extra Work and/or conditions not previously addressed within the Contract. Each Extra Work Order shall be executed by the Contractor and the County as indicated by the signature of the Contractor’s duly and legally authorized representative and the County Executive or his/her legally authorized designee, with evidence thereof of review for legal sufficiency by the County’s Office of Law.

Federal Agencies - Reference to any federal agency or official shall be deemed made to any agency or official succeeding in conformance with law or regulations to the powers, duties, jurisdictions, and authority of the agency or official mentioned.

Final Acceptance for Maintenance - The date upon which all the Work is sufficiently complete in accordance with the Contract so that the County can occupy and utilize the Work for the purposes for which it was intended, and more specifically, the date that the Engineer makes written acceptance of all Work under the Contract for the purpose of the County assuming maintenance responsibilities for all Work, as further described in Section GP-5.13(b) of the Standard Specifications. Final Acceptance for Maintenance will also be considered Substantial Completion for purposes of the Contract and the Work.
**Fixed-Price Items** - Unit prices established and prescribed by the County to compensate for the cost of Work and Materials that may or may not be necessary for the proper completion of the Contract, and the quantities of which are not amenable to the reliable quantitative estimate prior to Construction. Fixed-Price Items are shown on the Proposal sheets with the estimated quantities, fixed price, and estimated total cost imprinted prior to issuance of the Contract Documents to Bidders.

**Full and Final Completion** - The date upon which the County acknowledges in writing that the Contractor fully and finally completed all aspects of the Contract and the Contract Work, and met all terms, conditions and obligations of the Contract, as further described in Section GP-8.11 of the Standard Specifications.

**General Provisions or GP** - Contract provisions published as part of, or provided as a supplement to these Standard Specifications intended for general application and repetitive use.

**Highway or Road** - Includes rights-of-way, surfaces, Subgrades, Shoulders, Median dividers, drainage facilities and Structures, Road cuts, Road fills, traffic barriers, Bridges, Highway grade elimination Structures, tunnels, overpasses, underpasses, interchanges, entrance plazas, approaches and other Structures forming an integral part of a street, Road, or Highway; including bicycle and walking paths and related storm water management facilities and Structures. In addition, the terms include any other property acquired for the Construction, operation, or use of the Highway.

**Highways Standards** - Official MdSHA “Book of Standards, Highways and Incidental Structures” edited by the MdSHA with the latest incorporated revisions issued on or before the date of Advertisement of the Contract. These Highway Standards are used where County projects are constructed within MdSHA rights-of-way, or as directed by these Specifications or by the Engineer.

**Holidays** - Holidays only occur on:

- January 1 - New Year’s Day
- 3rd Monday in January - Martin Luther King’s Birthday
- 3rd Monday in February - President’s Day
- 4th Monday in May - Memorial Day
- July 4 - Independence Day
- 1st Monday in September - Labor Day
- 2nd Monday in October - Columbus Day
- November 11 - Veteran’s Day
- 4th Thursday in November - Thanksgiving Day
- December 25 - Christmas Day

All days of general and congressional elections (not primary elections) throughout the State.

If a Holiday falls on a Sunday, the following Monday shall be deemed and treated as a Holiday.
If a Holiday falls on a Saturday, the Friday immediately preceding shall be deemed and treated as a Holiday.

**Informal Contract** - A Private Contract not exceeding twenty-five thousand dollars ($25,000), subject to the approval of the County’s Department of Permits, Approvals and Inspections, bid on a lump sum basis, and not requiring a Contractor Performance Bond or Payment Bond. Informal Contracts may be used for commercial water meters and detector checks two (2) inches and smaller, fire hydrants, sanitary connections, residential water and sewer house connections for four (4) lots or less, and small road and drain projects not exceeding the twenty-five thousand dollars ($25,000).

**Inspector** - The authorized representative of the Engineer assigned to make detailed inspection of any or all portions of the Work.

**Interim Supplemental Specifications or ISS** – Those items required by the Department and the County for all County contracts, which shall be included as part of the Contract Documents and incorporated into the Contract, but which are not formally published in the Standard Specifications. The ISS control over the Standard Specifications but do not control over the Special Provisions.

**Laboratory** - The testing Laboratory of the State Highway Administration (or other administrations) or any other testing Laboratory designated by the Engineer.

**Landscaping (Highway) or Roadside Development** - Work for the preservation of natural and landscaped areas and the rehabilitation and protection against erosion of all areas disturbed by Construction through turf establishment and the placing of other ground covers, suitable planting, and other improvements to increase the effectiveness and enhance the appearance of the Highway.

**Major Contract Items** - The original Contract Items of greatest cost, excluding Contingent Items, (computed from the original price and estimated quantity or lump sum price) plus such other Contract Items next in sequence of lower cost (computed in like manner) as are necessary to show a total cost of original prices and quantities of not less than sixty percent (60%) of the original total cost of the Work, Bid and/or Proposal.

**Median** - The portion of a divided Highway separating the Traveled Ways for traffic in opposite directions.

**Materials** - Any substances and/or goods specified for use in the Construction of the Work and its appurtenances.

**Minor Contract Items** - All Contract Items other than the Major Contract Items and Contingent Items.
**Minor Structure** - Any structure not classified as a building, Bridge or Culvert. Minor Structures include, but are not limited to, catch basins, fences, inlets, manholes, retaining walls, steps and other miscellaneous items.

**Notice to Proceed** - A Written Notice to the Contractor of the date on or before which Contractor shall begin the prosecution of the Work to be done under the Contract.

**Partial Acceptance for Maintenance** - The date upon which the Engineer makes written acceptance of a unit or portion of the Work under the Contract and the County assumes maintenance responsibilities for only that unit or portion of Contract Work, as further described in Section GP-5.13(a) of the Standard Specifications.

**Pavement Structure** - The surface, base, or Subbase Course placed in layers on a Subgrade to support and distribute the traffic load to the Roadbed.

**Pay Item** - An item of Work specifically described and for which a price, either unit or lump sum, was provided in the form of a County-approved Bid Item. It includes the performance of all Work described therein.

**Payment Bond** - A County-approved form of security furnished and executed by the Contractor and Contractor's Surety as a guaranty of good faith to pay promptly, or cause to be paid promptly, in full, such sums as may be due for Material and/or labor supplied or performed, and/or services rendered by third parties in the prosecution of the Work under the Contract. This Payment Bond is in addition to the Performance Bond.

**Performance Bond** - The County-approved form of security, furnished and executed by the Contractor and Contractor’s Surety, guaranteeing Full and Final Completion of the Work in complete compliance with and in accordance with the Contract and all Contract Documents. This Performance Bond is in addition to the Payment Bond.

**Person** - A corporation, partnership, individual, sole proprietorship, joint venture, or any other legal entity through which commercial activity is conducted.

**Plans** - The official drawings issued by the Administration as part of the Contract Documents, including, but not limited to, those incorporated in the Contract Documents by reference.

**Private Contract** - A private contract for Highway, storm drain, water main, utilities, roads, and sanitary sewer Construction let by applicants or Persons, by procedures pursuant to Public Works Agreements with County at no cost to County. The developer, in such a Private Contract, obtains the bid privately using contract forms provided by the Department’s Division of Construction Contracts Administration. Private Contracts bearing the letters “UA” or “RA” within their Contract Numbers are governed and initiated by the Baltimore County Department of Permits, Approvals and Inspections Policy for the Construction of Improvements Under Private Contracts, pursuant to Baltimore County Code Section 32-4-301, as amended, and shall be referred to as UA and/or RA, as applicable, in these Standard Specifications.
Procurement Agency - Baltimore County, Maryland, a body corporate and politic.

Profile Grade - The trace of a vertical plane intersecting the top surface of the proposed wearing surface usually along the longitudinal center line of the Road. Profile Grade means either elevation or gradient of the vertical plane.

Proposal - A written submission including, but not limited to, price, terms of sale, and description of work technical expertise, work experience, and any other information requested in the Bid Package, offered by a Bidder to the County in response to the County’s Bid Package or request for Proposal.

Proposal Affidavit - An affidavit form (included in the Invitation for Bid) to be a certified form executed by a legally authorized representative of the Bidder and required to accompany a Bid.

Proposal Form - Includes, but is not limited to, the Standard Specifications and any Contract Document included and/or incorporated by reference therein, used by the County for soliciting and procuring Bids by competitive sealed Bid and/or requests for Proposals and/or small procurement procedures including, but not limited to, requests for quotations, requests for Bids, etc.

Proposal Guaranty - The security required and described in the Bid Package and GP-2.07 to be included in the Proposal and furnished by the Bidder as a guaranty of good faith to enter into a Contract with the County if the Work is Awarded to said Bidder.

Questionnaire - The approved form or forms upon which the Contractor shall furnish the information as to its ability to perform the Work, its experience in similar Work, the Equipment to be used, and its financial condition as related to its ability to finance the Work.

RA - A private contract for Highway, storm drain, water main, and sanitary sewer Construction is let by land developers, by procedures pursuant to Public Works Agreements with Baltimore County, Maryland. The developer, in such a Contract, obtains the Bid privately using Contract forms provided by the Division of Construction Contracts Administration. Private Contracts bearing the letters “RA” within their Contract Numbers are governed by the Baltimore County Department of Permits, Approvals and Inspections Policy for the Construction of Improvements Under Private Contracts pursuant to Baltimore County Code Section 32-4-301, as amended, and shall be referred to as RA and/or UA Contracts or RA and/or UA in these Standard Specifications.

Ramp - A connecting Road between two intersecting Highways at a Highway separation.

Regional Engineer - Unless an official is expressly identified in writing by the County or expressly stated in the Contract Documents, Regional Engineer means any one of the following:

Director of the Department, or his authorized delegated representative,
Deputy Director of the Department (if applicable),
Chief, Division of Construction Contracts Administration of the Department, or
Chief, Bureau of Engineering & Construction of the Department.

Any delegation of the Regional Engineer’s authority must be authorized in writing by any one of the above listed officials or expressly stated in the Contract, and such delegation of authority will pertain only to the specific Contract and/or Contracts as expressly stated in the authorization.

If the Regional Engineer’s authority is delegated as specified above to another County department or office, “Department” shall mean the County department or office delegated such authority, and any references to a director, deputy director, chief, division, or bureau shall mean the corresponding official, employee, division, bureau or office of the County department delegated such authority, as applicable and appropriate; provided that, any references to “Department” rules, lists, or published and/or adopted materials shall continue to refer to the County Department of Public Works.

**Repair** - To restore after injury, deterioration, or wear; to mend, to renovate, by such means as appropriate, and to supply such Materials and labor as necessary to render the item to be repaired sound, solid, true, plumb, square, even, smooth, and fully serviceable. Upon completion of such repair it must be, unless otherwise stated, rendered to such condition as to present a first-class finished work, or in instances where the repaired item serves as a base for additional finish, the repaired work must be such as to permit a first-class finish, to be applied without extra cost to the County. When the word “Repair” is used in connection with machinery or mechanical Equipment, it shall mean, in addition to the above, rendering the Equipment completely serviceable and efficient, ready for the normal use for which it was originally intended.

**Responsible Bidder** - A Person who is a Prequalified Contractor, as further described in these Standard Specifications and pursuant to the County’s Rules for Prequalification of Contractors, as described in GP-2.00 of these Standard Specifications, and who has the capability in all respects to perform fully the Contract requirements and to perform all mandatory and essential requirements of the Bid, and the integrity and reliability that shall assure good faith performance.

**Responsive Bid** - A Bid submitted in response to a Bid Package that conforms in all material respects to all requirements contained in the Bid Package, including, but not limited to, all mandatory and essential requirements of the Bid.

**Responsive Bidder** - A Responsible Bidder whose Bid conforms in all material respects to the Bid Package, including, but not limited to, all mandatory and essential requirements of the Bid.

**Right-of-Way** - The area that has been acquired and reserved by the County for use in constructing the proposed improvement and appurtenances thereto. The area may be held by the County for use in constructing the proposed improvements and appurtenances thereto. The area may be held by the County in fee simple or as an Easement -- perpetual or temporary, recorded or unrecorded.

**Roadbed** - The graded portion of a Highway within the top and side Slopes prepared as a foundation and/or the top surface of a Road upon which the Pavement Structure, Shoulders, and curbs are constructed.

*Revised October 11, 2013*
Road, Roadway or Highway - The words Road, Roadway and Highway include rights-of-way, surfaces, Subgrades, Shoulders, Median dividers, drainage facilities and Structures, Roadway cuts, Roadway fills, traffic barriers, Bridges, Highway grade elimination Structures, tunnels, overpasses, underpasses, interchanges, entrance plazas, approaches, and other Structures forming an integral part of a street, Road, Roadway, or Highway; including bicycle and walking paths and related storm water management facilities and Structures. Any other property acquired for the Construction, operation, or use of the Highway.

Roadside - A general term denoting the area adjoining the outer edge of the Roadbed within the Right-of-Way. Extensive areas between the Road of a divided Highway may also be considered Roadside.

Roadside Development - Work for the preservation of natural and landscaped areas and the rehabilitation and protection against erosion of all areas disturbed by Construction through turf establishment and the placing of other ground covers, suitable planting, and other improvements to increase the effectiveness and enhance the appearance of the Highway.

Seal Coat - An application of asphalt material followed by an application of cover coat aggregate.

Shoulder - The portion of the Roadbed contiguous with the Traveled Way for accommodation of stopped vehicles, for emergency use, and for lateral support of base and Surface Courses.

Sidewalk - The portion of the Road constructed for use by pedestrians.

Slopes - The inclined graded areas beyond the Shoulder, extending from the Shoulders to the natural, undisturbed surface of the ground.

Special Provisions or SP - Specifications for a specific item or condition or requirement peculiar to the Work and not otherwise thoroughly or satisfactorily detailed elsewhere in the Contract Documents. If a Special Provision or SP is in conflict with any portion of the Contract Documents, the Special Provisions shall always control and prevail. Specifically, the Special Provisions control over the Standard Specifications and the Interim Supplemental Specifications.

Standard Details / Standard Detail Drawings / Baltimore County Standard Details for Construction - The Baltimore County, Maryland Department of Public Works Standard Details for Construction published by the Administration for general application and repetitive usage, as may be supplemented, revised and superseded by the Contract Documents, which include detail drawings showing standard methods of Construction for water mains, sanitary sewers, storm drains, roads and streets.

Standard Specifications - The Baltimore County Department of Public Works Standard Specifications for Construction and Materials published by the Administration for general application and repetitive use, as may be supplemented, revised and superseded by the Contract Documents.

Revised
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State - The State of Maryland.

State Agency - A State agency or official thereof, including any agency or official succeeding to their powers, duties, jurisdictions and authority in accordance with law.

State Highway System - The system of Roads owned, operated, or maintained by the State of Maryland.

State Road - Any public Road included in the Maryland State Highway System.

Structure(s) - Bridges, culverts, catch basins, drop inlets, retaining walls, cribbing, manholes, end walls, buildings, sewers, service pipes, underdrains, foundation drains, steps, fences, and other features that may be encountered in the Work and not otherwise classified.

Subbase - The layers of specified or selected material of designed thickness placed on a Subgrade to support a Base Course or Surface Course.

Subcontract - Any agreement entered into by the Contractor with a Subcontractor for a portion of the Construction or any other part of the Work in connection with, and under the terms of, the Contract.

Subcontractor - Any Person undertaking a portion of the Construction or any other part of the Work under the terms of the Contract, by virtue of an agreement with the Contractor. Subcontractor does not include an employee with an employment contract, or an employee organization with a collective bargaining agreement. It includes one who furnished Material worked to a special design according to the Plans and Specifications for the Work. It excludes one who merely furnished Material not so worked.

Subgrade (Highways) - The top surface of a Roadbed upon which the Pavement Structure, Shoulders, and curbs are constructed.

Subgrade (Pipes) - The soil foundation layer upon which a pipe, cradle, or encasement is placed such that the prescribed invert elevation of the pipe will be achieved.

Subgrade (Structures) - The soil foundation layer upon which the structural foundation is built to achieve prescribed elevations of subsequent structural elements or controls.

Substantial Completion / substantial completion - The date upon which all the Work is sufficiently complete in accordance with the Contract so that the County can occupy and utilize the Work for the purposes for which it was intended, and more specifically, the date that the Engineer makes written acceptance of all Work under the Contract for the purpose of the County assuming maintenance responsibilities for all Work, as further described in Section GP-5.13(b) of the Standard Specifications. Substantial Completion will also be considered Final Acceptance for Maintenance for purposes of the Contract and the Work.

Revised
October 11, 2013
Substructure - All of that part of the Structure below bottoms of bearings of simple and continuous spans, skewbacks of arches and tops of footings of rigid frames, together with the back walls and wing walls.

Superintendent - The executive representative of the Contractor duly authorized by the Contractor, in accordance with Contractor’s organizational documents and requirements to receive and execute instructions from the Engineer, and who shall supervise and direct the Construction and the Work.

Superstructure - All of that part of the Structure above bottoms of bearings of simple and continuous spans, skewbacks of arches and tops of footings of rigid frames, except as noted above for Substructure.

Supplemental Agreement - Any written Contract Modification or Change Order evidencing, among other things, the terms, conditions, costs and time, mutually agreeable to the Contractor and the County as indicated by the signature of the Contractor’s duly and legally authorized representative and the County Executive or his/her legally authorized designee, with evidence of review for legal sufficiency by the County’s Office of Law.

Surety - The Person providing any or all of the Contract Bonds for the Contractor, for the Bid and the Full and Final Completion of the Contract and/or for the payment for all of the Work in connection with the Contract.

Surface Course - One or more layers of a pavement designed to accommodate direct traffic loading.

Technical Provisions - The technical provisions included in the Proposal Form and/or Invitation for Bid, which are a part of and incorporated into the Contract.

Third Tier Contracting - The process where the Contractor subcontracts a portion of the Contract to a Subcontractor who in turn subcontracts a portion of the Contract to a third party. This latter action is termed entering into a Third Tier Contract.

Traveled Way - The portion of the Roadway for the movement of vehicles, exclusive of Shoulders.

Trench - An excavation made for the purpose of installing or removing pipes, drains, catch basins, etc., which is later refilled.

UA - A private contract for Highway, storm drain, water main, and sanitary sewer Construction is let by land developers, by procedures pursuant to Public Works Agreements with Baltimore County. The developer, in such a Private Contract, obtains the bid privately using contract forms provided by the Department’s Division of Construction Contracts Administration. Private Contracts bearing the letters “UA” within their Contract Numbers are governed by the Baltimore County Department of Permits, Approvals and Inspections Policy for the Construction of
Improvements Under Private Contracts, pursuant to Baltimore County Code Section 32-4-301, as amended, and shall be referred to as UA and/or RA Contracts or UA and/or RA in these Standard Specifications.

Unclassified Excavation - Excavation not defined within Standard Specifications’ classifications, including, but not limited to, rock, logs, stumps, water, debris. (Excavation of all utility Trenches to subgrade.)

Utility Agreements/Right-of-Way Agreements or UA/RA - These UA/RA are initiated in the County Department of Permits, Approvals and Inspections (PAI), or any successor County department, by the applicant, including, but not limited to developers, schools, or commercial property owners for the Construction and installation of improvements to utilities or roads at no cost to the County. PAI reviews and approves, if and as applicable, the cost estimates, Construction drawings, UA and/or RA, as applicable, and collects any security and fees.

Utility Companies – Entities or Persons which may have utility facilities in a proposed Work area (e.g. BGE and Verizon, etc.)

Work – The Contractor’s furnishing of all labor, Materials, Equipment, services, supplies, Construction, construction-related services and/or other incidentals necessary to successfully perform and complete the Contract and carry out of all the duties and obligations imposed by the Contract.

Working Day - A Calendar Day upon which, in the judgment of the Engineer, weather and soil conditions are such that the Contractor can advantageously Work more than half of his current normal force for more than five (5) consecutive hours on a Controlling Operation. Working Days will not be charged on Saturdays, Sundays, and Holidays unless the Contractor actually Works more than five (5) hours on a Controlling Operation.

Working Drawings - Stress sheets, shop drawings, fabrication details, erection Plans, Plans for false work, forms, centering, cribs, cofferdams and masonry layouts, bending and placing drawings, bar schedules for reinforcement steel, and any other supplementary Plans or similar data that the Contractor may be required to furnish.

Written Notice - Shall be deemed to have been duly served if delivered with signed receipt or if sent by certified registered mail with signed receipt to the last business address known to party who gives the notice.

GP - SECTION 2
BIDDING REQUIREMENTS AND CONDITIONS

GP-2.00 GENERAL

All terms that are capitalized in this GP - Section 2 shall be in accordance with the Department Rules for Prequalification of Contractors, adopted November 28, 2006. Only the Bid of a
A contractor who holds a valid certificate ten (10) days prior to the date of bid opening will be considered. A prequalified contractor is one whose rating and classification have been determined by the prequalification committee and ratified by the director of the department.

All applicants for prequalification must comply with all procedures for prequalification as described in article II of the rules for prequalification of contractors.

All information must be filed with the department in sufficient time for action to be completed ten (10) days before the date of bid opening.

A prospective bidder, when prequalifying, shall state in the application the extent and type of work it considers it is qualified to handle at one time and shall show the exact type of work it has performed during the preceding five (5) years. The information and all other information required by procedures for prequalification, as described in article II of the rules for prequalification of contractors, shall be the basis for a determination of the bidder's financial rating and work classifications. Following the evaluation, the contractor may receive a certificate of prequalification from the director of the department of public works.

A prequalification certificate, subject to the following provision, is valid through the expiration date stated on the certificate. The county reserves the right to re-evaluate a prequalified contractor. A bidder who holds a prequalification certificate shall furnish additional information bearing on its qualification as may be required. The county reserves the right to reject unopened the bid of any bidder who fails to furnish promptly and properly all the information called for when so notified.

A contractor, dissatisfied with its rating or classification or both, may request a reconsideration on the basis of additional or revised information submitted to the committee in writing and may request a meeting with the prequalification committee to support its resubmittal in accordance with the rules for prequalification.

Each bidder and/or applicable subcontractor shall further qualify as otherwise required in the contract documents.

A prospective bidder may purchase plans if his prequalification certificate is valid. Materials suppliers and other interested parties may purchase plans without prequalification, such plans to be marked: "NOT FOR BIDDING PURPOSES".

GP-2.01 BID IRREVOCABLE

Unless otherwise provided in the bid package, bid prices are irrevocable for ninety (90) days following bid opening.

GP-2.02 CONTENTS OF BID FORMS

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All papers included in, bound thereto or attached to the Invitation for Bid and/or the Proposal Form are necessary parts thereof and shall not be detached, separated or altered. The Plans, Standard Specifications, and all other Contract Documents are part of the Invitation for Bid and/or the Proposal Form whether attached thereto or not.

GP-2.03 INTERPRETATION OF QUANTITIES IN BID SCHEDULE

Where designated as estimated quantities, the quantities in the prepared Invitation for Bid are approximate only. Payment to the Contractor will be made only for the actual quantities of Work performed or Materials furnished in accordance with the Contract and as provided in GP-4.04, Variations in Estimated Quantities.

GP-2.04 SITE INVESTIGATION

The Contractor acknowledges that it has investigated and satisfied itself as to the conditions affecting the Work, including but not restricted to those bearing upon transportation, disposal, handling and storage of Materials, availability of labor, water, electric power, Roads and uncertainties of weather, river stages, tides or similar physical conditions at the site, and the Contractor has further confirmed conditions of the ground, and the character of Equipment and facilities needed preliminary to and during prosecution of the Work. The Contractor further acknowledges that it has satisfied itself as to the character, quality and quantity of surface and subsurface Materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, including all exploratory Work done by the County, as well as from information presented by the drawings and Standard Specifications made a part of this Contract. Any failure by the Contractor to acquaint itself with the available information will not relieve Contractor from responsibility for estimating properly the difficulty or cost of successfully performing the Work. The County assumes no responsibility or liability of any kind, nature or amount for any conclusions or interpretations made by the Contractor on the basis of the information made available by the County.

Notwithstanding anything to the contrary in the Standard Specifications or the Contract Documents, including, but not limited to, GP-4.05, any and all subsurface soil/test borings, sample borings, boring logs, test pits, and/or related documents, reports or materials (collectively, the “Boring Materials”) provided by the County, or its engineer, architect, or consultant, to any Bidders or the Contractor are for the convenience of the Bidders and/or the Contractor. THE COUNTY NEITHER EXPRESSLY NOR IMPLIEDLY WARRANTS OR GUARANTEES THAT THE ACTUAL SITE CONDITIONS ENCOUNTERED UNDER THIS CONTRACT WILL BE THE SAME OR SIMILAR TO THOSE SITE CONDITIONS INDICATED BY ANY BORING MATERIALS.

THE CONTRACTOR HAS THE EXPRESS DUTY AND RESPONSIBILITY TO EXAMINE AND SATISFY ITSELF AS TO THE PHYSICAL CONDITIONS OF THE CONTRACT SITE, including, but not limited to, conformation and condition of the ground, character, quantity, and quality of subsurface materials which may be encountered, surface and subsurface conditions
including the presence of rock or groundwater, and all other physical conditions of the Contract site which may affect the Contractor's performance and/or costs and expenses under the Contract. THE CONTRACTOR SHALL NOT RELY ON THE COUNTY AND/OR ANY BORING MATERIALS TO FULFILL THIS EXPRESS DUTY AND RESPONSIBILITY UNDER THE CONTRACT.

NO ADDITIONAL COMPENSATION OF ANY KIND, INCLUDING, BUT NOT LIMITED TO, ADJUSTMENT OF COST OR SCHEDULING, WILL BE CONSIDERED BY THE COUNTY FOR THE CONTRACTOR'S FAILURE TO PROPERLY EXAMINE AND SATISFY ITSELF AS TO THE PHYSICAL CONDITIONS OF THE CONTRACT SITE. NOR WILL SUCH FAILURE BY THE CONTRACTOR RELIEVE THE CONTRACTOR OF ITS OBLIGATIONS, RESPONSIBILITIES, AND LIABILITIES TO ACHIEVE FULL AND FINAL COMPLETION OF THE CONTRACT TO THE COUNTY'S SATISFACTION.

GP-2.05 TAXES - RESPONSIBILITY FOR PAYMENT, EXEMPTIONS, FORMS TO FILE, ETC.

(a) The Contractor is responsible for, and by submitting a Bid agrees to pay, all retail sales, income, real estate, sales and use, transportation and special taxes applicable to and assessable against any Materials, Equipment, processes and operations incident to or involved in the Construction and/or Work. The Contractor is responsible for ascertaining and acquainting itself with such taxes and making all necessary arrangements to pay same.

(b) The County's Director, Office of Budget and Finance, may not authorize payment to a Contractor who has submitted an invoice if that Contractor is indebted by virtue of unpaid taxes or other obligations when in an amount of fifty dollars ($50) or more to the State of Maryland or any County department or agency or affiliated entity. In this regard, Contractors shall indicate their federal tax identification or social security number as required by the Rules for Prequalification of Contractors.

(c) If taxes or other obligations are owed to the State of Maryland or any County department or agency or affiliated entity, payment shall be deferred, and the Contractor shall be promptly notified. Subsequent release of the deferred payment shall be made promptly when the taxes or other obligations are satisfactorily resolved with no late fee and/or interest of any kind thereon.

(d) The County hereby reserves the right to withhold final payments under this Contract until the Contractor and/or any Subcontractors and/or Third Tier Contracting parties performing any duties under this Contract have paid all taxes or other obligations due the State or the County or any County affiliated entity.

GP-2.06 PREPARATION OF BID

(a) The Bidder shall submit the Bid upon the blank forms furnished by the Administration. The Bidder shall specify a price in U.S. dollars and cents for each Bid Item given, and shall show
the products of the respective unit prices and quantities written in figures in the column provided for that purpose, together with the total amount of the Bid obtained by adding the amounts of the several items.

(b) The Bid Form(s), including the fully and properly executed MBE/WBE forms, shall be filled out legibly in ink or typed. The Bid shall be signed by the Contractor's duly and legally authorized representative or officer, if and as applicable, of the Bidder, and attested by the Contractor's appropriate officer, if and as applicable. There must be on file with the County a copy of the current organizational documents and/or resolution, duly certified by the corporate secretary, if applicable, showing the authority of the Person so signing on behalf of the Contractor. In lieu thereof, the Contractor may file such evidence with the Administration, duly certified by the corporate secretary, if applicable, together with a list of the names of the Contractor's officers having legal and authority to execute Contract Documents on behalf of and legally bind the Contractor, duly certified, if applicable, which listing shall remain in full force and effect, and shall be materially relied upon by the Administration, until the Director of the Department receives Written Notice to the contrary. In any case, where a Bid is signed by an attorney in fact, the same must be accompanied by a copy of the appointing document, duly certified as described above. All Bids shall be signed in ink. All erasures and/or alterations shall be initialed by the signer in ink.

(c) If the Bid Package requires the Bidder to furnish samples or descriptive literature, it shall be submitted with the Bid, unless the Bid Package provides otherwise.

(d) Bidders must specifically identify any portions of their Proposals deemed to contain confidential, proprietary information or trade secrets. Such designations will not necessarily be conclusive and Bidders may be required to justify why such material should not, upon request, be disclosed by the County under the Maryland Public Information Act, Title 4, of the General Provisional Article of the Annotated Code of Maryland, as amended.

(e) Bid Items for which quantities are identified in the "Summary of Quantity" sheet of the Plans, in the column headed "Contingent" or listed in the "Bid Form" are established for the purpose of obtaining Bids on one or more Bid Items that may be incorporated into the Work.

The Engineer shall have sole discretion in determining whether and to what extent such Bid Items will be incorporated into the Work. The Engineer may order incorporation of such Bid Items at any location within the Contract and at anytime during the Work. These Bid Items may not be located on the Plans. The estimated quantities set out in the Bid Package for such Bid Items are presented solely for the purpose of obtaining a representative Bid price. The actual quantities employed may be only a fraction of, or many times the estimated quantity. Neither party shall make claims for additional compensation because of any increase, decrease or elimination of such Bid Items.

The Contractor is required to pay tax, as applicable, on Materials and supplies that will be incorporated into the Work. The Contractor must pay tax, as applicable, on all Equipment that is purchased and pertains to the Work.

Revised,
October 1, 2015
No Proposal will be considered unless accompanied by a guaranty of the amount specified in the Proposal in the form of either a certified check, bank cashier's check or a Bid Bond on the form provided therein or an exact facsimile thereof. The Bid Bond must be executed by a Surety that is, as of the date of the Bid: (a) licensed in the State of Maryland, (b) rated "B" or better by the A.M. Best Company, (c) on federal funded projects, authorized by the underwriting limitation contained in the U.S. Department of the Treasury Circular 570, as amended, to guaranty the amount of the Bid, and (d) in good standing as determined by the County's Engineer. The Bid Bond must guaranty payment to the County of liquidated damages as follows: (a) if only one Bid is received, the guaranteed payment shall be five (5%) percent of the Bidder's Bid amount, (b) if two or more Bids are received, the guaranteed payment shall be the difference between the Bidder's Bid amount and the next lowest Bid amount, subject to the limitation that the guaranteed payment not be greater than five (5%) percent of the Bidder's Bid amount. This Bid Bond is required in case the successful Bidder, after issuance of notice of Award, fails to comply, timely and completely, with each of the requirements set forth under Section GP-3.04.

**DELIVERY OF BIDS**

Each Bid must be submitted in a sealed envelope plainly marked to indicate its contents. When sent by mail, the sealed Bid must be addressed to the Administration at the address and in care of the official in whose office the Bids are to be received. All Bids shall be filed prior to the time and at the place specified in the Bid Package. Bids received after the time for opening of Bids will be treated in accordance with the provisions of GP-2.12.

**COMMUNICATIONS AND INTERPRETATIONS - PRIOR TO BID OPENING**

Any information regarding the requirements or the interpretation of any provision of the General Provisions, Special Provisions, Standard Specifications, Interim Supplemental Specifications or any part of the Bid Package, Bid and/or Bid Form shall be requested, in writing, from the Engineer, and delivered no later than five (5) Days prior to the scheduled date of Bid opening. Responses to questions or inquiries having any material effect on the Bids shall be made by written addenda, or by written notice sent to all purchasers of Contract Documents. THE CONTRACTOR SHALL NOT MAKE VERBAL INQUIRIES TO THE COUNTY, AS VERBAL INQUIRIES MAY NOT BE ACKNOWLEDGED AND SHALL NOT BE BINDING UPON THE COUNTY IN ANY MANNER OR EXTENT.

Any and all verbal interpretations and/or oral pre-Bid statements made by the Engineer, County employees or their respective representatives and/or agents shall not be binding in any manner or extent upon the County.
Pre-Bid conferences may be conducted by the Department of Public Works or the applicable County agency or department. If they are to be conducted, notice of the same will be contained in the Bid Package. Any minutes of Pre-Bid conferences are provided as a courtesy to the Bidders and ANY MINUTES PROVIDED ARE NOT BINDING UPON THE COUNTY IN ANY MANNER OR EXTENT.

GP-2.10 AMENDMENTS TO INVITATIONS FOR BIDS

(a) Form. Pre-Bid amendments shall be identified as addenda and shall require that the Bidder acknowledge receipt of all addenda issued. The addenda shall reference the portion of the proposed Invitation for Bid and/or Proposal Form it amends. Any addenda shall be issued in writing by the County.

(b) Distribution. Addenda shall be sent to all purchasers of Contract Documents.

(c) Timeliness. Addenda shall be distributed to allow Bidders a reasonable time to consider them in preparing their Bids. The Bid receipt date shall be changed in the addenda only if the distribution of the addenda, in the sole determination of the Administration, does not permit timely preparation and distribution thereof. If the Administration deems that there is adequate time for consideration of the addenda, the addenda may be silent as to the Bid receipt date.

GP-2.11 PRE-OPENING MODIFICATION OR WITHDRAWAL OF BIDS

(a) Procedure. Bids may be modified or withdrawn by Written Notice executed by a duly and legally authorized representative of the Bidder, received in the office designated in the Bid Package before the time and date set for Bid opening.

(b) Disposition of Bid Security. If a Bid is withdrawn in accordance with this GP-2.11, the Bid Bond, if any, shall be returned to the Bidder.

GP-2.12 LATE BIDS, LATE WITHDRAWALS, AND LATE MODIFICATION

(a) Policy. Any Bid is late if not received at the place designated in the Invitation for Bid and/or Proposal Form at or prior to the time and date set for receipt of Bids. Any request for withdrawal or request for modification received at the place designated in the Invitation for Bid and/or Proposal Form after the time and date set for receipt of Bids is late.

(b) Treatment. A late Bid, late request for modification, or late request for withdrawal shall not be considered. Late Bids will be returned to the Bidder unopened.
(a) Bids, and modifications pursuant to GP-2.11, shall be opened publicly, at the time, date, and place designated in the Bid Package. The name of each Bidder, the Bid price, and such other information as is deemed appropriate by the County shall be read aloud or otherwise made available to the public. This information also shall be recorded at the time of Bid opening. The Bids shall be tabulated or a Bid abstract made. If the Bidder designates in writing trade secrets or other proprietary data to be confidential, in accordance with applicable State law, regulations, and/or these Standard Specifications including, but not limited to, GP-2.06, material so designated in writing by the Bidder shall accompany the Bid but Bidder shall make such readily separable from the Bid in order to facilitate public inspection of the nonconfidential portion of the Bid. After Contract Award, prices, makes, and model or catalog numbers of the items offered, deliveries, and terms of payment shall be available for public inspection at a reasonable time regardless of any designation to the contrary at the time of Bid opening.

(b) The Engineer shall examine the Bids to determine the validity of any requests for nondisclosure of trade secrets and other proprietary data identified in writing by the Bidder. Confidential, proprietary information, and trade secrets furnished by a Bidder may be disclosed to State and/or other County department, or agencies if there is a need for the information and may not be disclosed outside of the County except as provided by the Maryland Public Information Act or other applicable laws and/or regulations.

GP-2.14 MISTAKES IN BIDS

(a) Mistakes Discovered Before Opening. A Bidder may correct mistakes discovered before the time and date set for Bid opening by withdrawing or correcting the Bid as provided in GP-2.11.

(b) Mistakes Discovered After Opening But Prior To Award. If the Director of the Department knows or has reason to conclude that a mistake may have been made, the Bidder may be required to confirm the Bid. Situations in which confirmation may be requested include obvious, apparent errors on the face of the Bid or a Bid unreasonably lower than the other Bids submitted. If the Bidder alleges mistake, the Bid may only be corrected or withdrawn upon the written approval of the County’s Director, Office of Budget and Finance, as follows:

(1) If the mistake and intended correction are clearly evident on the face of the Bid document, the Bid shall be corrected to the intended correct Bid and may not be withdrawn. Examples of mistakes that may be clearly evident on the face of the Bid document are typographical errors, errors in extending unit prices, transposition errors, and arithmetical errors.

(2) Subject to the written approval of the County’s Director, Office of Budget and Finance, a Bidder may be permitted to withdraw a low Bid if:

(a) A mistake is clearly evident on the face of the Bid document but the intended correct Bid is not similarly clearly evident; or
(b) The Bidder submits proof of evidentiary value that clearly and convincingly demonstrates that a mistake was made.

(c) **Mistakes Discovered After Award.** Mistakes may not be corrected after Award of the Contract unless and only when the County’s Director, Office of Budget and Finance, determines that it would be unconscionable not to allow the mistake to be corrected. Changes in price are not permitted, except as allowed in the County’s sole discretion. Corrections, if permitted, shall be submitted to and approved by the County’s Director, Office of Budget and Finance before being incorporated into the Contract.

**GP-2.15 MINOR IRREGULARITIES**

Minor irregularities in Bids, as defined below, may be waived if the County’s Director, Office of Budget and Finance, determines, in his sole discretion, that it shall be in the County’s best interest. The County’s Director, Office of Budget and Finance, may either give a Bidder an opportunity to cure any minor irregularity in its Bid, or waive the minor irregularity where it is to the County’s advantage to do so.

When at any public opening of Bids, a Bid appears to be irregular, as herein specified, this apparent fact may be announced when read. Said Bid shall be read as other Bids and then referred to the Director of the Department for consideration and appropriate action thereon in accordance with these General Provisions, laws and regulations, as applicable.

A minor irregularity is one that is merely a matter of form and not of substance, or pertains to some immaterial or inconsequential defect or variation of a Bid or Proposal from the exact requirement of the Bid Package and/or Proposal Form, the correction or waiver of which would not be prejudicial to other Bidders. The defect or variation in the Bid or Proposal is immaterial and inconsequential when its significance as to price, quantity, quality, or delivery is trivial or negligible when contrasted with the total cost or scope of the Bid Package and the labor, Materials, Equipment, services and supplies being procured, and when the intent and meaning of the entire Bid or Proposal is clear.

**GP-2.16 CANCELLATION OF INVITATIONS FOR BIDS**

(a) Before opening of the Bids, an Invitation for Bid may be canceled, in whole or in part, when the County determines this action is fiscally advantageous or otherwise in its best interest.

(b) When an Invitation for Bid is canceled before Bid opening, the Bids shall be returned to the Bidders submitting them and notice of cancellation shall be included and no party or Person including, but not limited to, the County shall have any liability or obligation of any amount, kind, or nature to another or any other in connection therewith.

**GP-2.17 REJECTION OF INDIVIDUAL BIDS OR PROPOSALS**
(a) Any Bid may be rejected, in whole or in part, when it is in the best interest of the County
to do so.

(b) Reasons for rejection of a Bid may include but are not limited to:

   (1) It is not a Responsive Bid.

   (2) Unreasonable price.

   (3) The Bidder submitting the Bid is determined to be nonresponsible. A
determination of nonresponsibility may be made for, but is not limited to, any of the following
reasons:

      (a) Bidder debarred or ineligible and period of debarment or ineligibility not
          expired.

      (b) The unit prices contained in a Bid are unbalanced.

      (c) Evidence of collusion among Bidders.

      (d) Inadequate quantity and/or quality of experience, plant, equipment,
          financing, manpower or other resources required to perform the Contract.

      (e) Bidder’s workload that, in the judgment of the Administration, might
          hinder or prevent the prompt completion of the subject Work if Awarded.

      (f) Default by the Bidder on other contracts.

      (g) Failure to pay or satisfactorily settle all reasonable and just bills due for
          labor and material on prior or current contracts.

      (h) The same Person has an interest in more than one Bid on a Contract
          exclusive of being named by another Bidder as a Subcontractor.

      (i) Failure to perform satisfactorily on other contracts awarded, and the
          conditions leading to unsatisfactory performance remain unresolved.

      (j) Any other reason affecting the Bidder’s ability to perform, or a record of
          business integrity.

      (k) Bidder not otherwise qualified and eligible to receive an Award under
          applicable laws and regulations.
(4) The Bidder fails to supply information to the Engineer promptly, after notification from the Engineer that such information is required in connection with a determination to be made pursuant to this GP-2.17.

GP-2.18 REJECTION OF ALL BIDS, IN WHOLE OR IN PART

(a) After opening of Bids or Proposals but before Award, all Bids or Proposals may be rejected, in whole or in part, when the Engineer, with the approval of the using-County department or agency head, or his/her designee, determines such rejection is fiscally advantageous or otherwise in the County’s best interest.

(b) If and as applicable, notice of rejection of all Bids shall be sent to all Bidders that submitted Bids, and Bids which have been opened shall be retained by the Department’s Division of Construction Contracts Administration.

GP-2.19 BID EVALUATION AND AWARD

(a) General. The Contract is to be Awarded to a Responsible Bidder who is also a Responsive Bidder and whose Bid meets the requirements and evaluation criteria set forth in the Bid Package, and is either the lowest Bid price or lowest evaluated Bid price, in the County’s sole discretion.

(b) Determination of Lowest Bidder. Bids shall be evaluated to determine which Bidder offers the lowest cost to the County in accordance with the evaluation criteria set forth in the Bid Package.

Except as otherwise provided under GP-2.14 Mistakes in Bids:

(1) The unit price will govern in the event of a discrepancy between the unit price and the extended price (product of unit price multiplied by the quantity).

(2) The sum of the extended prices will govern in the event of a discrepancy between the total lump sum and the extended prices.

(3) The written words for the lump sum will govern in the event of a discrepancy between the lump sum prices written in words and the lump sum prices written in figures.

(4) If a unit price was omitted, the unit price will be determined by dividing the extended price by the quantity.

The Administration reserves the right to make the Award by Bid Item, or groups of Bid Items, rather than total Bid if it is in the best interest of the County to do so, unless the Bidder expressly stated in its Bid that a particular or progressive Award was not acceptable to the Bidder.
(c) **Award.** Upon determination of the Responsible Bidder who is also a Responsive Bidder, and whose Bid meets the requirements and evaluation criteria of the Bid Package and is the lowest Bidder in accordance with these Standard Specifications and the Bid Package, the Contract may be Awarded to that Bidder. In accordance with these Standard Specifications and the Bid Package, a Contract may be Awarded to a Bidder offering a higher quality item than that designated in the Bid Package if that Bidder is a Responsible Bidder with the lowest Responsive Bid whose Bid meets the requirements and evaluation criteria of the Bid Package.

**GP-2.20 TIE BIDS**

(a) **Definition.** Tie Bids are Responsive Bids from Responsible Bidders that are identical in price, terms and conditions and which meet all the requirements and evaluation criteria set forth in the Bid Package.

(b) **Award.** If two or more Bidders shall be tied for the lowest Bid, quality and service being equal, the Contract shall be Awarded to the Bidder qualified as a minority, as defined in the State procurement regulations. If both Bidders are qualified minorities, as defined in the State procurement regulations, the Contract shall be Awarded to the minority that is a local Bidder. Please see Baltimore County Code, 2003, as amended, Article 10, Title 2, for more information and the governing statute regarding minority Bidders and local Bidders.

**GP-2.21 – Reserved.**

**GP-2.22 MULTIPLE OR ALTERNATE BIDS**

Unless multiple or alternate Bids are requested in the Bid Package, such multiple or alternate Bids may not be accepted. However, if a Bidder clearly indicates a base Bid, it shall be considered for Award as though it were the only Bid submitted by the Bidder.

**GP-2.23 BID PROTESTS**

(a) **Bidder Protest of Award or Alleged Improprieties.** The Bidder must file a written Bid protest of Award pursuant to this GP-2.23 of the Standard Specifications. The Bid protest of Award must be in writing and filed with the Engineer. Oral objections, whether or not acted on, are not protests.

   (1) **Time for Filing.** A Bid protest of Award shall be filed not sooner than the date of Award and not later than three (3) Business Days after the date of Award. A protest based on alleged improprieties in the Bid Package which are apparent before the Bid opening or the closing date for receipt of Bids shall be filed not later than five (5) Business Days before the Bid opening date.
(2) **Content of Written Protest.** The written protest must state: the name and address of the Bidder; the Bid or Contract Number; the reasons for protest; and any supporting exhibits, evidence or documents to support the protest.

(b) **Bidder Protest of Bid Rejection.** The Bidder must file a written Bid protest of Bid rejection with the Engineer not later than three (3) Business Days from the date of the Bid rejection. Oral objections, whether or not acted on, are not protests. The written Bid protest must comply with GP-2.23(a)(2).

(c) **Department Response to Bidder Protest.** The Department’s Chief of Division of Construction Contracts Administration, or other designated County official, will review the Bidder’s protest, as filed pursuant to GP-2.23(a) or (b), and respond to the Bidder in writing within ten (10) Working Days of receipt of protest.

(d) **Bidder Appeal.** The Bidder may appeal the decision by the Department’s Chief of Division of Construction Contracts Administration, or other designated County official, (a) to the County’s Director of the Office of Budget and Finance for all MBE/WBE-related protests or (b) to the Director, or other designated County director, for all other protests.

The Bidder must file a written appeal with the relevant director not later than three (3) Business Days from the date of the Department response in GP-2.23(c). Oral objections, whether or not acted on, are not appeals. The appeal must comply with GP-2.23(a)(1) and (2), but may include any additional documentation as deemed necessary and appropriate by the Bidder.

(e) **Director Response to Bidder Appeal.** The relevant County director, as appropriate and applicable, will review the Bidder’s appeal under GP-2.23(d) and respond to the Bidder in writing within fifteen (15) Working Days of receipt of appeal.

(f) **Second Bidder Appeal.** The Bidder may appeal the decision by the relevant County director, as appropriate and applicable, to the County Administrative Officer (CAO).

The Bidder must file a written appeal with the CAO not later than three (3) Business Days from the date of the director response in GP-2.23(e). Oral objections, whether or not acted on, are not appeals. The appeal must comply with GP-2.23(a)(1) and (2), but may include any additional documentation as deemed necessary and appropriate by the Bidder.

(g) **CAO Response to Bidder Appeal.** The CAO, or his/her duly authorized designee, will review the Bidder’s appeal under GP-2.23(f) and respond to the Bidder in writing within twenty (20) Working Days of receipt of appeal. The CAO’s, or his/her duly authorized designee’s, written decision is final and binding on all involved parties.

**GP - SECTION 3**
**AWARD AND EXECUTION OF CONTRACT**
GP-3.01  AWARD OF CONTRACT (See GP-2.19)

Notice of Award shall be faxed, where available, at the number provided with the Bid and/or mailed, by first class mail, to the successful Bidder at the address submitted with the Bid. In addition, the Department’s Division of Construction Contracts Administration shall maintain for public inspection a record of the date of the notice of Award for each Contract, if Awarded and as applicable.

(a) The notice of Award, if it be Awarded, shall be within ninety (90) Calendar Days (or as otherwise specified in the Contract) after the opening of the Bid, and will be to the Responsible Bidder with the lowest Responsive Bid whose Bid complies with all the requirements prescribed in these Standard Specifications and the Invitation for Bid. The successful Bidder will be notified by letter, as stated above, to the address shown on its Bid, that its Bid has been accepted and that it has been Awarded the right to execute the Contract Documents with the County. The notice of Award shall be deemed to have been received three (3) Calendar Days after the date on the notice of Award. The successful Bidder will also be deemed to be on notice of the information contained in the public record log referred to above.

(b) If a Contract is jointly Bid by more than one Person, all Persons will be, upon Award, notified and shall execute the Control thereafter and will be held jointly and severally responsible for the performance and Full and Final Completion of the entire Contract.

(c) The right is reserved to cancel and rescind any notice of Award at any time before the County fully executes the Contract Documents. Upon the County’s cancellation and rescission of the notice of Award the County shall not be liable or obligated in any kind, nature or amount to any Person.

GP-3.02  RETURN OF PROPOSAL GUARANTY

If a Bid is withdrawn by Written Notice received in the office designated in the Bid Package before the time and date set for Bid opening, the Proposal Guaranty will be returned if requested. Each Proposal Guaranty submitted, other than the three low Bidders, will be considered released immediately following opening and review of the Bids. The Proposal Guaranty of the 2nd and 3rd low Bidders will be returned upon request only, following execution of the Contract with the lowest Bidder, and the Proposal Guaranty of the lowest Bidder (i.e., the Contractor) can only be released upon execution of the Contract and submittal of the Performance Bond and the Payment Bond by the Contractor, as required by GP-3.03.

GP-3.03  PERFORMANCE BOND AND PAYMENT BOND REQUIREMENTS

(a) Acceptable security in the County-required forms for the Performance Bond and a Payment Bond are included in the Bid Package.
(b) A Performance Bond and a Payment Bond must be provided by Contractor from a Surety acceptable to the County who is (1) licensed in the State of Maryland, (2) rated "B" or better by the A.M. Best Company, (3) on federal funded projects, authorized by the underwriting limitation contained in the U.S. Department of the Treasury Circular 570, as amended, to guaranty the amount of the Bid, and (4) in good standing as determined by the County's Engineer as amended at the time of the underwriting and provision of the Payment Bond and Performance Bond.

A Payment Bond and Performance Bond are required for every and each Contract in excess of twenty-five thousand dollars ($25,000). Each Payment Bond and each Performance Bond shall be in the amount equal to at least one hundred (100%) percent of the Contract price. The fully executed Payment Bond and fully executed Performance Bond shall be delivered by the Bidder to the Department's Division of Construction Contracts Administration no later than the time the Contract is to be executed by the Contractor. If the Bidder fails to deliver the required Payment Bond and the required Performance Bond in a timely manner, the Bid shall be rejected, the Proposal Guaranty shall be enforced, and Award of the Contract may be made to the Responsible Bidder with the next lowest Responsive Bid in accordance with the Invitation for Bid and these Standard Specifications.

All Bond premiums shall be paid by the Contractor. At the direction of the Department, the Contractor may be required to increase the Payment Bond and Performance Bond with such increase to be paid for by the County in the amount of the documented actual cost to the Contractor.

GP-3.04 EXECUTION OF CONTRACT/SUBMISSION OF REQUIRED DOCUMENTS AND MBE/WBE FORMS

The successful Bidder for the Contract will be provided, upon Award of the Contract, five (5) sets of Bid Proposal Forms and Plans and two (2) sets of cross sections free of charge (this number of copies may be increased to fifteen (15) for certain large building projects, in the sole discretion of the Administrator). Any additional Plan sets required by the Contractor may be purchased at the price noted in Bid Package. Individual Plan sheets or complete sets of Plans may be purchased at the prevailing price set by the County.

(a) Not later than ten (10) Business Days after the date of the notice of Award, the successful Bidder shall have obtained and returned the Contract Documents to the County and two (2) sets of cross sections, including, but not limited to: (1) the fully and properly executed Contract Proposal Form, (2) the fully and properly executed Payment Bond and Performance Bond, if required under GP-3.03, (3) the fully and properly completed evidence of insurance required pursuant to GP-7.14 of these Standard Specifications and the Bid Package, and (4) the Proposal Affidavit. The documents referred to in this GP-3.04 (a) (1), (2), (3), and (4) are to be delivered to the Department's Division of Construction Contracts Administration unless expressly specified otherwise by the Engineer or in the Contract Documents.

(b) The Department's Division of Construction Contracts Administration shall record in the public record log, referred to in GP-3.01, the date it received from the successful Bidder each of the properly completed Contract Documents required in GP-3.04 (a) (1), (2), (3), (4) and (5)
above, and the date it received notification from the County’s Office of Fair Practices that the successful Bidder’s MBE/WBE forms required by the County have been approved. The successful Bidder is deemed to be on notice of such information so recorded.

(c) In the event the County fails to fully execute the Contract Documents within thirty (30) Business Days after the date all of the required documents in this section have been received by the Department, the successful Bidder will have, as its sole remedy, the option to declare the Contract terminated or to agree to an extension of the time for the County to execute the Contract. Should Bidder declare the Contract terminated, in no event shall County be liable or obligated for any losses, costs, expenses or damages in any amount, nature, or kind incurred by any Person including, but not limited to, the Bidder. If the successful Bidder, however, shall fail within thirty-five (35) Business Days of the aforementioned date to deliver Written Notice to the Department’s Division of Construction Contracts Administration that it elects to rescind its Bid and have the Contract terminated, the time period for the County to execute the Contract shall automatically be extended for an additional fifteen (15) Business Days.

(d) All Contract Documents remain the property of the County and must not be used on other work but shall be returned to the County upon request by Engineer.

GP-3.05 FAILURE TO EXECUTE CONTRACT

Failure to deliver to the County the required items listed in GP-3.04 within the time specified therein shall be just cause for the annulment and rescission of the notice of Award and the Contractor’s and Surety’s forfeiture of the Proposal Guaranty to the County, not as a penalty, but in liquidation of damages sustained. Notice of Award may then be made to the Responsible Bidder with the next lowest Responsive Bid, or, at the County’s option, the Work may be re-advertised.

GP - SECTION 4
SCOPE OF WORK

GP-4.01 INTENT OF CONTRACT

(a) The Contractor shall (within specified tolerances) perform all Work in accordance with the Contract Documents including, but not limited to, the lines, grades, typical cross sections, dimensions, and other data shown on the Plans or as modified by Contract Modification including the furnishing of all Materials, implements, machinery, Equipment, tools, supplies, transportation, labor, and all other things necessary to the satisfactory prosecution and completion of the Work in full compliance with the Contract Documents.

(b) The Contract Documents are intended to be complementary, and to describe the Construction and completion of the Work. Anything mentioned in the Contract Documents and not shown on the Contract Drawings, or shown on the Contract Drawing, and not elsewhere
mentioned in the Contract Documents shall be of like effect as if it is shown or mentioned in both.

(c) Omissions from the Contract Documents including, but not limited to, Contract Drawings or the misdescription of details of Work which are manifestly necessary to carry out the intent of the Contract Documents and/or Contract Drawings or which are customarily performed shall not relieve the Contractor from performing such omitted or misdescribed details of Work, but they shall be performed as if fully and correctly set forth and described in the Contract Drawings and Contract Documents. The Engineer shall consider modifications of the Bid and/or postponement of Bid opening as may best serve all interested parties where Written Notice of apparent omissions is received by the Engineer five (5) Business Days before the hour prescribed for Bid opening. This is not to be construed as a limitation on the Engineer. If justified and deemed appropriate by the County, the Engineer may issue a Contract Modification or, if after execution of the Contract, prepare a Supplemental Agreement(s) for Extra Work that was not anticipated and/or shown on the Contract Drawings or described in the Contract Documents.

(d) Work described in words that have a well-known technical or trade meaning shall be held to refer to such recognized standard use.

(e) The Contractor shall keep in the office on the Work site a complete set of all Contract Drawings, Standard Specifications, shop drawings, schedules, etc., in good order and available to the Engineer and representatives of the County.

GP-4.02 CONTRACT DOCUMENTS

The Contract Documents are essential parts of the Contract, and a requirement occurring in one is as binding as though occurring in all. They are intended to be complementary and to describe and provide for a complete Work. In the event of any discrepancy between the drawing and figures written thereon, the figures, unless obviously incorrect, will govern over scaled dimensions. In the event of any discrepancy between the Plans and the Standard Specifications, the Plans will govern. If there is a discrepancy between the Standard Specifications and Interim Supplemental Specification, the Interim Supplemental Specifications will govern. Special Provisions will govern over Standard Specifications, Interim Supplemental Specification and Plans.

Special Provisions govern over all other Contract Documents unless expressly stated to the contrary in the Contract Documents.

GP-4.03 ENTIRE CONTRACT

The Contract represents the entire and integrated agreement between the parties thereto and supersedes all prior negotiations, representations or agreements, either written or oral.
GP-4.04 VARIATIONS IN ESTIMATED QUANTITIES

(a) Where the quantity of a Major Contract Item in this Contract is an estimated quantity and where the actual quantity of such Pay Item varies more than twenty-five (25%) percent above or below the estimated quantity stated in this Contract, an equitable adjustment in the Contract price shall be made upon demand of either party. The equitable adjustment shall be based upon any increase or decrease in costs due solely to the variation above one hundred twenty-five (125%) percent or below seventy-five (75%) percent of the estimated quantity. If the quantity variation is such as to cause an increase in the time necessary for completion, the Engineer shall, upon receipt of a written request for an extension of time within ten (10) Days from the beginning of the delay, or within a further period of time which may be granted by the Engineer before the date of final settlement of the Contract, ascertain the facts and make the adjustment for extending the Completion Date as in Engineer's judgment the findings justify.

(b) Should any Contract Items contained in the Bid Package be found unnecessary for the proper completion of the Work, the Engineer may, upon written order to the Contractor, eliminate such Contract Items from the Contract and no allowance will be made for Contract Items so eliminated in making final payment to the Contractor except for Material costs documented incurred prior to notification of the elimination of the Contract Items and for which there is no other possible or reasonable use.

GP-4.05 DIFFERING SITE CONDITIONS

(a) Pursuant to and incorporated GP-2.04, the Contractor is solely responsible for ascertaining soil conditions impacting any and all portions of the Work and soils testing shall be performed by an independent testing firm at Contractor’s sole cost and expense. Unless waived in writing by the Engineer, the independent testing shall be performed by a professional engineer licensed by the State of Maryland. The Contractor shall promptly, and before such conditions are disturbed, notify the Engineer in writing of:

   (1) Subsurface or latent physical conditions at the site differing materially from those indicated in this Contract; or

   (2) Unknown physical conditions at the site of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in Work of the character provided for in this Contract. The Engineer shall promptly investigate the conditions, and if he finds, in his sole discretion, that such conditions do materially so differ and cause an increase or decrease in the Contractor’s cost of, or the time required for, performance of any part of the Work under this Contract, whether or not changed as a result of such conditions, an equitable adjustment shall be made and the Contract modified in writing accordingly.

(b) No claim of the Contractor under this General Provision shall be allowed unless the Contractor has given the notice required in (a) above; provided however, the time prescribed therefor may be extended by the County, in its sole discretion.
(c) No claim by the Contractor for an equitable adjustment under this General Provision shall be allowed if asserted after final payment under this Contract.

**GP - 4.06 CHANGES**

(a) The Engineer may unilaterally, at any time, and without notice to the Surety, if any, by a Change Order, make any change in the Work within the general scope of the Contract, including but not limited to changes:

1. In the Contract Documents (including, but not limited to, Contract Drawings and designs);
2. In the method or manner of performance of the Work;
3. In the County-furnished facilities, Equipment, Materials, services, or Work site; or

If the Contractor intends to assert an equitable adjustment claim under this GP-4.06(a) for changes made by the Engineer, it shall, within thirty (30) Days after receipt of a written Change Order submit to the Engineer a Written Notice setting forth the general nature and monetary extent of such claim for equitable adjustment and the Contractor’s position relative to Contract Time, unless the Contract Time was already extended by the County.

(b) The Contractor may request a Change Order by providing the Engineer with Written Notice stating the date, circumstances, and the source of any written or oral order from the County causing the change in Work. Except for claims based on defective Contract Documents, no claim for any change under this GP-4.06(b) shall be allowed for any costs incurred more than twenty (20) Days before the Contractor gives Written Notice as required. Further, in the case of defective Contract Documents in the Bid Package for which the County is responsible, the equitable adjustment shall include any increased costs reasonably incurred by the Contractor in attempting to comply with such defective Contract Documents in the Bid Package.

If the Contractor intends to assert an equitable adjustment claim under this GP-4.06(b) for changes it requested, it shall, within thirty (30) Days after the furnishing of Written Notice submit to the Engineer a written statement setting forth the general nature and monetary extent of such claim and the Contractor’s position relative to Contract Time, unless the Contract Time was already extended by the County. This statement of claim for equitable adjustment may be included in the Written Notice submitted pursuant to this GP-4.06(b).

The Engineer will consider the Written Notice provided, and all facts at hand or that can be readily obtained, without unduly delaying the Work, and:
(1) Where the Engineer finds the change presented by the Contractor would cause a difference in Contract cost or Contract Time, he/she will consider alternatives to minimize impacts in the Contract cost or Contract Time in the mutual interest of both parties and commit his final decision to writing in a Change Order; or

(2) Where the Engineer does not find in favor of the change presented by the Contractor, he shall commit his instructions to writing and direct the Contractor’s and the Engineer’s staff to proceed as if a force account, as further described in GP-9.02, were ordered to provide a record for later re-evaluation as to merits of the change and any adjustments that may be needed.

Both parties are duty-bound to minimize the accumulation of expenses during the time the Engineer requires to complete the evaluation required in this GP-4.06(b). Delay costs and time, to the extent judged reasonable and unavoidable, are to be considered in the Engineer’s Change Order, if any.

(c) No order, statement, or conduct of the Engineer shall be treated as a change under this General Provision or entitle the Contractor to an equitable adjustment unless made in a properly authorized and executed Change Order or Contract Modification.

(d) Each Contract Modification or Change Order that affects Contract price, whether an increase or a decrease, shall be subject to the prior written approval of the Engineer and other appropriate authorities and to prior Certification of the County’s Office of Budget and Finance of fund availability and the effect of the Contract Modification or Change Order on the Contract budget or the total Contract cost. If, according to the Certification of the County’s Office of Budget and Finance, the Contract Modification or Change Order will cause an increase in Contract cost that will exceed budgeted and available funds, the Contract Modification or Change Order may not be made unless sufficient additional funds are made available or the scope of the Contract is adjusted to permit its completion within the Contract budget.

(e) No claim by the Contractor for an equitable adjustment hereunder shall be allowed if asserted after final payment is made pursuant to GP-9.04 and this Contract.

(f) No claim for Extra Work by the Contractor will be granted which includes cost of delays or Work stoppage due to strikes, lockouts, fire, avoidable casualties or damage or delay in transportation for which the County or its agents are not responsible.

**GP-4.07 NEGOTIATED PAYMENT PROVISION**

(a) The County, without invalidating the Contract, may order changes in the Work by altering, adding to or deducting from the Work, the Contract amount being adjusted accordingly in a Change Order. Extension of time made, or if necessary thereby, shall be adjusted at and documented in a Change Order.
(b) The Engineer shall have the authority to make minor changes in the Work not involving extra cost and not inconsistent with the purpose of the Contract and/or Work. Otherwise, except in an emergency endangering life or property, no Extra Work or change shall be made unless a written order from the Department signed by the Director has been received by the Contractor. No claim for addition to the Contract sum shall be valid unless so ordered in writing by the Director.

(e) The value of any such Extra Work or change under this GP-4.07 shall be determined in one or more of the following ways as determined by the Department:

(1) By Estimate and Acceptance of a Lump Sum

(a) The Contractor shall furnish a breakdown of the estimated Construction cost. The breakdown shall be of sufficient detail to describe the Extra Work and related costs for labor, Material, overhead and profit.

(b) Overhead and Profit

1. Extra Work by Subcontractor:

   Subcontractor will be allowed 10% overhead and 10% profit added to the direct labor and Material costs. The Contractor will be allowed to increase the Subcontractors total lump sum by 10% to cover its administration.

2. Extra Work by Contractor:

   The Contractor will be allowed 10% overhead and 10% profit added to the labor and Material costs.

(c) The Contractor will be allowed 1% for Contract Bond added to the labor and Material costs, as applicable.

(d) The allowed overhead will include all supervision; no additional allowance will be made for it.

(2) By Unit Prices Named in the Contract or Subsequently Agreed Upon

Such unit prices are to include all supervision, overhead, taxes, insurance and profit.

(3) By Cost and a Fixed Fee

Added to the cost is a fixed fee portion that is to include supervision, overhead, insurance and profit.
(4) By Force Account (Labor and Material Cost plus)

See GP-9.02 entitled “Force Account Work”.

Should none of the methods stated in Paragraph 4.07(c) 1, 2, or 3 be applicable, the Contractor shall, providing the Contractor receives an order as defined in Paragraph 4.07(b) of this General Provision, proceed with the Work in accordance with GP-9.02 entitled “Force Account Work”.

The Contractor and Engineer shall keep accurate costs, in such form as the Engineer may direct, for presentation, together with vouchers, to the Department for determination of the value of the Extra Work included in each Change Order. Pending determination of the final value and the execution of the Change Order, the Engineer may include payments for Materials and labor, as stated in General Provision - Section 9, “Payment”, in monthly vouchers.

GP-4.08 UNAUTHORIZED WORK

Work done contrary to or regardless of the instructions of the Engineer, Work done beyond the lines and grades shown on the Contract Drawings, or as given, or any Extra Work done without written authority of the Engineer is unauthorized and at the sole cost and expense of the Contractor and will not be measured or paid for. Work so done may be ordered removed and/or replaced at the Contractor’s sole cost and expense.

GP-4.09 FINAL CLEAN UP

Upon Final Acceptance for Maintenance of the Work specified in the Contract and before final payment will be made, the Construction area and all other adjoining areas occupied by the Contractor during the Construction of said Contract, other than those owned by the Contractor, shall be cleaned of all surplus and discarded Materials, spilled Materials, excess Materials left deposited on the permanent Work as a result of the Contractor’s operations, falsework, and rubbish and temporary Structures and buildings, that were placed thereon by the Contractor. The adjoining areas mentioned above, outside the normal pay limits for seeding, will be reshaped, seeded and mulched, or otherwise restored as directed by the Engineer at the Contractor’s expense.

GP-4.10 WARRANTY OF CONSTRUCTION

(a) In addition to any other warranties at law and specified in the Special Provisions of the Contract, the Contractor warrants for two (2) years after the date of Final Acceptance for Maintenance by the County, that Work performed under this Contract shall conform to the Contract requirements and is free of any defect of Equipment, Material or design furnished, or workmanship performed by the Contractor or any of the Contractor’s Subcontractors or suppliers at any tier. Under this warranty, the Contractor at its own and sole cost and expense shall make any Repairs or replacements which, in the judgment of the Engineer, may become necessary during this warranty period on account of any failures or defects. In addition, the Contractor
shall remedy at its own and sole cost and expense any damage to County-owned or controlled real or personal property, when that damage is the result of the Contractor's failure to conform to Contract requirements or any such defect of Equipment, Material, workmanship, or design. The Contractor shall also promptly restore any Work damaged in fulfilling the terms of this General Provision. The Contractor's warranty with respect to Work Repaired or replaced hereunder will run for two (2) years from the date of the County's acceptance of such Repair or replacement; provided that the terms and conditions of all warranties in place following the Final Acceptance for Maintenance shall continue to remain in full force and effect.

(b) The County shall notify the Contractor in writing within a reasonable time after the discovery of any failure, defect, or damage.

(c) Should the Contractor fail to remedy any failure, defect, or damage described in (a) above within a reasonable time after receipt of notice thereof, or in the case of an emergency, the County shall have the right to replace, Repair, or otherwise remedy such failure, defect, or damage at the Contractor's sole cost and expense. To insure the County against the nonpayment of any such costs, on the date of Final Acceptance for Maintenance, the County will either require the retainage of five percent (5%) of the total value of the Contract or require the Contractor to submit a value equivalent maintenance bond. Said maintenance bond shall be in a form and with a Surety approved by the County, binding the Contractor as principal, and the Surety, to promptly and properly replace any improper Work or Materials that may become apparent within the two (2) year warranty period following the date of Final Acceptance for Maintenance. In lieu of a bond, other forms of security such as irrevocable letters of credit, or a bank cashier's or treasurer's check may be accepted. Upon acceptance and approval by the County of such a bond or other security, the sum retained by the County will be released pursuant to GP-Section 9.

(d) In addition to the other rights and remedies provided by this General Provision, all Subcontractors', manufacturers', and suppliers' warranties expressed or implied, respecting any Work and/or Materials shall, at the direction of the County, be enforced by the Contractor for the benefit of the County. In such case if the Contractor's warranty under (a) above has expired, any suit directed by the County to enforce a Subcontractor's, manufacturer's or supplier's warranty shall be at the expense of the County. The Contractor shall obtain any warranties that the Subcontractors, manufacturers, or suppliers would give in normal commercial practice.

(e) If directed by the Engineer, the Contractor shall require any such warranties under this GP-4.10 to be executed in writing to the County.

(f) Notwithstanding any other provision of this General Provision, unless such a defect is caused by the negligence of the Contractor or its Subcontractors or suppliers at any tier, the Contractor shall not be liable for the Repair or any defects of material or design furnished by the County nor for the Repair of any damage which results from any such defect in County furnished Material or design.
(g) The warranty specified herein shall not limit the County’s rights under GP-5.13 “Acceptance for Maintenance”, or any other rights available to County under the Contract, at law, and/or in equity.

### GP - SECTION 5

**CONTROL OF THE WORK**

**GP-5.01 AUTHORITY OF THE ENGINEER**

(a) The Engineer shall decide: all questions which may arise as to the quality and acceptability of Materials furnished and Work performed and as to the rate of progress of said Work; all questions which may arise as to the interpretation of any or all Plans and Contract Documents; and all questions as to the acceptable fulfillment of the Contract on the part of the Contractor.

(b) The Engineer shall determine the amount and quantity of Work performed and Materials which are to be paid for under the Contract.

(c) The Engineer shall have the authority to suspend the Work wholly or in part due to the failure of the Contractor to carry out any provisions of the Contract.

**GP-5.02 CONFORMITY WITH CONTRACT REQUIREMENTS**

All Work performed and all Materials furnished shall be in conformity with the Contract requirements.

In the event the Engineer finds the Materials or the finished product in which the Materials are used or the Work performed are not in reasonably close conformity with the Contract requirements and have resulted in an inferior or unsatisfactory product, the Work or Materials shall be removed and replaced or otherwise corrected by and at the expense of the Contractor.

In the event the Engineer finds the Materials or the finished product in which the Materials are used are not in conformity with the Contract requirements but that acceptable Work has been produced, he shall then make a determination if the Work shall be accepted in the Engineer’s sole discretion. In this event, the Engineer will document the basis of acceptance by a Change Order that will, if applicable, provide for an appropriate adjustment in the Contract price. Any action taken pursuant to this General Provision shall not result in an increase of the Contract price.

**GP-5.03 DISCREPANCI ES IN THE CONTRACT DOCUMENTS**

Revised
October 11, 2013
In the event the Contractor discovers any discrepancies in the Contract Documents, the Contractor shall immediately notify the Engineer in writing. The Engineer will then make such corrections and interpretations as may be deemed necessary for fulfilling the intent of the Contract.

**GP-5.04 COOPERATION BY CONTRACTOR**

The Contractor will keep available on the Work site at all times one complete set of Contract Documents.

The Contractor shall give the Work the constant attention necessary to facilitate the timely progress thereof, and shall cooperate with the Engineer and the Engineer’s Inspector at all times and in every way possible.

The Contractor shall assign to the Contract as his agent, a competent Superintendent capable of communicating in English and capable of reading and thoroughly understanding the Contract Documents and thoroughly experienced in the type of Work being performed, who shall receive instructions from the Engineer or his authorized representatives. The Superintendent shall have full authority to execute the order or directions of the Engineer without delay, and to promptly supply such Materials, Equipment, tools, labor and incidentals as may be required. Such superintendence shall be furnished irrespective of the amount of Work sublet. Said Superintendent shall be on the Work site at all times when the Work is in progress.

The Contractor shall so schedule the Work as to ensure efficient and uninterrupted progress and to hold to an absolute minimum the cutting and patching of new Work. All cutting, patching and digging necessary to the execution of the Work is included in the Contract.

The Contractor shall so schedule (to include Subcontracts) the Construction performed by each group or trade that each installation or portion of the Construction shall member with and join with all other Work as required for a complete installation, all according to accepted good Construction practice.

The Contractor shall be responsible for the coordination of the Work of all Subcontractors.

**GP-5.05 COOPERATION WITH UTILITIES**

It is understood and agreed that the Contractor has considered in its Bid all of the permanent and temporary utility appurtenances in their present or relocated positions and that no additional compensation will be allowed for delays, inconvenience, or damage sustained by the Contractor due to any interference from the said utility appurtenances or the operation of moving them.

The Contractor shall have responsibility for notifying all affected Utility Companies before performing any Work on their utilities and shall cooperate with them. All damage to utility
facilities caused by the Contractor's operations shall be the sole financial and legal obligations, liability and responsibility of the Contractor.

MISS UTILITY: Sections 12-101, et seq., of the Public Utility Companies Article of the Maryland Annotated Code, as amended from time to time, establish requirements regarding protection of existing underground utilities from excavation and demolition activities.

The Contractor shall notify Utility Companies and their public agencies at least forty-eight (48) hours but not more than ten (10) Days before digging. Locate requests may be processed through Ticket Check by calling this special toll-free number: 1-866-821-4226, where the caller will be prompted through the steps to retrieve ticket status, using a 10 digit Contractor's number. Contact the MISS UTILITY help desk at 410-712-0056, x4040 or check the www.missutility.net/maryland web site for more information on how to use the Ticket Check system.

One call to 1-800-257-7777 or use of Ticket Check will reach most companies and organizations that have underground facilities in the County. A list of member utilities belonging to MISS UTILITY is on the MISS UTILITY website at www.missutility.net/maryland. Other utilities, which are non-participants in MISS UTILITY, may also be encountered. It is the Contractor's responsibility to identify all utilities, to inform the proper authorities of Work near the utility line, and to exercise caution at all times in regard to them.

The UTILITY SERVICE PROTECTION CENTER (MISS UTILITY: (800 257-7777) may also be called between 7:00 a.m. and 5:00 p.m., Monday through Friday, excluding Holidays. Emergencies will be processed promptly on a 24-hour basis.

FIRE HYDRANTS: The Contractor shall notify the County Fire Department’s Fire Dispatch Liaison Officer (410 887-4592) prior to starting any Work involving the removal or relocation of existing fire hydrants.

SANITARY SEWERS: To protect against accidental clogging, existing sanitary sewer channels shall be covered within manholes, as directed by the Engineer, prior to any grubbing or grading operations. This will not be a separate Pay Item, but shall be included in the cost of other Pay Items.

ADDITIONAL COSTS: The cost of charges for marking the locations for water and sewer utilities by the organizations which are part of the MISS UTILITY program shall be included as an incidental cost in the Contractor's Bid.

Water mains, gas mains, storm drains, sanitary sewers, and other utilities are shown on the Plans, in accordance with the best information available to the County, for the convenience of the Contractor. THE COUNTY ASSUMES NO RESPONSIBILITY FOR ACCURACY OR COMPLETENESS OF THE INFORMATION SHOWN ON THE PLANS AND THE CONTRACTOR SHALL BE FULLY AND SOLELY RESPONSIBLE FOR VERIFYING THE LOCATION OF ALL UTILITIES. Existing mains and services shall be carefully protected and any damage to them caused by the Work and/or the Contractor shall be immediately Repaired to
the satisfaction of the Engineer by the Contractor at its own expense, using Materials of the quality and kinds damaged.

GP-5.06 COOPERATION BETWEEN CONTRACTORS

(a) Each and every contractor under contract with the County, with regard to any adjoining or overlapping Work or work of or with another under contract with the County, shall cooperate with each other as necessary. Such cooperation shall include:

(1) Arrangement and conduct of Work and/or work; and

(2) Storage and disposal of Materials, etc., by each in such manner as to not unnecessarily interfere with or hinder the progress of the Work and/or work being performed by other contractors. Contiguous Work shall be joined in an acceptable manner.

(b) The Administration and Department shall have the right, at any time, to contract for and perform other Work and/or work on, near, over or under the Work covered by this Contract. In addition, other Work and/or work may be performed under the jurisdiction of another public body, public entity, the County agency or entity, County affiliate or any public educational or college entity. In such cases, when a dispute arises among one or more contractors, the Engineer will decide which department, body, or entity has jurisdiction over said dispute. The Contractor shall cooperate fully with such other contractors and carefully fit Contractor’s own Work to such other work as may be directed by the Engineer.

(c) The Contractor agrees that in the event of dispute as to cooperation the Engineer will act as referee. The Contractor waives its rights and remedies to make a claim or take any other action of any kind against the Administration for any inconvenience, delay or loss experienced by Contractor because of the presence and operations of other contractors.

(d) The County reserves the right to let other contracts in connection with paving and utilities adjoining this Work. The Contractor shall afford other contractors reasonable opportunity for the introduction and storage of their materials and the execution of their work, and shall properly connect and coordinate its Work with theirs.

If any part of the Contractor’s Work depends for proper execution or results upon the work of any other contractor, the Contractor shall inspect and promptly report to the Engineer any defects in such work that render it unsuitable for such proper execution and results. Failure to inspect and report shall constitute an acceptance of the other contractor’s work as fit and proper for the reception of the Work. The Contractor shall take all reasonable precautions during construction to prevent damages to previously installed work. The Contractor shall monitor the previously installed area/work while performing its assigned Work, and shall advise the Engineer immediately if defects in that previously installed work become apparent.
To ensure the proper execution of Contractor’s subsequent Work, the Contractor shall verify Work already in place and shall at once report to the Engineer any discrepancy between the executed Work and the Contract Drawings.

GP-5.07   AUTHORITY AND DUTIES OF INSPECTORS

The Inspector shall be authorized to inspect all Work done and all Material furnished. Such inspection may extend to all or any part of the Work and to the preparation, fabrication or manufacture of the Materials to be used. The Inspector is not authorized to revoke, alter or waive any requirements of the Contract, nor is he authorized to approve or accept any portion of the Work. The Inspector is authorized to call the attention of the Contractor to any failure of the Work or Materials to conform to the Contract. The Inspector shall have the authority to reject Materials or suspend the Work until any questions at issue can be referred to and decided by the Engineer. The Inspector shall perform his duties at such times and in such manner as will not unnecessarily impede progress on the Contract.

The Inspector shall in no case act as foreman or perform any other duties for the Contractor, nor interfere with the management of the Work by the Contractor. Any advice, instruction, direction or other order which the Inspector may give the Contractor shall not be construed as binding the Engineer in any way, or releasing the Contractor from fulfilling all of the terms of the Contract.

Where there is disagreement between the Contractor, the Superintendent, or any other contractor and the Inspector, such as refusal by the Contractor to use properly approved Material, performing Work not in compliance with Plans and Contract Documents, and/or refusing to suspend Work until problems at issue can be referred to and decided by the Engineer, the Inspector will immediately direct the Engineer’s attention to the issues of disagreement. If the Contractor still refuses to make corrections and/or comply or suspend Work, as applicable, the Engineer may prepare and deliver in writing to the Contractor, by mail or otherwise, a written order suspending the Work and explaining the reason for such shutdown. As soon as the Inspector is advised of the delivery of the shutdown order, the Inspector shall immediately leave the site of the Work and any Work performed during the Inspector’s absence will not be accepted or paid for and may, in the sole discretion of the Engineer be required to be removed and disposed of at the Contractor’s sole cost and expense.

GP-5.08   INSPECTION OF WORK

All Materials and each part or detail of the Work shall be subject at all times to inspection by the Engineer and/or the Inspector, and the Contractor will be held strictly to the Materials, workmanship, and the diligent execution of the Contract. Such inspection may include mill, plant or shop inspection, and any Material furnished under the Contract is subject to such inspection. The Engineer and/or Inspector shall be allowed access to all parts of the Work and shall be furnished with such information and assistance by the Contractor as is required to make a complete and detailed inspection of all parts of the Work.
If the Engineer requests it, the Contractor, at any time before Partial Acceptance for Maintenance and/or Final Acceptance for Maintenance of any Work, shall remove or uncover such portions of the finished Work as may be directed. After examination, the Contractor shall restore said portions of the Work to the standards required by the Contract. Should the Work thus exposed or examined prove acceptable, adjustments in Contract Time and price will be made pursuant to Section GP-4.06 for the uncovering or removing, and the replacing of the covering or making good of the parts removed. Should the Work so exposed or examined prove unacceptable, the uncovering, or removing and replacing, shall be at the Contractor's sole cost or expense.

When the United States Government, the State, another local government or municipality, or any railroad, corporation or other Person is to pay a portion of the cost of the Work covered by this Contract, their respective representatives shall have the right to inspect and approve the Work.

If the Contract Documents, the Engineer's instructions, laws, regulations, executive orders, ordinances, or any public authority require any Work to be specially tested or approved, the Contractor shall give the Engineer timely notice of its readiness for inspection, and if the inspection is by another authority, the date fixed for such inspection. Inspections by the Engineer shall be made promptly, and where practicable, at the source of supply. Any Work covered without approval of the Engineer must, if required, be uncovered for examination at the Contractor's sole cost and expense.

If initial tests and/or inspections show substandard products, Materials, workmanship, etc. and the Contractor elects, with the Engineer's approval, to perform additional tests and/or inspections to prove the acceptability of the substandard products, Materials, workmanship etc., the Contractor shall perform same at Contractor's sole cost and expense.

**GP-5.09 REMOVAL OF DEFECTIVE WORK**

All Work and Materials which do not conform to the requirements of the Contract will be considered unacceptable, unless otherwise determined acceptable under the provisions in GP-5.02.

Any defective Work, whether the result of poor workmanship, use of defective Materials, damage through carelessness or any other cause, found to exist shall be removed and replaced by Work and Materials which shall conform to the Contract Documents or shall be remedied otherwise in an acceptable manner authorized by the Engineer.

Upon failure on the part of the Contractor to comply promptly with any order of the Engineer made pursuant to these General Provisions, the Engineer shall have authority to cause defective Work to be remedied or removed and replaced and unauthorized Work to be removed and to deduct the costs from any monies due or to become due the Contractor under this Contract.

**GP-5.10 LOAD RESTRICTIONS**

Revised
October 11, 2013
(a) The Contractor shall comply with all applicable State and local laws, regulations and requirements pertaining to speed, size and weight of motor vehicles.

(b) The Administration may indicate in the Contract any load restrictions on any Road or Structure within the vicinity of the Work site.

(c) The Contractor shall take into account any and all posted Bridges, the crossing of which might be contemplated by the Work of the Contract. No loads in excess of posted limits will be allowed in the prosecution of the Work on any Contract, unless the required permits are obtained from the appropriate State and local governmental agencies.

(d) The Contractor shall consider possible detrimental effects of operating heavy paving and grading Equipment contiguous to retaining walls, pipe Culverts, arches, forms for concrete Work as well as any Construction existing prior to this Contract.

(e) The Engineer shall have the right to limit passage of heavy Equipment (plus loads) when such passage or usage is causing apparent or visible damage to embankments, paving, Structures or any other property.

(f) Within Baltimore City limits, and within the limits of the Baltimore City-maintained watershed properties, the Department of Transportation of the City of Baltimore has jurisdiction for oversize and overweight vehicle movements. Permits are obtainable from the Baltimore City Department of Transportation.

GP-5.11 MAINTENANCE OF WORK DURING CONSTRUCTION

(a) The Contractor shall maintain the Work during Construction and until Final Acceptance for Maintenance by the County. This maintenance shall constitute continuous and effective Work prosecuted as required with adequate Equipment and forces to the end that all parts of the Work be kept in satisfactory condition at all times.

The Contractor shall at all times keep the Work site free from accumulations of waste Material or rubbish caused by its employees, Subcontractors, or Work, and at the Final Acceptance for Maintenance of the Work, shall remove all rubbish, waste, Contractor’s tools, scaffolding and surplus Material from and about the Work site. In case of dispute, the County may remove the waste and rubbish and charge the cost to the Contractor as the Engineer shall determine to be just, in his sole discretion.

All debris shall be kept sprinkled to reduce dust and shall be promptly removed from any Structure, and no combustible Materials shall be stored against perimeter walls of any Work.

The Contractor shall clean entirely any Structure as it is completed, wash all windows, scrub all floors at least once, and leave all floors free from spots and blemishes. The interior of any Structure and the entire Work site shall be left “broom clean,” or its equivalent.
(b) Particular attention shall be given to drainage, both permanent and temporary. The Contractor shall use all reasonable precautionary measures to avoid damage or loss that might result from accumulations and concentrations of drainage water, and material carried by such water and such drainage shall be diverted or removed when necessary to prevent damage to excavation, embankments, surfacing, Structures or any other property. Suitable measures shall be taken by the Contractor to prevent the erosion of soil in all Construction areas where the existing ground cover has been removed and/or disturbed.

The Contractor shall remove all water, including rain water, encountered during the entire progress of the Work, using pumps, drains or other methods approved by the Engineer. Excavations and the Work site shall be kept free from water until all backfilling is completed. The water shall be discharged to catch basins, or other drainage points as directed by the Engineer.

(c) All cost of maintenance Work during Construction and before Final Acceptance for Maintenance by the County shall be included in the Bid and the Contractor will not be paid an additional amount for such Work, except as otherwise provided in the Contract Documents.

(d) In the event that the Contractor’s Work is ordered to shut down for failure to comply with any provision of the Contract, the Contractor shall maintain the entire Work site as provided herein, and provide such ingress and egress for local residents or tenants adjacent to the Work site, for tenants of the Work site, and for the general public as may be necessary during the period of suspended Work or until the Contract has been declared in default.

(e) On Contracts where traffic flow is maintained, the Contractor shall be responsible for Repair of all traffic damages to the Work, either partially or totally completed, until Final Acceptance for Maintenance of the Work is achieved. Responsible, as used here, shall mean the responsibility for restoration and the cost thereof unless otherwise expressly provided for in the Special Provisions.

**GP-5.12 FAILURE TO MAINTAIN ENTIRE PROJECT**

Failure on the part of the Contractor, at any time, to respond to the provisions of GP-5.11 will result in the Engineer’s immediately notifying the Contractor to comply with the required maintenance provisions. In the event 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 after receipt of such notice, the Engineer may notify the Contractor to suspend all other Work on the Contract until the unsatisfactory maintenance is corrected. In the event that the Contractor has failed to commence with adequate corrective measures within four (4) hours after receipt of such notice the Engineer may immediately proceed with adequate forces and Equipment to maintain the Contract Work and the entire cost of this maintenance will be deducted from any monies due or to become due to the Contractor from the County. The Contractor is and remains responsible for any injury or damage that may result from lack of maintenance of any refilled excavation at any time until Final Acceptance for Maintenance by the County. The Engineer may suspend Work as further described in GP-8.07.

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GP-5.13 ACCEPTANCE FOR MAINTENANCE

(a) Partial Acceptance for Maintenance. If at any time during the performance of the Work the Contractor substantially completes a unit or portion of the Work, the Contractor may request the Engineer to make final inspection of that unit or portion. If the Engineer determines upon inspection that the unit has been satisfactorily completed in compliance with the Contract, the Engineer may make a written Partial Acceptance for Maintenance of that unit or portion of Work, and the Contractor may be relieved of further maintenance responsibility for that unit or portion of Work. Generally, Partial Acceptance for Maintenance will only be considered when the Administration feels that such action is in the public interest. Such Partial Acceptance for Maintenance of any unit or portion of Work shall in no way void or alter any of the terms of the Contract.

(b) Final Acceptance for Maintenance. Upon due notice from the Contractor of presumptive completion of the Contract Work, the Engineer shall make a Construction inspection and if at such inspection all Construction and Contract Work provided for and contemplated by the Contract is found completed, such inspection shall constitute the final inspection and the Engineer shall make the Final Acceptance for Maintenance of the Work as of that date, and the Contractor shall be notified of such Final Acceptance for Maintenance in writing. After Final Acceptance for Maintenance, the Administration will assume responsibility for maintenance except where otherwise provided by the Contract.

(c) If, however, at any Construction inspection any Contract Work, in whole or in part, is found unsatisfactory, the Engineer shall give the Contractor the necessary instructions as to the Contract Work required for Final Acceptance for Maintenance by the County. The Contractor forthwith shall comply with and execute such instructions. Upon completion of such Contract Work, another inspection shall be made which shall constitute the final inspection if the said Contract Work is completed satisfactorily. In such event, the Engineer shall make the Final Acceptance for Maintenance and the Contractor shall be notified as aforesaid. After Final Acceptance for Maintenance, the Administration will assume responsibility for maintenance except where otherwise provided by the Contract.

(d) Unless otherwise provided in this Contract, Partial Acceptance for Maintenance and/or Final Acceptance for Maintenance by the County shall be made as promptly as practicable after completion and inspection of all Work required by this Contract, or that portion of the Work that the Engineer determines can be accepted separately. Partial Acceptance for Maintenance and/or Final Acceptance for Maintenance shall be final and conclusive except as regards latent defects, fraud, and such gross mistakes as may amount to fraud or the County's rights under any warranty or guarantee or any claims or counter claims reserved by the County.

(e) No claim for Extra Work will be granted which includes cost of delays or Work stoppage due to strikes, lockouts, fire, avoidable casualties or damage or delay in transportation for which the County or officials, employees, or its agents are not responsible.

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GP-5.14    CLAIMS

Unless a shorter period is prescribed by law or elsewhere in this Contract:

(a) The Contractor shall file a Written Notice of claim for extension of time, equitable adjustment, extra compensation, damages, or any other matter (whether under or relating to this Contract) with the Engineer within ninety (90) Days after the basis for the claim is known or should have been known, whichever is earlier.

(b) Contemporaneously with or within ninety (90) Days of the filing of a notice of a claim, but no later than the date that final payment for the Pay Item and/or portion of the Work for which the claim is made, a Contractor shall submit the claim to the appropriate Engineer. The claim shall be in writing and shall contain:

   (1) An explanation of the claim, including reference to all Contract provisions upon which it is based;

   (2) The amount of the claim;

   (3) The facts upon which the claim is based;

   (4) All pertinent data and correspondence that the Contractor relies upon to substantiate the claim;

   (5) A Certification by a legally authorized representative of the Contractor or Subcontractor, as applicable, that, to the best of the Person’s knowledge and belief, the claim is made in good faith, supporting data are accurate and complete, and the amount requested accurately reflects the Contract adjustment for which the Person believes the Administration is liable; and

   (6) Itemized supporting data for the elements of cost the Contractor claims to have incurred or which the Contractor will incur. This data shall be in sufficient detail to permit analysis by the Administration of Material, labor, Equipment, Subcontract and overhead costs as well as profit and shall include all Work covered by the claim, whether deleted, added, or changed. Subcontractors’ costs shall be supported by similar detailed data.

(c) A notice of claim or a claim that is not filed within the prescribed time shall be dismissed.

GP-5.15    DISPUTES

(a) Except as otherwise may be provided by applicable law or regulation, all disputes arising under or as a result of a breach of this Contract that are not disposed of by mutual agreement shall be resolved in accordance with this General Provision.
(b) As used herein, "claim" means a written demand or assertion by one of the parties seeking, as a legal right, the payment of money, adjustment or interpretation of Contract terms, or other relief, arising under or relating to this Contract.

A voucher, invoice, or request for payment that is not in dispute when submitted is not a claim under this General Provision. However, if the submission subsequently is not acted upon in a reasonable time, or is disputed either as to liability or amount, it may be converted to a claim for the purpose of this General Provision.

(c) When a claim cannot be resolved by mutual agreement, the Contractor shall submit a written request for decision to the Department's Chief of the Division of Construction Contracts Administration, or other designated County official, for his decision in consultation with the County Office of Law. The Contractor's written request shall set forth all the facts surrounding the controversy, including, but not limited to, those items listed in GP-5.14(b). Any claim by the County shall be decided in like manner.

(d) The Contractor, at the discretion of the Engineer, may be afforded an opportunity to be heard and to offer evidence in support of his claim. Pending resolution of a claim, the Contractor shall proceed diligently with the performance of the Contract.

(e) The Department's Chief of the Division of Construction Contracts Administration, or other designated County official, shall decide any and all claims. The decision by the Department's Chief of the Division of Construction Contracts Administration, or other designated County official, shall be issued within ninety (90) Days on matters of less than fifty thousand dollars ($50,000) and within one hundred eighty (180) Days on matters of fifty thousand dollars ($50,000) or more. The written decision of the Department's Chief of the Division of Construction Contracts Administration, or other designated County official, shall be final and binding unless appealed in writing to the Director of the Department within thirty (30) Days of the Chief's, or other designated County official's, written opinion to the parties. If the Chief's, or other designated County official's, decision is timely appealed in writing to the Director of the Department, the Director of the Department, serving as referee, will review the written appeal submitted to assure all reasonable attempts were made to resolve the appeal.

(f) The Director shall issue his/her decision in writing within ninety (90) Days. The Director's decision shall be final and conclusive unless a written appeal is mailed or otherwise filed with the County Administrative Officer within thirty (30) Days of the Director's written decision.

(g) When the County Administrative Officer is satisfied all efforts at the Department level were made to resolve the dispute, a claim shall be resolved as follows:

(1) Subject to, and without in any way enlarging or limiting the other provisions of the Contract, the parties to any Agreement which adopts or incorporates by reference these Standard Specifications, appoint the County Administrative Officer as an administrative hearing
officer pursuant to Article 25A, “Chartered Counties of Maryland”, of the Annotated Code of Maryland.

(2) The parties further grant the County Administrative Officer the right to delegate this responsibility and authority in writing to a County official who is a registered professional engineer, independent of the Department of Public Works’s Division of Construction Contracts Administration, or to any other County official.

(3) For disputes involving ten thousand dollars ($10,000) or more the decision of the administrative hearing officer shall be final and binding on both parties, subject only to such appeals on the record as provided by Article 25A. For disputes involving less than ten thousand dollars ($10,000), the decision of the administrative hearing officer shall be final and binding on both parties.

GP - SECTION 6
CONTROL OF MATERIAL

GP-6.01 GENERAL

All Materials shall meet all quality requirements of the Contract. In order to expedite the inspection and testing of the Materials, the Contractor shall notify the Engineer in writing of the sources from which the Contractor proposes to obtain all Materials requiring approval, testing, inspection, or Certification prior to incorporation into the Work as soon as possible after receipt of notification of Award of the Contract.

To expedite the approval of this notice a list of Approved Sources of Supply is available through the Department’s Division of Construction Contracts Administration. If all Materials are to be supplied from the sources on the Approved Sources of Supply list, no written notification to that effect is required unless specifically requested by the Engineer or required by the Contract. If other sources are to be used, they shall be submitted for approval to the Engineer. It shall be the Contractor’s responsibility to insure that all Materials are supplied from approved sources. Once the source of concrete or bituminous concrete for exposed final surfaces has been selected, that source is to provide Material for all Construction of continuous surfaces on all of the Contract Work. Submittal of all sources of supply will still be required for contracts involving State or federal funding. The Engineer will inform the Contractor as to source acceptability as soon as possible.

GP-6.02 STORAGE AND HANDLING OF MATERIALS

Materials shall be stored so as to assure the preservation of their quality and acceptability for the Work. Stored Materials shall, at the discretion of the Engineer, be again inspected prior to their use in any Work even if approved before storage. Stored Materials shall be located so as to facilitate their prompt inspection. Approved portions of the Right-of-Way or Work site may be used for storage purposes and for the placing of the Contractor’s plant and Equipment; such
storage areas must be restored to their original condition by the Contractor prior to Final Acceptance for Maintenance of the Work at Contractor’s sole cost and expense. Any additional space required must be provided by the Contractor at Contractor’s sole cost and expense.

Materials shall be handled in such a manner as to preserve their quality and acceptability for the Work.

**GP-6.03 UNACCEPTABLE MATERIALS**

(a) Materials represented by samples taken and tested in accordance with the County-specified tests and failing to meet required values shall be considered to be defective regardless of prior tests or approvals.

(b) Unless otherwise allowed by the Engineer as set forth below, defective Materials shall be removed from the Work site and any tags, stamps or other markings implying conformance with Contract Work removed for those Materials and returned to the Engineer or obliterated if located on the Materials.

(c) Where defects can be corrected, the Contractor may propose such corrective action as the Contractor deems appropriate to the Engineer. The Engineer may approve the corrective action but in so doing does not assume responsibility for the success thereof. Retests will be made to determine the acceptability of the Material after corrective measures have been taken by the Contractor.

(d) The cost of replacing, correcting and/or removal of defective Material will be the sole responsibility of the Contractor.

(e) The cost of Repairing or replacing Materials damaged by the installation, correction and/or removal of defective Materials will be the sole responsibility of the Contractor.

**GP-6.04 ADMINISTRATION FURNISHED MATERIAL**

The Contractor shall furnish all Materials required for Full and Final Completion of the Work, except those specified to be furnished by the Administration. Materials furnished by the Administration will be delivered or made available to the Contractor at the point or points specified in the Special Provisions. The cost of handling and placing all Materials, after they are delivered to the Contractor, shall be considered as included in the Contract price for the Contract Item in connection with which they are used.

The Contractor shall be held responsible for all Material delivered to Contractor, and deductions will be made from any monies due or to become due to the Contractor to make good any shortages and deficiencies, from any cause whatsoever, and for any damage which may occur after such delivery, and for any demurrage charges.
In cases where Materials are supplied by the Administration and incorporated in the Contract Work by the Contractor, Materials inspection and acceptance will not be prerequisite for Final Acceptance for Maintenance as the Work pertains to these Contract Items.

GP-6.05 MATERIALS

Materials include all manufactured products and all processed and unprocessed natural substances required for the Full and Final Completion of the Contract. The Contractor in accepting the Contract is assumed to be thoroughly familiar with the Materials required and their limitations as to use and requirements for connections, setting, maintenance and operation.

Materials testing shall be performed by an independent testing firm, paid for by the Contractor, which has previously been approved by the County and the Architect and/or Design Engineer. Certified copies of all such test reports shall be submitted to the Engineer for approval.

Whenever an article, Material or Equipment is specified and a fastening, furring, connection (including utility connections), bed or accessory is normally considered essential to its installation in good quality Construction, such shall be included as if fully specified. Nothing in the Contract shall be interpreted as authorizing any Work in any manner contrary to applicable law, codes or regulations. (See GP-7.01).

(a) Approval

All Materials are subject to the Engineer’s and the Architect’s and/or Design Engineer’s approval as to conformity with the Contract Documents, quality, design, color, etc. No Work for which approval is necessary shall be contracted for, or used, until written approval is given by the Engineer and the Architect and/or Design Engineer. Approval of a Subcontractor, as such, does not constitute approval of a Material which is other than that included in the Contract Documents.

(b) New Materials

Unless otherwise specified, all Materials shall be new.

(c) Quality

Unless otherwise specified, all Material shall be of the best quality of the respective kinds.

(d) Samples

The Contractor shall furnish for approval all samples of the Materials as directed. The Work shall be the same as the approved samples.

(e) Painting and Color
The Architect and/or Design Engineer and the Contractor shall jointly prepare the paint and color schedules. The Architect and/or Design Engineer shall direct the exact color, texture and finish.

(f) **Proof of Quality**

The Contractor shall, if required, furnish satisfactory evidence as to the kind and quality of Materials either before or after installation. The Contractor shall pay for any tests as may be deemed necessary in relation to “Substitutions” as specified in GP-6.05(i).

(g) **Contractor’s Option**

When several products or manufacturers are named in the Contract Documents for the same purpose or use, then the Contractor shall select any of those so named. However, all of the units of a thing required for a Contract must be the same in material and manufacture.

(h) **“Or Equal”, “Equal”, “Approved Equal”**

The above terms are used as synonyms throughout the Contract Documents. They are implied in reference to all named manufacturers. Only Materials that, in the opinion of the Engineer, are fully equal in all details of Construction, methods of assembly, finish and design quality will be considered. (See (a), (c), (e) and (i) of this General Provision)

(i) **Substitutions**

Should the Contractor desire to substitute another Material for one or more specified by name, the Contractor shall apply, in writing, for such permission from the Engineer and state the credit or Extra Work involved by the use of such Material. The Engineer will not consider the substitution of any Material different in type or Construction methods unless such substitution effects a benefit to the County. (See (a) and (d) of this General Provision.)

The Contractor shall not submit for approval Materials other than those specified, unless the Contractor concurrently submits a written statement explaining why such a substitution of Materials is proposed. Approval of a “substitute” material by the Architect and/or Design Engineer when the Contractor has not designated such Material as a “substitute,” shall not be binding on the County nor release the Contractor from any obligations of the Contract, unless the Engineer and the Architect and/or Design Engineer approves such “substitutions” in writing.

(j) **Storage**

The Contractor shall confine apparatus and storage of Materials to the “off-Road” area delineated as the “limit of contract” or “limit of disturbance”, as applicable. The Contractor shall not load or permit any part of any Structure to be loaded with a weight that will endanger the safety of any Structure or any part thereof.

**GP-6.06 SALVAGE MATERIALS**
For Contract Work that involves the renovation, repair, and/or improvement of an existing Structure, the County has the right to claim as salvage any equipment and/or materials removed under the Work of the Contract. Should such right of salvage be exercised by the County, through verbal notification to the Contractor, the Contractor shall be responsible for the removal, protection, and transport, intact, of all salvaged equipment and/or materials to one or more government locations as directed by the Engineer. The Contractor shall provide the County with five (5) days advance notice prior to delivery of any salvage item to the designated government location. Until such time that items claimed as salvage by the County are provided to the County, the Contractor shall move and neatly store said items in a dry, secure location at the Contract Work site approved by the Engineer. Any and all costs associated with salvage materials, including, but not limited to, removal, protection, transportation and storage, shall be included by the Contractor in its Bid and Bid Package, and there will be no additional payment of any kind by the County for salvage operations or salvage materials.

GP - SECTION 7
LEGAL RELATIONS AND RESPONSIBILITY TO PUBLIC

GP-7.01 COMPLIANCE WITH LAWS

The Contractor hereby represents and warrants that:

(a) It is qualified to do business in the State of Maryland and that it will take such action as, from time to time hereafter, may be necessary to remain so qualified;

(b) It is not in arrears with respect to the payment of any monies due and owing the State or the County, or any department or unit thereof, including, but not limited to, the payment of taxes and employee benefits, and that it shall not become so in arrears during the term of this Contract;

(c) It shall comply with all federal, State and local laws, regulations, codes, executive orders, and ordinances applicable to its activities and obligations under this Contract; and

(d) All requirements set forth in federal assistance instruments applicable to this Contract shall be satisfied. The Contractor understands and agrees that it is possible federal and/or State funds may be used in connection with the Contract. Accordingly, prior to commencing any and all Work under the Contract, the Contractor shall ascertain and verify if federal and/or State funds are to be used by the County. It is the Contractor’s obligation to ascertain if the County will use any federal and/or State funds in connection with the Contract or any portion thereof. Further, it is the obligation of the Contractor and the Contractor understands and agrees that should any federal and/or State funds be used by the County in connection with the Contract, the Contractor shall adhere to and comply with all applicable federal and/or State laws, regulations, circulars, executive orders, procedures and guidelines, as and if applicable, as amended from time to time, at no additional cost or expense to the County.

GP-7.02 PERMITS AND LICENSES

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(a) The Contractor shall procure at Contractor's sole cost and own expense such permits, licenses, insurances and governmental approval as may be necessary in order to comply with federal, State and local laws, ordinances, codes, executive orders and regulations in performance of the Contract. The Contractor shall further give any notices necessary and incidental to the due and lawful prosecution of the Contract.

(b) The cost incurred in compliance with all permits shall be incidental to and included in the Bid. Any required permits, licenses and governmental approvals desired by the Contractor for temporary Structures such as docks, piers, anchorages, etc. must be applied for and obtained by the Contractor at Contractor’s sole cost and expense.

(c) Fire hydrant permits must be obtained if water is required from a hydrant. No water is to be drawn from a public fire hydrant except through a meter. Applications shall be made through the County Department of Permits, Approvals and Inspections (PAI), or any successor County department. All costs are considered incidental to the Bid, with the following exceptions:

The Department will issue a meter for fire hydrant utilization for performance of the Contract. At the request of the Contractor within five (5) Days of charging the lines the Engineer will issue the meter application to the Contractor without cost and there will be no charge for Contractor’s water use recorded on the meter provided. Failure to return the meter in good condition, or utilization of the meter provided for any other purpose, will be grounds for assessment of replacement costs thereof and/or liquidated damages.

(d) A backflow valve must be used in drawing water from the metropolitan system for charging and testing new utilities.

(e) This General Provision only applies, in its entirety, to building Contracts. GP-7.02(e)(8), “Miscellaneous Permits” applies to all types of Contracts.

1. BUILDING PERMIT – The County will obtain the building permit at no cost to the Contractor.

2. PERMANENT WATER AND/OR SEWER SERVICE – The County will apply for the permanent water and/or sewer service and pay all related charges; i.e., water meter, water systems connection charge, water distribution charge and sewer systems connection charge. Total installation of the permanent water and/or sewer service is part of this Contract. Water and/or sewer service shall be installed by a County prequalified utility contractor.

3. PLUMBING PERMIT – The Contractor shall apply for the plumbing permit; however, the County will pay all related charges and fees.

4. PERMANENT ELECTRIC SERVICE – The Contractor shall apply for and pay for the electrical permit. The County shall obtain permanent gas and electric service from the applicable Utility Companies for the Work site at no cost to the Contractor.
The Contractor shall coordinate the installation of permanent gas and electric service with the applicable Utility Companies. Both the gas and electric services shall be activated at the same time under one account number showing the County as owner. The Contractor shall be responsible for payment of consumption charges for the use of gas and electric energy obtained through the permanent gas and/or electric service until Final Acceptance for Maintenance of the Contract Work or until agreed upon by the County in direct coordination with the Department’s Building Services Division. Charges from the Utility Companies for removal of existing electric service will be paid by the County.

(5) PERMANENT TELEPHONE SERVICE – The County shall pay for the permanent telephone service and systems to and in any Contract building. The Contractor is responsible for supplying and installing all conduit, cables and junction boxes as shown on the Contract Drawings or as described in the Contract Documents.

(6) CABLE – The County shall pay for any permanent cable television service into any Contract building. The Contractor is responsible for supplying and installing the remaining Work as shown on the Contract Drawings or as described in the Contract Documents.

(7) TEMPORARY SERVICES – All temporary services, such as water, electric, telephone, etc., shall be the Contractor’s entire responsibility.

The Contractor shall arrange for and pay for the installation of temporary connection to the County’s water mains, including all incidental fees and expenses for water supply during Construction of the Contract Work, and shall pay for all water used. Wasting of County water will not be permitted.

The Contractor shall arrange for and pay for temporary electric light and power service required during Construction of the Contract Work, and shall pay for all electricity used. Gasoline or other torches for lighting will not be permitted.

The Contractor shall provide and pay for any other temporary services that may be required for the Full and Final Completion of the Contract Work.

The Contractor shall provide, at Contractor’s sole cost and expense, all cold weather protection, temporary heat and fuel as necessary to carry on the Work expeditiously during inclement weather, to protect Work and Materials against injury from dampness and cold, to dry out the building, and to provide suitable Working conditions. Refer to other portions of these Standard Specifications and/or the Contract Documents for temperatures required for Work under the various trades.

The methods of heating and type of fuel and Equipment used shall be subject to approval by Engineer.

With special permission, obtained from the Engineer in writing, a permanent heating system may be used to dry out any Contract building and provide suitable working conditions in all or various parts thereof as soon as practicable. If used, the Contractor shall be
responsible for use of the permanent heating system for the purpose described and all costs of fuel, attendance, etc. in connection therewith shall be borne by the Contractor. Such use shall not relieve the Contractor of its responsibility to turn over the permanent heating system to County on the date of Final Acceptance for Maintenance in perfect condition, including the removal of all dust of Construction from air handling units, etc., the replacing of all filters, etc., nor shall it shorten the stipulated guarantee period which will commence upon the date of Final Acceptance for Maintenance by the County of the Work.

(8) MISCELLANEOUS PERMITS - The Contractor shall procure any and all necessary permits not previously mentioned and pay any and all related charges and fees required and incidental to the due and lawful prosecution of the Work.

(f) The Contractor shall give all notices and comply with all State and federal laws, ordinances, rules and regulations bearing on the conduct of the Work as drawn and specified.

GP-7.03 INTELLECTUAL PROPERTY AND PATENTED DEVICES, MATERIALS AND PROCESSES

If the Contractor is required or desires to use any intellectual property right, design, device, propriety information, material, or process covered by letters of patent or copyright or any other intellectual property right, the Contractor shall provide for such use by suitable legal agreement with the patentee, license holder, or owner and a copy of such agreement shall be filed with the Administration. The Contractor and the Surety shall indemnify, protect and save harmless (and defend upon request) the County and its officials, employees, agents and any affected third party, or political subdivision from any and all claims, suits, demands, liabilities, actions, costs, and/or judgments including, but not limited to, attorneys fees, by reason of the use of any such patented design, proprietary information, device, trade secret, patent right or intellectual property right or design, device, material, or process, or any trademark or copyright.

GP-7.04 FEDERAL OR STATE PARTICIPATION

When the United States Government and/or the State pays all or any portion of the cost of a project, the Work shall be subject to the inspection of the appropriate federal or State agency. Such inspection shall in no sense make the federal or State government a party to this Contract, and will not interfere in any way with the rights of either party hereunder.

GP-7.05 CONSTRUCTION SAFETY AND HEALTH STANDARDS

(a) It is a condition of this Contract, and shall be made a condition of each Subcontract entered into pursuant to this Contract, that the Contractor and any Subcontractor shall not require any laborer or mechanic employed in performance of the Contract to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his health or safety, as determined under Construction safety and health laws, standards and regulations (Title 29,
The Contractor shall be responsible for gas detection in and ventilation of confined spaces.

When procedures require workers to enter confined spaces such as steel or concrete box section type Superstructures, the Contractor shall be cognizant of the potential health hazards, particularly when the interior is closed off at both ends.

It shall be the Contractor’s responsibility to adhere to all applicable MOSHA regulations. The Contractor shall have available approved detecting devices and shall conduct tests for oxygen content and presence of gases, such as combustible gas, carbon dioxide, methane, carbon monoxide, and hydrogen sulfide whenever any fabrication, erection or inspection operations are to be performed within the confined spaces. The Contractor shall apply mechanical ventilation continuously to the confined space during occupancy to maintain the proper oxygen content. The Contractor shall conduct air tests periodically during the occupancy.

(c) The Contractor shall arrange for the erection and maintenance of temporary toilets equipped with running water and a drain connection for use of the Contractor’s employees, Subcontractors, and/or agents, and County employees. These conveniences shall be erected and kept clean, neat and in good sanitary condition, as required by applicable law and/or regulation, until ordered removed by the Engineer.

In lieu of temporary toilets, the Contractor may install a portable chemical toilet at a location as approved by the Engineer.

The permanent plumbing fixtures to be constructed under the Contract shall not be used by any Person, under any circumstances, before Final Acceptance for Maintenance of the Contract by the County.

(d) The Contractor shall erect and properly maintain at all times as required by the conditions and progress of the Work, all necessary safeguards for the protection of workers and the public.
and shall post danger signs warning against the hazards created by such features of Construction as protruding nails, hod hoists, well holes, elevator hatchways, scaffolding, window openings, stairways and falling material.

In an emergency affecting the safety of life, or of the Work, or of the adjoining property, the Contractor, without special instruction or authorization is hereby permitted to act, at the Contractor’s discretion, to prevent such threatened loss or injury, and the Contractor shall so act, without appeal, if so instructed or authorized by the Engineer. Any compensation claimed by the Contractor on account of emergency Work shall be determined as outlined in GP-4.07.

**GP-7.06 PUBLIC CONVENIENCE AND SAFETY**

The Contractor at all times shall conduct the Work in such a manner as to ensure the least practicable obstruction to all forms of traffic. The convenience of the general public, tenants, and of the residents along and/or adjacent to the Work site shall be provided for as follows and as further directed by the Engineer:

(a) Equipment and/or Materials stored upon or about the Work site shall be placed so as to cause a minimum of obstruction to the public.

(b) Sprinkling shall be performed at the direction of the Engineer.

(c) The Contractor shall, unless otherwise specified, provide and maintain in passable condition such temporary access, Roads and Bridges as may be necessary to accommodate traffic diverted from the Work site under Constructions, or using the project under Construction and shall provide and maintain in a safe condition temporary approaches to and crossings of the Work site.

(d) Existing facilities planned to be removed, but which might be of service to the public during Construction are not to be disturbed until other and adequate provisions are made.

(e) Existing mailboxes shall be maintained or reset in positions accessible to the public and to mail deliveries during Construction and subsequent to Construction in their final locations in a satisfactory condition.

(f) On facilities occupied by railroad or light rail stations, temporary platforms for the entrance and exit of passengers and/or freight to and from the railway cars shall be provided and maintained in an approved manner by the Contractor and the applicable railroad/agency.

(g) Fire hydrants on or adjacent to the Contract Work site shall be kept accessible to fire apparatus at all times, and no material or obstruction shall be placed within fifteen (15) feet of any such hydrant. Work closed down for the winter or at any other times shall be left entirely accessible at all points to fire apparatus.
(h) All footways, gutters, storm drainage and portions of the Contract Work site adjoining the Work under Construction shall not be obstructed more than is absolutely necessary. The Engineer, in cooperation with the Sediment Control Inspector, shall specify that drainage inlets in sumps where there is potential for localized flooding shall have flow restrictions removed in the event of a predicted significant rainfall event.

GP-7.07 DETOURS

Detours may be indicated in the Contract Documents, or at the Contractor’s request traffic may be detoured over County-approved routes along existing Roads, as determined acceptable by the Department’s Bureau of Traffic Engineering and Transportation Planning. Detours over existing Roads will be designated, marked and maintained by the Contractor.

GP-7.08 BARRICADES AND WARNING SIGNS

The Contractor shall provide, erect and maintain all necessary barricades, suitable and sufficient lights, danger signals, signs and other traffic control devices, and shall take all necessary precautions for the protection of the Work and safety of the public. All Highways and other County facilities closed to vehicular traffic shall be protected by effective barricades, and obstructions shall be illuminated during hours of darkness with electric lights. The Contractor shall erect warning signs in advance of any place on the Work site where operations may interfere with the use of the facility by vehicular traffic, and at all other points where the new Work crosses or coincides with an existing Roadway or traffic lane(s). Such warning signs shall be constructed and erected in accordance with the MUTCD for Street and Highways, or as directed by the Engineer.

The Contractor shall furnish, erect and maintain warning and direction signs in the number required by the Engineer and at locations designated by the Engineer throughout the limits of the Contract Work site.

For street and Highway type traffic, the signs shall conform in every respect to the requirements of the MUTCD for Streets and Highways. Signs must be freshly painted and adequately reflectorized before being placed on any Contract Work site. No Work may be performed or begun unless an adequate number of signs of the proper category are in place.

In cases where the Contractor’s sequence of operations results in grade differentials that would be hazardous to vehicular traffic the Contractor shall, at the direction of the Engineer, provide suitable substantial traffic barriers to the extent determined by the Engineer.

GP-7.09 FLAGGING OF MOTOR VEHICLE TRAFFIC

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For all Construction Contracts requiring the flagging of motor vehicles licensed for operation on the Highways of the State, said flagging shall be conducted as specified in the MUTCD for Streets and Highways.

**GP-7.10 MAINTENANCE OF TRAFFIC**

Unless otherwise noted in the Special Provisions, it shall be the Contractor’s responsibility to maintain pedestrian and vehicular traffic safely, adequately and continuously on all portions of existing facilities affected by the Contractor’s Work. In addition to existing facilities undergoing improvement, this also applies to crossroads, approaches, crossovers and entrances affected or made necessary by the Contractor’s Work.

**GP-7.11 PRESERVATION AND RESTORATION OF PROPERTY OUTSIDE OF RIGHT-OF-WAY**

(a) The Contractor shall not enter upon public or private property (outside of the Right-of-Way or Contract Work area as shown on the Contract Drawings) for any purpose without obtaining prior written permission from any applicable property owners. The Contractor shall be responsible for the preservation of all public and private property, trees, property pipes, monuments, signs and markers and fences thereon, and shall use every precaution necessary to prevent damage or injury thereto. The Contractor shall take suitable precaution to prevent damage to underground or overhead public utility structures. The Contractor shall carefully protect all survey land monuments and property marks located on the Contract Drawings or found in the Work site from disturbance. No alteration or damage thereto shall occur until survey references are established by a licensed surveyor at Contractor’s sole cost and expense. If any land monuments and/or property marks are damaged or disturbed, they shall be reset by a licensed surveyor at the Contractor’s sole cost and expense.

(b) The Contractor shall be responsible for all damage or injury to property of any character during the prosecution of the Work, resulting from any act, omission, neglect or misconduct in the Contractor’s manner or method of executing said Work, or at any time due to defective Work or Materials, and said responsibility shall not be released until Final Acceptance for Maintenance of the Work is achieved. When or where any direct or indirect damage or injury is done to public or private property by or on account of any act, omission, neglect or misconduct in the execution of the Work or in consequence of the nonexecution thereof on the part of the Contractor, the Contractor shall restore, at the Contractor’s sole cost and expense, such property to a condition similar to, or equal to, that existing before such damage or injury, in an acceptable manner to the County and/or applicable property owner. In case of the failure on the part of the Contractor to restore such property or make good such damage or injury, the Engineer may, upon forty-eight (48) hours notice to the Contractor, proceed to Repair, rebuild or otherwise restore such property as may be deemed necessary, and the cost and expense thereof will be deducted from any monies due or which may become due the Contractor under this Contract. If the property damage results in a public safety issue, in the sole discretion of the County, the
Contractor shall restore immediately or the County shall do so at Contractor’s sole cost and expense.

(c) The Contractor should be aware of the potential of cultural resources on the Contract Work site. During the Construction phase, whenever anything that might appear to be a cultural resource of an historical, archeological, or paleontological nature is encountered, such an object shall not be disturbed. Work shall be stopped and rescheduled in a way that shall avoid not only the objects encountered but also the area of discovery and the Engineer shall be notified in writing at once. The Engineer will arrange for the evaluation of the situation by the appropriate authorities and for the ultimate disposition of the matter, taking the evaluation of the situation by the appropriate authorities into consideration.

(d) All trees along the way of access and all trees surrounding any Contract building which are liable to injury by the moving, storing and working up of Materials shall be boxed. No permanent tree shall be used for attachment of any ropes or derricks. Every public way, catch basin, conduit, tree, fence or things injured in carrying out this Contract, shall be replaced and put in good condition by the Contractor at no cost or expense to the County, unless the same shall be permanently done away with by written order of the Engineer.

GP-7.12  LAND, AIR AND WATER POLLUTION

(a) The Contractor shall incorporate all permanent erosion control features into the Work at the earliest practicable time as required by the Contract Documents. Temporary pollution control measures will be used to correct conditions that develop during Construction that were not foreseen during design; that are needed prior to installation of permanent pollution control features; or that are needed temporarily to control erosion that develops during normal Construction practices, but are not associated with permanent control features on the Contract.

(b) The Contractor’s attention is directed to the fact that temporary pollution control may include control measures outside the Right-of-Way or Contract Work site where such Work is necessary as a direct result of Contract-required Construction. The Engineer shall be kept advised of all such off-site control measures taken by the Contractor. This shall not relieve the Contractor of the basic responsibilities for such Work.

(c) In case of failure on the part of the Contractor to control erosion, pollution or siltation, the Engineer reserves the right to employ outside assistance or to use County forces to provide the necessary corrective measures. All costs and expenses incurred by the Engineer in the performance of such duties for the Contractor shall be withheld from monies due or becoming due to the Contractor.

(d) The Contractor and the Contractor’s suppliers must submit evidence to the Administration that the governing federal, State and local air pollution laws, regulations and criteria will be met. This evidence and related documents will be retained by the Administration for on-site evaluation.

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GP-7.13 RESPONSIBILITY FOR DAMAGE CLAIMS

(a) The Contractor shall indemnify and save harmless the County and all of its officials, agents, employees and representatives from all suits, actions, or claims of any character, including, but not limited to, all the costs of defense, brought on account of any injuries or damages sustained by any person or property in consequence of any neglect in safeguarding the Work, and/or through the use of unacceptable Materials in the Construction of the Contract Work, and/or on account of any act or omission by the said Contractor in the performance of the Contract, and/or as a result of faulty, inadequate or improper temporary drainage during Construction, and/or on account of the use, misuse, storage or handling of explosives, and/or on account of any claims or amounts recovered for any infringement of intellectual property, patent, trade secret, proprietary information, trademark, or copyright, and/or from any claims or amounts arising or recovered under the workers’ compensation laws, and/or any other State or local law, executive order, charter, bylaw, code, ordinance, regulation, order or decree whether caused by or resulting from the act, omission, neglect, or misconduct of the Contractor, or its employees, agents, or Subcontractors, at any tier. The Contractor shall be responsible for any and all damage or injury to property of any character during the prosecution of the Work resulting from any act, omission, neglect or misconduct, in the manner or method of executing said Work satisfactorily or due to the nonexecution of said Work or at any time due to defective Work or Materials and said responsibility shall continue until Full and Final Completion of the Contract. The obligation of the Contractor to the County and all of its officials, agents, employees and representatives to indemnify, defend, and save harmless shall not apply if resulting from the sole negligence of the County.

(b) The Contractor shall conduct its operations upon the right-of-way of any applicable railroad company fully within the rules, regulations and requirements of the railroad company including, but not limited to, any additional flagging, insurance, inspection, and/or permit requirements. The Contractor shall be responsible for acquainting itself with such requirements as the railroad company may demand.

(c) The Contractor shall be held solely responsible for any accidents that may happen to the railroad company as a result of its operations.

(d) In accordance with GP-7.15, the Contractor shall not be held responsible for any claims arising from accidents incurred because of any traffic or general use permitted during the time the Construction Work site or any section thereof is open to traffic except from accidents which are attributable to the Contractor’s, or the Contractor’s employee’s, Subcontractor’s or agent’s, acts or omissions or negligence.

GP-7.14 LIABILITY INSURANCE

Prior to the start of the Work on the Contract, or prior to the execution of the Contract if permitted by the County, the Contractor shall submit to the Department’s Division of

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Construction Contracts Administration, an evidence of insurance certificate indicating that the following insurance is carried:

“Comprehensive general public liability and property damage insurance” in the amounts of at least five hundred thousand dollars ($500,000) for the death of or injury to any person, each occurrence. Such insurance shall protect the Contractor from claims which may arise out of, or result from, the Contractor’s operations under the Contract, whether such operations be by the Contractor, any Subcontractor, or anyone directly or indirectly employed by the Contractor or Subcontractor, or anyone for those acts any of the above may be liable. Minimum coverages to be included: “independent contractor’s coverage”; “completed operations and products liability coverage”; and “contractual liability coverage”. “Damages not to be excluded insurance” shall contain no exclusions applying to operations by the Contractor or any Subcontractor in the performance of the Contract pertaining to: (1) collapse of, or structural injury to, any Contract building or Structure; (2) damage to underground property; or (3) damage arising out of blasting or explosion and, where applicable, (4) removal of asbestos/lead or debris and building products containing asbestos/lead, transportation and disposal of asbestos/lead and contaminated materials.

“Automobile liability insurance” shall include “bodily injury liability” and “property damage liability” for a combined single limit of five hundred thousand dollars ($500,000) any one accident. Such insurance shall provide coverage for all Contractor owned, non-owned and hired automobiles.

“Workers’ compensation and employers’ liability insurance” must contain statutory coverage, including “employers’ liability insurance” with limits of at least for “bodily injury by accident” — two hundred fifty thousand dollars ($250,000) each accident; “bodily injury by disease” — two hundred fifty thousand dollars ($250,000) each employee; and “bodily injury by disease” — five hundred thousand dollars ($500,000) policy limit.

Any policy exclusions must be shown on the face of the evidence of insurance.

When specified in the Contract Documents, the Contractor shall carry the type and amounts of insurance in addition to any other forms of insurance or bonds required under the terms of the Contract and the Contract Documents.

The cost of the insurance will be incidental to the Contract lump sum price for mobilization, or if that is not identified, to the other Contract Items specified in the Contract Documents.

Contractor shall procure “railroad public liability and property damaged insurance” and this insurance shall be provided by the Contractor as specified in TC-6.03.

The Contractor and its insurer shall immediately notify in writing the Department’s Division of Construction Contracts Administration in the event that the Contractor’s insurance coverage lapses for any reason.

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Unless previously waived in writing by the Engineer, the Contractor shall, at the Contractor’s sole expense and cost, insure the Work and keep it insured at all times during the Contract term and period of Construction, and until Final Acceptance for Maintenance of all Contract Work by the County, against loss or damage covered by an “all risk” builders risk type of policy. The amount of insurance shall be the one hundred percent (100%) estimated replacement cost of the Work.

The policies shall name the County and the Contractor as certificate holder and shall name the County as an additional insured in accordance with the requirements of the Contract Documents, as their interest may appear, and the policies shall be left in the possession of the Engineer, prior to the start of Construction.

GP-7.15   USE AND POSSESSION PRIOR TO FULL AND FINAL COMPLETION

(a) The Administration shall have the right to take possession of or use any completed or partially completed part of the Work. Such possession of or use shall not be deemed Partial Acceptance for Maintenance and/or Final Acceptance for Maintenance of any Work not completed in accordance with the Contract. While the Administration is in such possession, the Contractor shall be relieved of the responsibility for loss or damage to that portion of the Work in possession of the Administration, other than that resulting from the Contractor’s fault, omission, act, or negligence. If such prior possession or use by the Administration delays the progress of the Work or causes additional expense to the Contractor, the Contractor shall provide the Administration with immediate Written Notice thereof to allow possible equitable adjustment in the Contract price or the time of completion. If necessary, an equitable adjustment will be made and the Contract shall be modified pursuant to a Contract Modification accordingly.

(b) Under this GP-7.15, only upon the prior written authorization of the Engineer may the Contractor be relieved of maintenance during the time the County has taken possession. Any portion of the Work that may be disturbed or damaged shall be restored at respective Contract prices for Contract Items involved, or on the basis of a predetermined arrangement entered into by the Contractor and Engineer before the performance of the restoration Work.

GP-7.16   CONTRACTOR’S RESPONSIBILITY FOR WORK

(a) Except as herein elsewhere provided, until Final Acceptance for Maintenance of the Work by the Administration, the Contractor shall have the charge and care thereof and shall take every reasonable precaution against injury or damage to any part thereof by the action of the elements, or from any other cause, whether rising from the execution or from the nonexecution of the Work. The Contractor, except as herein elsewhere provided, shall rebuild, Repair, restore, and make good all injuries or damages to any portion of the Work occasioned by any of the above causes before the Final Acceptance for Maintenance and shall bear the expense thereof. Material lost or Structures damaged as a result of faulty temporary drainage during Construction or the action of the elements shall be replaced or Repaired by the Contractor at no cost, expense, or delay to the Administration. The Contractor shall make good or replace at the Contractor’s
cost and expense, and as otherwise required, any Administration-furnished Material which may be broken, lost through fire, theft, or otherwise damaged, or in any way made useless for the purpose and use intended subsequent to delivery to the Contractor by the Administration and prior to Final Acceptance for Maintenance of the Work by the County even though such breakage, damage, loss or uselessness may result from causes beyond the control of the Contractor.

(b) In case of suspension of Work for any cause whatever, the Contractor shall be responsible for the Contract Work and Work site and shall take such precautions as may be necessary to prevent damage to the Work and the Work site, provide for normal drainage, and shall erect any necessary temporary structures, signs, or other facilities at the Contractor’s cost and expense. During such period of suspension of Work, the Contractor shall properly and continuously maintain in an acceptable growing condition all living material in newly established plantings, seedings, and soddings furnished under this Contract, and shall take adequate precautions to protect new growth and other important vegetative growth against injury.

GP-7.17 CONTRACTOR'S RESPONSIBILITY FOR UTILITY PROPERTY AND SERVICES

At points where the Contractor’s operations are adjacent to properties of railway, telegraph, telephone, power companies, and/or Utility Companies or are adjacent to other property, damage to which might result in expense, loss or inconvenience, Work shall not be commenced until all arrangements necessary for the protection thereof have been made between the Contractor and the property owner and/or affected Person.

The Contractor shall cooperate with the owners of any underground or overhead utility lines in their removal and rearrangement operations in order that these operations may progress in a reasonable manner, that duplication or rearrangement Work may be reduced to a minimum and that services rendered by those parties will not be unnecessarily interrupted.

In the event of interruption to utility services as a result of accidental breakage or as a result of being exposed or unsupported, the Contractor shall promptly notify the proper authority and shall cooperate with the said authority in the restoration of service. No Work shall be undertaken around fire hydrants until provisions for continued service have been approved by the local fire authority.

GP-7.18 PERSONAL LIABILITY OF PUBLIC OFFICIALS

In carrying out any of the provisions of the Contract, or in exercising any power or authority granted to them by or within the scope of the Contract, there shall be no liability upon the Administrator, Engineer or other County officials, employees, agents and/or authorized representatives, either personally or as officials, employees, or agents of the County, it being understood that in all such matters they act solely as agents and representatives of the County.
In addition, the Engineer and all of Engineer’s representatives shall be held harmless, free of liability and duress, in the exercise of their duties and obligations as Inspector, administrator, witness, referee, mediator, and arbiter by both parties in their mutual best interest.

**GP-7.19 NO WAIVER OF LEGAL RIGHTS**

The Administration shall not be precluded or estopped by any measurement, estimate, or Certificate made either before or after the Partial Acceptance for Maintenance and/or Final Acceptance for Maintenance of any Work and payment therefore by the County, from showing the true amount and character of the Work performed and Materials furnished by the Contractor, nor from showing that any such measurement, estimate or Certificate is untrue or is incorrectly made, nor from showing that the Work or Materials do not in fact conform to the Contract. The Administration shall not be precluded or estopped, notwithstanding any such measurement, estimate or Certificate and payment in accordance therewith, from recovering from the Contractor or its Sureties, or both, such damage as it may sustain by reason of Contractor’s failure to comply with the terms of the Contract. Neither the acceptance by the Administration, or any representative of the Administration, nor any payment for or acceptance of the whole or any part of the Work, nor any extension of time, nor any possession taken by the Administration, shall operate as a waiver of any portion of the Contract or of any power herein reserved, or of any right to damages.

No failure or delay by the County to insist upon the strict performance of any term, condition or covenant within the Contract, or to exercise any right, power, or remedy consequent upon a breach thereof, shall constitute a waiver of any such term, condition, or covenant or of any such breach, or preclude the County from exercising any such right, power, or remedy at any later time or times. Further, the express written waiver of any breach of the Contract shall not be a waiver of any other or subsequent breach of the Contract.

**GP-7.20 NONDISCRIMINATION IN EMPLOYMENT**

(a) The Contractor shall agree to the following conditions during the performance of its Contract with the County:

(1) To comply with all applicable federal, State, and County laws, regulations, codes, circulars, and executive orders;

(2) Not to discriminate in any manner against an employee or applicant for employment because of race, color, religion, creed, age, sex, marital status, national origin, ancestry, or physical or mental handicap unrelated in nature and extent so as reasonably to preclude the performance of such employment;

(3) To include a provision similar to that contained in GP-7.20 (a)(2), above, in any Subcontract except a Subcontract for standard commercial supplies or raw Materials;
(4) To post and to cause Subcontractors to post in conspicuous places available to employees and applicants for employment, notices setting forth the substance of this GP-7.20;

(5) In all solicitations or advertisements for employees placed by or on behalf of the Contractor, to state that all qualified applicants will receive consideration for employment without regard to sex, race, creed, color or national origin;

(6) If requested by the County to furnish a compliance report concerning its employment practices and policies in order for the County to ascertain compliance with the provisions of this Contract concerning nondiscrimination in employment; and

(7) To include the provisions outlined in this GP-7.20 pertaining to nondiscrimination in employment in every Subcontract or purchase order it uses in order to carry out the terms and conditions of the Contract so that such nondiscrimination in employment provisions are binding on each Subcontractor or vendor.

(b) In the event of the Contractor’s noncompliance with the nondiscrimination provisions of this GP-7.20 and/or the Contract, the County shall impose such sanctions as it may determine to be appropriate, including but not limited to:

(1) Withholding of payment to the Contractor under the Contract until the Contractor complies; and/or

(2) Cancellation, termination or suspension of the Contract in whole or in part.

(c) Contractors providing Materials, Equipment, supplies, or services to the County under this Contract herewith assure the County that they are conforming to the provisions of the Civil Rights Act of 1964 and Section 202 of the Executive Order 11246 of the President of the United States of America as amended by Executive Order 11375, as applicable and as may be amended from time to time.

GP-7.21 SANCTIONS UPON IMPROPER ACTS – Reserved.

GP-7.22 NONHIRING OF EMPLOYEES

No official or employee of the County or any unit, department or agency of the County, whose duties as such official or employee include matters relating to or affecting the subject matter of this Contract, shall, while so appointed and/or employed, and during the pendency and/or term of the Contract, become or be an officer or employee of the Contractor.

GP-7.23 CHOICE OF LAW

The Parties hereby agree that:

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(a) This Contract was made and entered into in Maryland, and under the laws, regulations, codes, and executive orders of the County and the State, as applicable.

(b) The laws, regulations, codes and executive orders of the County and the State shall govern the resolution of any issue arising in connection with this Contract including, but not limited to, all questions concerning the validity of this Contract; the capacity of the parties to enter therein; any modification or amendment thereto; and the rights and obligations of the parties hereunder.

**GP-7.24 CONTINGENT FEE PROHIBITION**

(a) The Contractor warrants that it has not employed or retained any Person, partnership, corporation, or other entity, other than a bona fide employee or agent working for the Contractor, to solicit or secure this Contract, and that it has not paid or agreed to pay any Person, partnership, corporation, or other entity, other than a bona fide employee or agent, any fee or any other consideration contingent on the making of this Contract.

(b) For a breach or violation of this warranty, the Administration shall have the right to terminate this Contract without liability, or, in its discretion, to deduct from the Contract price or consideration, or otherwise recover, the full amount of such fee, commission, percentage, brokerage fee, gift or contingent fee.

**GP-7.25 MULTI-YEAR CONTRACTS CONTINGENT UPON APPROPRIATIONS**

– Reserved.

**GP-7.26 COST AND PRICE CERTIFICATION** – Reserved.

**GP-7.27 CORPORATE REGISTRATION AND TAX PAYMENT CERTIFICATION**

– Reserved.

**GP-7.28 BUY AMERICAN STEEL ACT**

The Provisions of COMAR 21.11.02 pertaining to implementation of the “Buy American Steel” Act (Subtitle 3 of Title 17 of the State Finance and Procurement Article of the Annotated Code of Maryland), as amended from time to time, are incorporated in this Contract by reference.
GP-7.29 MINORITY BUSINESS ENTERPRISE AND WOMEN BUSINESS ENTERPRISE

It is the policy of the County that MBE and WBE, as defined by the most recent County Executive Order, and as further described in the Contract Documents, shall have the maximum opportunity to participate in the performance of capital improvement contracts financed by County capital funds and/or County operating funds in accordance with the most recent County Executive Order. The Contractor shall comply with all MBE/WBE requirements as set forth in the Contract Documents.

GP-7.30 PREVAILING WAGE CONTRACTS FOR PUBLIC WORKS

(a) The Provisions of Subtitle 2 of Title 17 of the State Finance and Procurement Article of the Annotated Code of Maryland, as amended, and COMAR 21.11.11, as amended, pertaining to the Prevailing Wage for Public Works are incorporated in construction contracts of five hundred thousand dollars ($500,000) or more by reference, if and as applicable.

(b) When all or a portion of the cost of a contract is funded by the U.S. Government, and the cost of the contract exceeds two thousand dollars ($2,000), among other legal requirements, the minimum wage rates and benefits paid to workmen under the contract shall be those prevailing in the locality, as predetermined by the Secretary of Labor pursuant to the Davis-Bacon Act (40 USC 276a to a-7), as amended from time to time, and regulations (29 CFR, Part 5) promulgated thereunder, as amended from time to time. Davis-Bacon rates applicable to this Contract, if any, may be specified elsewhere in the Contract Documents.

GP-7.31 SMALL BUSINESS PROCUREMENTS – Reserved.

GP-7.32 FINANCIAL DISCLOSURE – Reserved.

GP-7.33 POLITICAL CONTRIBUTION DISCLOSURE

The Contractor affirms that it is aware of, and will comply with, the provisions of Sections 14-101 through 14-108 of the Election Law Article of the Annotated Code of Maryland, as amended from time to time, which requires every Person who makes, during any 12-month period, one or more contracts, with one or more State governmental entities involving cumulative consideration, of at least two hundred thousand dollars ($200,000.00), to file with the State Board of Elections certain specified information to include disclosure of attributable political contributions in excess of five hundred dollars ($500.00), during defined reporting periods.

GP-7.34 CONFLICT OF INTEREST LAW

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May 15, 2017
It is unlawful for any County official, employee, or agent to participate personally in his/her official capacity through decision, approval, disapproval, recommendation, advice, or investigation in any contract or other matter in which he or she, his or her spouse, or his or her dependent child has a financial interest or to which any firm, corporation, association, or other organization in which he or she has a financial interest or in which he or she is serving as an officer, director, trustee, partner, or employee is a party, or to which any person with whom he or she is negotiating or has any arrangement concerning prospective employment, is a party, unless such official, employee, or agent has previously complied with the provisions of Article 7 of the Baltimore County Code, 2003, as amended.

GP-7.35  PRE-EXISTING REGULATIONS – Reserved.

GP-7.36  RETENTION OF RECORDS

(a) Except as otherwise expressly stated in this General Provision and the Contract Documents, the Contractor shall retain and maintain all records and documents including, but not limited to, cost or pricing data, relating to this Contract for three (3) years after final payment by the County under the Contract or any applicable statute of limitations, whichever is longer, and shall make them available for inspection and audit by authorized representatives of the County, including the Engineer or his designee at all reasonable times. Should the Contract involve use of State or federal funds, the Contractor shall retain and maintain, all records and documents including, but not limited to, cost or pricing data, relating to this Contract for not less than ten (10) years after final payment by the County under the Contract or any applicable statute of limitations, whichever is longer.

(b) The Contractor shall include the provisions of GP-7.36(a) in every Subcontract.

GP-7.37  RESPONSIBILITY FOR RIGHT OF WAY

(a) The Right-of-Way (or Work site) as shown on the Contract Drawings has been, or will be, secured by the County.

(b) The Contractor shall not move any Equipment or Material in or on the Right-of-Way until authorized to do so by the Engineer. The Contractor shall confine its operations strictly within the limits of the Rights-of-Way shown in the Contract Documents unless the Contractor obtains the prior written permission of any applicable property owner of such additional lands as Contractor proposes to occupy. A copy of the written permission will be furnished to the Engineer before Contractor enters said property.

(c) Unless otherwise provided in the Contract Documents, trees with a butt diameter in excess of three inches (3") , measured three feet (3') above the ground, shall not be felled or damaged by the Contractor in a Right-of-Way identified as a Construction Strip. Should the Contractor obtain written permission of any applicable property owner to fell a tree or trees with

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a diameter greater than three inches (3") from a Construction Strip, Contractor shall provide a

(d) Unless otherwise provided in the Contract Documents, all trees may be felled with the

(e) Unless otherwise provided in the Contract Documents, the Contractor is to preserve and

(f) The Contractor shall not enter upon public or private property (outside of the Right-of-

(g) Upon Final Acceptance for Maintenance of the Work by the County, the Contractor shall

(h) No arrangements will be made by the County for rights-of-way or rights of access beyond

GP-SECTION 8
PROSECUTION AND PROGRESS

GP-8.01 SUBCONTRACTING

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(a) **Utilities and/or Highways Contracts.** Except as may be provided elsewhere in the Contract, the Contractor to whom a utilities and/or Highways Contract is Awarded shall perform with its own organization and with the assistance of workmen under the Contractor's immediate supervision, Work of a value of not less than fifty percent (50%) of the total Bid value of the Contract. The Director may permit the Contractor to sublet or Subcontract Work in excess of the fifty percent (50%) limitation where it is determined by the Engineer that the best interest of the County will be promoted thereby. The execution of Work by a subsidiary of the Contractor is not considered to be Work performed by the Contractor under this GP-8.01(a). The Contractor shall not assign any monies due or to become due to the Contractor hereunder, without the previous written consent of the County.

The Engineer's consent to Subcontract shall not be construed to relieve the Contractor or its Surety of any responsibility for the fulfillment of all the requirements of the Contract.

Unless required by the County pursuant to GP-8.01(e) or unless specified in the Contract Documents, Subcontractors undertaking a portion of Work under a utilities or Highways Contract in accordance with GP-8.01(a) (less than fifty percent (50%) of the Bid value) do not require Department approval.

When required, the Contractor shall give assurance that the minimum wage for labor, as specified in the Contract Documents, shall apply to labor performed on all Work sublet, subcontracted, assigned or otherwise disposed of in any way under a utilities or Highway Contract.

(b) **Buildings Contracts.** Except as may be provided elsewhere in the Contract, the contractor to whom a buildings Contract is Awarded shall perform with its own organization, and with the assistance of workmen under the Contractor’s immediate supervision and with Materials directly purchased and paid for by the Contractor, Work of a value of not less than ten percent (10%) of the total Bid value of the Contract. Costs for insurance, overhead, and supervisions may not be claimed as a portion of the ten percent (10%) or more of the Work. The execution of Work by a subsidiary of the Contractor is not considered to be Work performed by the Contractor under this GP-8.01(b). The Contractor shall not assign any monies due or to become due to the Contractor hereunder, without the previous written consent of the County.

The Engineer’s consent to Subcontract shall not be construed to relieve the Contractor or its Surety of any responsibility for the fulfillment of all the requirements of the Contract.

Unless required by the County pursuant to GP-8.01(e) or unless specified in the Contract Documents, Subcontractors undertaking a portion of Work under a building Contract in accordance with GP-8.01(b) (less than ten percent (10%) of the Bid value) do not require Department approval.

When required, the Contractor shall give assurance that the minimum wage for labor, as specified in the Contract Documents, shall apply to labor performed on all Work sublet, subcontracted, assigned or otherwise disposed of in any way under a building Contract.
(c) **All Contracts.** The Contractor shall not assign any of its obligations, responsibilities, or liabilities under any portion of the Contract except with the express prior written consent of the Engineer. Any assignment of any of the Contractor’s obligations responsibilities, or liabilities under any part of the Contract without the express prior written consent of the Engineer shall be null and void. Along with any applicable legal documentation to be signed by all applicable parties, any approved assignee must provide the County with (1) an executed Contract specifying the Contract Items and dollar volume of the Work to be performed by the assignee, (2) a Payment Bond and a Performance Bond as required pursuant to GP-3.03, and (3) a certificate of insurance as required pursuant to GP-7.14.

(d) **All Contracts.** For purposes of documentation and the County’s file, the Contractor shall provide the County with Written Notice of all Subcontractors’ names, and the amount or percent of the Bid value of the Contract and/or the Contract to be performed by each named Subcontractor, at or before time of Notice to Proceed.

(e) **All Contracts.** At any time after the County’s issuance of the Bid Package, the County expressly reserves the right, for purposes of County approval and/or rejection, to require the Contractor to provide the County with Written Notice of all Subcontractors’ names, and the amount or percent of the Contract to be performed by each named Subcontractor, and the names for such material men, suppliers, and others as the Engineer may direct, within ten (10) Business Days upon request by the County therefore. The Engineer shall review the Contractor’s Written Notice under this GP-8.01(e) in a timely manner and inform the Contractor in writing of those Subcontractors approved by the Engineer for use on the Contract. If any Subcontractor is rejected in writing by the Engineer, such Subcontractor shall not work on the Contract Work. Prior to any Engineer approval, the Engineer may request the Contractor and any Subcontractor to meet additional criteria as specified by the Engineer in writing or in a Contract Modification. If the County requests Written Notice under this GP-8.01(e), the Contractor shall employ only those Subcontractors as may be approved in writing by the Engineer. No substitutions or further Subcontracting shall be employed by the Contractor without prior written approval from the Engineer. Approved Subcontractors shall not Subcontract principal or important parts of their Work, as determined in the County’s sole discretion, without the Engineer’s prior written approval.

The Engineer’s approval of a Subcontractor under this GP-8.01(e) is only for Work to be prosecuted under the Contract and said approval is not applicable to any other contract with the County.

The Engineer reserves the express right to revoke approval of any Subcontractor for that Subcontractor’s breach of any Contract provision, including, but not limited to, GP-8.06.

The Contractor agrees to be fully responsible to the County for the acts and omissions of its employees, Subcontractors and, of Persons either directly or indirectly employed by Contractor, and their respective employees and agents. The Contractor shall not assign this responsibility to any Person, except as provided in GP-8.01(c).
The Contractor shall incorporate by reference or otherwise include these General Provisions in every Subcontract issued pursuant to or under this Contract, and shall require that the same reference or inclusion be contained in every Subcontract entered into by any of its Subcontractors, at any tier.

(f) All Contracts. The Contractor agrees to bind every Subcontractor and every Subcontractor agrees to be bound by the terms of the Contract, the Standard Specifications, the Standard Details, the Special Provisions, the Contract Drawings and the Contract Documents, as far as applicable, to the Work.

The Subcontractor agrees to be bound to the Contractor by the terms of the Contract, the Standard Specifications, the Standard Details, the Special Provisions, the Contract Drawings and the Contract Documents and to assume towards the Contractor all obligations and responsibilities that the Contractor, by those documents, assumes towards the County.

The Contractor agrees to be bound to the Subcontractor by all the obligations the County assumes to the Contractor under the Contracts, the Standard Specifications, the Standard Details, the Special Provisions, the Contract Drawings, and the Contract Documents and by all the provisions thereof affording remedies and redress to the Contractor from the County.

(g) All Contracts. The Contractor shall pay its Subcontractors:

(1) Upon receipt of payment, as described in Section GP-9.03, the amount allowed to the Contractor on account of that Subcontractor’s Work, to the extent of that Subcontractor’s interest herein.

(2) Upon the receipt of payment, if issued otherwise than as described in Section GP-9.03, so that at all times the total payments shall be as large in proportion to the value of the Work done by the Contractor as the total amount certified to the Contractor is to the value of the Work done by that Subcontractor.

(3) To such extent as may be provided by the Contract Documents or any related Subcontracting documents, if either of these provides for earlier or larger payments than described in GP-8.01(g)(1) and (2).

(4) On demand for that Subcontractor’s Work or Materials as far as executed and fixed in place, less the retained percentage, at the time the payment is requested, even though the Engineer fails to approve it for any cause not the fault of that Subcontractor.

(5) To give that Subcontractor an opportunity to be present and to submit evidence in any manner involving that Subcontractor’s rights under the Contract.

The Contractor and the Subcontractor agree that nothing in this GP-8.01(g) shall create any obligation on the part of the County to pay any Subcontractor or to see to the payment of any sums to any Subcontractor. County has no obligation or liability of any kind, nature or amount to any Subcontractor. Nothing contained in the Contract, or any related Subcontracting
documents, shall create any contractual relationship between any Subcontractor, materialman, supplier, and/or other party and the County.

GP-8.02 NOTICE TO PROCEED

(a) Unless otherwise stated in the Contract Documents, upon execution of the Contract and within ninety (90) Calendar Days from the date of Award, the Department’s Division of Construction Contracts Administration will issue to the Contractor a “Notice to Proceed” and this notice will stipulate when the Contractor is expected to begin Work. The specified Contract Time shall begin on the date stipulated in the Notice to Proceed or, if an earlier start is authorized in the Notice to Proceed, on the Day Work (other than the erection of the inspection office, Construction stakeouts and mobilization) actually starts. Work done prior to receipt of the Notice to Proceed is unauthorized and will not be measured or paid for.

(b) If the County is unable to issue the Notice to Proceed within ninety (90) Calendar Days from the Award of the Contract, and the County has not yet executed the Contract, the Contractor may request that the County rescind the Notice to Proceed, it being mutually understood that in such instance and upon such rescission, the County shall have no further obligation or liability to Contractor of any nature, kind or amount. If the County is unable to issue the Notice to Proceed within ninety (90) Calendar Days from the Award of the Contract, and the Contract was executed by the Contractor and the County, the Contractor may request that the County rescind the Contract, it being mutually understood that in such instance and upon such rescission, the County’s obligations and liabilities shall be limited to the net documented cost of Materials actually fabricated and/or delivered to the Work site of the Contract preauthorized in writing by the Engineer. The County’s remedies shall be in accordance with the Contract Documents, at law and/or in equity.

(c) The County has no obligation or duty to remit payment for any Materials prior to the County’s execution of the Contract. Any Material paid for by the County after a notice of Award will become the property of the County.

(d) Emergency Roster. Each successful Contractor must furnish the Engineer with the names, addresses and telephone numbers of at least two (2) members of the Contractor’s organization who may be contacted in an emergency.

GP-8.03 PROSECUTION OF THE WORK/DETERMINATION & EXTENSION OF CONTRACT TIME

(a) The Contractor shall begin Work promptly within the time specified by the Engineer in the Notice to Proceed and shall notify the Engineer at least forty-eight (48) hours before starting Work. The Contractor shall complete the Work and achieve Full and Final Completion within the number of Working Days, Calendar Days or Calendar Date, as specified in the Contract.
The Engineer will make available to the Contractor each week a record showing the number of Days charged to the Contract for the preceding week. The Contractor will be allowed one week in which to protest and thirty (30) Days in which to file a written statement, setting forth in what respects time charges are incorrect.

(b) If Full and Final Completion of the Contract, including all extensions and increases authorized under GP-4.04 and changes specified in the General Provisions and Interim Supplemental Specifications, requires the performance of Work in greater quantities than specified in the Contract, as determined by the Engineer, the Contract Time allowed for Contract performance may be adjusted based on the quantities, cost and the nature of the Work involved.

(c) The Contractor, under certain conditions, may be granted permission or ordered to suspend operations as defined in GP-8.07 “Suspension of Work”. On a Working Day Contract, if the Contractor elects and is permitted by the Engineer to do any Work during a suspension period, the Working Days charged shall be based on the “daily value” of the Contract, which shall be calculated as the Bid price of the Contract divided by the number of Working Days allowed by the Contract Time. At the end of each month during any suspension period, the amount of money earned for that month will be divided by the “daily value” (as defined above) to determine the number of Working Days to be charged for that month (number of Working Days to be rounded down). However, the resultant number of Working Days to be charged for any particular month will never exceed the number of Calendar Days for that month, excluding Saturdays, Sundays or Holidays on which no Work was performed by the Contractor on a Pay Item and/or a Controlling Operation.

Time used in performing Work of an emergency nature ordered by the Engineer for the convenience of the traveling public or for the production or delivery of Materials for storage, if performed during the period of suspension, will not be charged against the Contract Time.

(d) Following the date on which Partial Acceptance for Maintenance has been achieved for all Work, except those landscaping Contract Items on which Work is restricted to specified seasons and when inspection and Final Acceptance for Maintenance is being deferred pending completion of those landscaping Contract Items because such Work is currently out of season, and for no other reason, no time will be charged against the Contractor until such time as it is again permissible to proceed with such landscaping Work. However, time will be charged during any extensions of the specified season documented by the County and which may be granted the Contractor.

(e) Prosecution of the Work shall not be discontinued without the prior written approval of the Engineer. After the Work has started, the Contractor shall prosecute the Work continuously within the Contract Time without stoppage until Final Acceptance for Maintenance of all Contract Work is achieved and the Contractor achieves Full and Final Completion.

(f) Should the prosecution of the Work for any reason be discontinued without the prior written approval of the Engineer, the Contractor shall immediately notify the Engineer in writing of Contractor’s intention to stop and the County may exercise any and all rights pursuant to the Contract, at law and/or equity.
GP-8.04 PROGRESS SCHEDULE REQUIREMENTS

(a) General.

(1) Scheduling of Construction is the responsibility of the Contractor. The Contractor must take all reasonable action to avoid or to mitigate the effects of delays including, but not limited to, rescheduling or resequencing the Work, accepting other work, and reassigning personnel. When the Contractor is responsible for any delays, the County may order the Contractor to accelerate Construction, work overtime, add additional shifts or manpower, work on weekends, or to do anything else reasonably necessary to achieve Full and Final Completion of the Work within the Contract Time, at no additional cost to the County.

(2) The Contractor shall submit to the County for review and approval a baseline schedule, monthly progress schedules, and any required recovery schedules as outlined in this GP-8.04.

(3) Failure of the Contractor to comply with the requirements of this GP-8.04 shall be grounds for determination by the County that the Contractor is not prosecuting the Work with due diligence as to ensure Full and Final Completion of the Work within the Contract Time specified in the Contract Documents or as agreed upon with the County after execution of the Contract. Based on this determination, the County may terminate the Contractor’s right to proceed with the Work, or any separable part thereof, in accordance with GP-8.08 of these Standard Specifications.

(4) The Contractor does not have the unilateral right to complete the Work late and to then pay liquidated or other damages as a proposed remedy to this lateness.

(b) Baseline Schedule.

(1) Within thirty (30) Days after the Award of the Contract, the Contractor shall submit to the Department a detailed baseline schedule indicating the time allocated by the Contractor for performance of each portion of the Work. The baseline schedule shall show commencement of Work from the date the Notice to Proceed is issued. The baseline schedule shall show Full and Final Completion of the Work within the Contract Time as specified in the Contract or as mutually agreed upon with the County in writing pursuant to a Contract Modification after execution of the Contract.

(2) The submitted baseline schedule shall be properly and reasonably sequenced to show the order of performing the various tasks of Work. The baseline schedule shall clearly identify the sequencing restraints and the critical activities necessary to complete the Work and achieve Full and Final Completion of the Work within the Contract Time, and shall list proposed Work Days, Holidays and any special non-Work Days.

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(3) The submitted baseline schedule shall list the dollar value for each Contract Item and shall show the Contractor's labor requirements for achieving each Contract Item. The baseline schedule shall also include a list of submittals related to Material and Equipment fabrication orders, permits, Easements and any other Work tasks requiring submittals. Each necessary submittal shall be shown on the baseline schedule as a separate Work activity with necessary dates of submittal, anticipated review and response time, anticipated dates of resubmittal if necessary, and anticipated dates for final review and approval.

(4) Within fourteen (14) Calendar Days after the Engineer reviews and rejects or conditionally approves the submitted baseline schedule, the Contractor shall make all necessary corrections and resubmit the corrected baseline schedule. The County may decline to issue a Notice to Proceed until the Contractor submits the required baseline schedule in form and content acceptable to the County in the County’s sole discretion.

(c) Monthly Progress Schedules.

(1) Within thirty (30) Days after the County issues Notice to Proceed, and on a monthly basis thereafter, the Contractor shall submit a monthly progress schedule accurately updated to reflect Contract Work performed to date since the previously submitted monthly progress schedule including, but not limited to, actual commencement dates of listed Work activities, actual Work activities completed to date, and any sequence changes made or planned for the order of Work activities and their effect on the critical path for Full and Final Completion of the Contract. The sequencing changes shall show extension of times granted in a Contract Modification by the County and any delays or early completion of Work activities.

(2) The Contractor shall, and it is the Contractor’s obligation to, meet with the Engineer, or his designee, at least once a month to discuss in detail the Contractor’s updating of the monthly progress schedule and the necessity for revision or correction in the monthly progress schedule.

(3) Within ten (10) Calendar Days after the County reviews and rejects or conditionally approves the submitted monthly progress schedule, the Contractor shall make all necessary corrections and resubmit the corrected monthly progress schedule in form and content acceptable to the County in the County’s sole discretion.

(4) The Contractor shall submit the required monthly progress schedule whether or not the Contractor submits an application for payment each month. The County may decline to process any pending payment requests under the Contract unless and until the Contractor submits the required monthly progress schedule in form and content acceptable to the County, in the County’s sole discretion, and the Engineer approves such schedule in writing.

(d) Recovery Schedules.

(1) At all times during the Contract term, within ten (10) Calendar Days after the Contractor falls behind a baseline schedule or a monthly progress schedule, or is alleged by the County to be behind a baseline schedule or a monthly progress schedule, the Contractor shall
furnish to the County, at no additional cost, a recovery schedule. The recovery schedule shall show how the Contractor will finish the Contract Work and achieve Full and Final Completion by the Contract Date.

(2) The recovery schedule shall include all of the information required under GP-8.04(c).

(e) Logical Sequencing and Layout of the Submitted Schedules (CPM Schedules).

(1) Unless the Contract Documents expressly permit the Contractor to use a type of schedule other than a Critical Path Method (CPM) schedule, the submitted baseline schedule, the monthly progress schedules, and any required recovery schedules shall all be CPM schedules.

(2) CPM schedules are required to assure and to monitor the Contractor's adequate planning and execution of the Work and to assist in the County's evaluation of the Contractor's progress of the Work and the impact on the Completion Date.

(3) The submitted CPM schedules shall clearly designate the dates of Final Acceptance for Maintenance and Full and Final Completion of the Contract Work. THE CONTRACTOR'S ACHIEVEMENT OF FINAL ACCEPTANCE FOR MAINTENANCE DOES NOT RELIEVE THE CONTRACTOR OF ANY OBLIGATION OR RESPONSIBILITY TO ACHIEVE FULL AND FINAL COMPLETION OF ALL CONTRACT WORK BY THE COMPLETION DATE.

(4) As part of the CPM schedule format, the Contractor shall include logic or network diagrams showing the order and interdependence of activities and the sequence in which Work is to be accomplished as planned by the Contractor. These diagrams must show how the start of a given activity is dependent on preceding activities and how its completion restricts the start of the following activities.

(5) At a minimum, the following information shall be furnished for each Work activity in any and all schedules provided under this GP-8.04:

i. Activity number
ii. Description of activity
iii. Activity numbers for any predecessor and successor activities
iv. Relationships with preceding activities
v. Activity duration in calendar days
vi. Percent of activity completed
vii. Early start date (by Calendar Date)
viii. Early finish date (by Calendar Date)
ix. Actual start date (by Calendar Date)
x. Actual finish date (by Calendar Date)
xi. Float or slack (by Calendar Date)
(6) The Contractor’s monthly progress schedules and any required recovery schedules shall show the activities or portion of the activities completed during the reporting period and their total dollar value as basis for the Contractor’s periodic request for payment. For each activity, the update shall state the percentage of Work actually completed and the progress along the critical path in terms of Days ahead or behind the allowable dates.

(7) The Contractor’s monthly progress schedules and any required recovery schedules shall include a comments section summarizing the updated analysis for the Contract Work as a whole, describing any and all problems with Work activities, and explaining proposed corrective actions.

(8) Approved Change Orders shall be reflected as new activities or as change in logic and/or time framing of existing activities. Approved Change Orders shall be shown on the Contractor’s applicable updated schedule that immediately follows the Contractor’s receipt of a Change Order approval from the County.

(9) The Contractor shall hold bi-weekly progress meetings, or more frequently if required by Engineer, at the Work site, at a time suitable to the Engineer, at which the progress of the Work shall be reported upon in detail with reference to all applicable schedules. Each interested Subcontractor shall be required to have present a competent representative to report the condition of the Subcontractor’s portion of the Work and to receive instructions. Minutes of these progress meetings shall be taken by the Contractor who shall type them for distribution to members of the meeting, the Department’s Division of Construction Contracts Administration, the Department’s Bureau of Engineering and Construction, and other interested persons. These minutes shall be received by all parties prior to the next scheduled progress meeting and will be revised by the Contractor if not accurately describing events to date.

ANY AND ALL MINUTES FROM ANY PROGRESS MEETING ARE FOR INFORMATIONAL PURPOSES ONLY. THESE MINUTES ARE NOT INCORPORATED INTO THE CONTRACT DOCUMENTS AND ARE NOT LEGALLY BINDING UPON THE DEPARTMENT OR THE COUNTY.

(f) Form of Schedule Submittal.

All schedules including, but not limited to, the baseline schedule, the monthly progress schedules, and any required recovery schedules shall be submitted by the Contractor to the County in three (3) paper copies and one (1) copy on CD.

GP-8.05 LIMITATIONS OF OPERATION

The Contractor shall conduct the Work at all times in such a manner and in such sequence as will assure the least interference with the public.

Except as otherwise stated in the Contract Documents, no Work shall be done on Saturdays, Sundays, or Holidays without the prior written approval of the Engineer. Except for
emergencies, approval to Work on Saturdays, Sundays and Holidays shall be obtained forty-eight (48) hours in advance.

GP-8.06 CHARACTER OF WORKMEN, METHODS AND EQUIPMENT

(a) The Contractor shall employ sufficient labor and Equipment for prosecuting the several and all classes of Work to achieve Full and Final Completion in the manner and time required by the Contract.

Workmen must have sufficient skill and experience to properly perform the Work assigned to them. All workmen engaged in special Work or skilled Work shall have sufficient experience in such Work and in the operation of the Equipment required to perform the Work properly and satisfactorily.

(b) Any person employed by the Contractor or by any Subcontractor who, in the opinion of the Engineer, does not perform his Work in a proper manner or is intemperate or disorderly shall, at the written request of the Engineer, be removed forthwith by the Contractor or Subcontractor employing such person, and shall not be employed again in any portion of the Work without the prior written approval of the Engineer.

Should the Contractor fail to remove such person or persons as required in this GP-8.06(b), or fail to furnish suitable and sufficient personnel for the proper prosecution of the Work, the Engineer may withhold estimates and/or monies which are or may become due on the Contract until a satisfactory understanding and resolution is reached in the County’s sole discretion.

(c) Only persons thoroughly trained and skilled in the task assigned them may be employed on any portion of the Work, or they shall be removed by the Contractor.

When County, State or federal laws require that certain persons (such as, by way of example, electricians, plumbers, etc.) be licensed, then all such persons employed on the Work shall be so licensed.

(d) The Contractor shall confine the operations of Contractor’s employees and agents to the limits as provided by law, regulations, executive orders, ordinance, permits or directions of the Department. Generally, the “off-Road” area will be the same as the “limit of Contract” line.

(e) All workmanship shall be of good quality. Whenever the method or manner of the Work or manner of procedure is not specifically stated or shown in the Contract Documents, then it is intended and understood that the best standard practice shall be adhered to by the Contractor. Recommendations of the manufacturers of approved Materials shall be considered as a part of and incorporated into the Standard Specifications and all Materials shall be applied, installed, connected, erected, used, cleaned and conditioned as so called for thereby. This, however, does not remove any requirement in Contract to add to the manufacturer’s recommendations.
All Materials shall be accurately assembled, set, etc., and when so required in good Construction, shall be true to line, even, square, plumb, level and regularly spaced, coursed, etc. Under no circumstances, either in new or old Work, shall any Material be applied over another which has not been thoroughly cleaned, sanded or otherwise treated so as not to impair the finish, adhesion, or efficiency of the next applied item.

(f) Equipment to be used on the Work shall meet the requirements of the Work and produce a satisfactory quality of Work in accordance with the Contract. The Engineer may order the removal and require replacement of any unsatisfactory Equipment at the Engineer's sole discretion. When the methods and Equipment to be used by the Contractor in accomplishing the Construction are not prescribed in the Contract, the Contractor is free to use any methods or Equipment that Contractor demonstrates in advance to the satisfaction and written approval of the Engineer will accomplish the Contract Work in conformity with the requirements of the Contract.

When the Contract specifies that the Construction be performed by the use of certain methods and Equipment, such methods and Equipment shall be used unless others are pre-authorized by the Engineer in writing. If the Contractor desires to use a method or type of Equipment other than those specified in the Contract, the Contractor shall request authority from the Engineer to do so. The request shall be in writing and shall include a full description of the methods and Equipment proposed for use and an explanation of the reasons for Contractor desiring to make the change. If written pre-approval of the Engineer is given, it will be on the condition that the Contractor will be fully responsible for producing Construction Work in conformity with Contract requirements. If, after trial use of the substituted methods or Equipment, the Engineer determines that the Work produced does not meet Contract requirements, the Contractor shall promptly discontinue the use of the substituted method or Equipment and shall complete the remaining Construction with the specified methods and Equipment in accordance with the Contract. The Contractor shall remove the deficient Work and replace it with Work of specified quality, or take such other corrective action as the Engineer may direct. Any Change Order issued, if any, in accordance with this GP-8.06(f) shall not result in an increase in Contract price or Contract Time.

(g) All methods, procedures and results are subject to the Engineer’s approval as to the finished result to be obtained. However, this is not to be interpreted as placing upon the Engineer any responsibility for the Work management that is solely the responsibility of the Contractor.

The Contractor shall at all times enforce strict discipline and good order among Contractor’s employees and agents. The Contractor shall neither employ any unfit person nor shall the Contractor permit an unfit person to remain on the Work site. The Contractor shall enforce all instructions relative to use of water, heat, power, smoking, and shall control any use of fires, as required by law, regulation, and the Contract and by the Department. Employees and agents of the Contractor shall not loiter on, near or about the Work site before or after work.

GP-8.07 SUSPENSION OF WORK

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(a) The Engineer may unilaterally order the Contractor in writing to suspend the Work, wholly or in part, for such period or periods as Engineer may deem necessary, in the Engineer's sole discretion, for reasons including, but not limited to, unsuitable weather or such other conditions as are considered unfavorable for the proper prosecution of the Work, or for such time as is necessary because the Contractor has failed to carry out orders given or to perform any and all provisions of the Contract. If it should become necessary to stop Work for an indefinite period, the Contractor shall store all Materials in such manner that they will not obstruct or impede the traveling public unnecessarily or become damaged in any way, and the Contractor shall take every precaution to prevent damage or deterioration of the Work performed, provide suitable drainage by opening ditches, Shoulder drains, etc., and erect temporary Structures where necessary.

(b) If the performance of all or any part of the Work is for an unreasonable period of time, suspended, delayed, or interrupted by an act of the Engineer in the administration of this Contract, or by Engineer's failure to act within the time specified in this Contract (or if no time is specified, within a reasonable time), an adjustment shall be made for any increase in the cost of performance of this Contract (excluding profit) necessarily caused by an unreasonable suspension, delay, or interruption and a Contract Modification executed accordingly. However, no adjustment shall be made under this GP-8.07 for any suspension, delay, or interruption of the Work to the extent that performance would have been so suspended, delayed or interrupted by any other cause, including, but not limited to, the fault or negligence of the Contractor, including, but not limited to, GP-8.07(a) and (c), or for which an equitable adjustment is provided for or excluded under any other provisions of this Contract.

(c) The Engineer shall have the unilateral authority to suspend the Work, wholly or in part, due to the failure of the Contractor to correct conditions unsafe for the workers or the general public; for Contractor's failure to carry out the requirements of the Contract Documents; or as directed in conformance with the Contract Documents for conditions considered unsuitable for the prosecution of the Work.

(d) No claim under this General Provision shall be allowed:

1. For any costs incurred more than twenty (20) Days before the Contractor shall have notified the Engineer in writing of the act or failure to act involved (but this requirement shall not apply as to a claim resulting from a suspension ordered by Engineer); and

2. Unless the claim, in an amount stated, is asserted in writing as soon as practicable after the termination of a suspension, delay, or interruption, but not later than the date of final payment under the Contract.

(e) If the Contractor should neglect to prosecute the Work properly or fail to perform any provision of this Contract, the County after three (3) Days' Written Notice to the Contractor may, without prejudice to any other remedy, make good such deficiencies and/or perform the Contract or any portion thereof, as deemed applicable and appropriate by the County in its sole
discretion, and may deduct the cost thereof from the payment then or thereafter due the Contractor.

**GP-8.08 TERMINATION FOR DEFAULT - DAMAGES FOR DELAY - TIME EXTENSIONS.**

(a) If the Contractor refuses or fails to timely and properly prosecute the Work, in whole or in part, with such diligence as shall insure Full and Final Completion within the Contract Time, or breaches the terms of the Contract, termination for default, in whole or in part, shall be evidenced and the Department may, by Written Notice to the Contractor, terminate the Contract and the Contractor’s right to proceed with the Work, in whole or in part, in accordance with this GP-8.08.

(b) The Department, upon proof that sufficient cause exists to satisfy such action, in the County’s discretion, may without prejudice to any other right or remedy, terminate the Contract for default, in whole or in part. Termination for default, in whole or in part shall be evidenced and documented by Written Notice by the County to the Contractor and said termination for default shall be effective seven (7) days after Contractor’s receipt of such Written Notice. Upon a termination for default the County may take over the Work and take possession of the Work and of all Materials, tools, Equipment and plant thereon and prosecute the same to completion, by contract, by whatever method may be deemed expedient, or otherwise, and may take possession of and utilize in completing the Work, the Materials, Equipment, and plant as may be on the site of the Work and necessary therefore. Whether or not the Contractor's right to proceed with the Work is terminated for default, the Contractor and its Sureties shall be liable for any damage to the County resulting from the Contractor’s refusal or failure to achieve Full and Final Completion of the Work within the Contract Time and/or the Contractor’s breach of the Contract Documents.

The County may appropriate or use any or all Materials and Equipment intended to be incorporated in the Contract as may be suitable and acceptable and may enter into an agreement for the completion of said Contract according to the terms and provisions thereof, or use such other methods as in the County’s determination shall be required for the completion of said Contract in a manner acceptable to the County.

(c) Examples of sufficient cause to terminate for default include, but are not limited to, cases where the Contractor should:

1. Be adjudged a bankrupt or make a general assignment for the benefit of creditors,
2. Have a receiver appointed on account of insolvency,
3. Fail to or refuse to supply properly skilled persons or proper Materials, Equipment except in cases for which extension of time is provided by the County,

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(4) Fail to make payment to a Subcontractor, materialmen, supplier, and/or other persons.

(5) Fail to comply with any law, regulation, executive order, ordinance, or persistently disregarded the instructions of the Engineer, or

(6) Breach any material representation, warranty, covenant, condition, obligation, or provision of the Contract.

(d) If the County terminates for default of the Contract under this GP-8.08, the Contractor shall not be entitled to receive any further payment until the Contract Work is finished and, even then, only if the unpaid balance of the Contract price shall exceed the expenses of finishing the Work, including compensation for additional managerial and administrative services, shall such excess be paid to the Contractor. If such expenses shall exceed such unpaid balance, the Contractor shall pay the difference to the County. The expenses incurred by the County as herein provided, and the damage incurred by the County as herein provided, and the damage incurred through the Contractor's default, shall be itemized by the Engineer and a certified copy supplied to the Contractor.

(e) The Contractor's right to proceed may not be terminated for default and the Contractor shall not be charged with resulting damages if:

(1) The delay in the completion of the Work arises solely from unforeseeable causes beyond the control and without the act, omission, fault or negligence of the Contractor including, but not restricted to, acts of God, acts of the public enemy, acts of the County in either its sovereign or contractual capacity, acts of another contractor in the performance of a contract with the County, fires, floods, epidemics, quarantine, restrictions, strikes, freight embargoes, unusually severe weather, or delays of Subcontractors or supplies arising solely from unforeseeable causes beyond the control and without the act, omission, fault or negligence of either the Contractor and/or the Subcontractors, suppliers or materialmen; and

(2) The Contractor, within ten (10) Days from the beginning of any such delay (unless the Engineer grants a further period of time before the date of final payment under the Contract), notifies the Engineer in writing of the causes of delay. The Engineer shall ascertain the facts and the extent of the delay and extend the Contract Time for completing the Work when, in the Engineer's judgment, the findings of fact justify such an extension, and the Engineer's findings of fact shall be final and conclusive on the parties, subject only to appeal as provided in the GP-5.15 "Disputes".

(f) If, after notice of termination for default of the Contract and the Contractor's right to proceed under these General Provisions, it is determined for any reason that the Contractor was not in default under the provisions of the Contract, or that the delay was excusable under the provisions of the Contract, the rights and obligations of the parties shall be the same as if the notice of termination had been issued pursuant to GP-8.10.
The rights and remedies of the County provided in this GP 8.08 are in addition to any other rights and remedies provided by law, equity and/or under this Contract.

As used in GP 8-08, the term Subcontractors, materialmen, or suppliers means Subcontractors, materialmen or suppliers at any tier.

**GP-8.09 LIQUIDATED DAMAGES**

Time is an essential element of the contract and it is important that the work be vigorously prosecuted until full and final completion of the contract.

For each day that full and final completion remains unachieved beyond the contract time, the contractor and/or its surety shall be liable for liquidated damages in the amount provided for in the contract.

(a) All additional costs and charges incurred by the County, including, but not limited to, any and all damage to persons or property, the cost of completing the work under the contract, shall be deducted from any monies due or which may become due to contractor. If the expense so incurred by the County is less than the sum which would have been payable under the contract if it had been completed by said contractor, the said contractor shall be entitled to receive the difference, and if such expense exceeds the sum which would have been payable under the contract, the contractor and the surety shall be liable and shall pay to the County the amount of said excess.

(b) If fixed and agreed liquidated damages are provided in the contract and if the County so terminates the contract, and accordingly the contractor's right to proceed, the resulting damage shall consist of such liquidated damages for the reasonable time required for full and final completion of the work together with any increased costs and expenses incurred by the County in completing the work.

(c) If fixed and agreed liquidated damages are provided in the contract and if the County does not so terminate the contractor's right to proceed, the resulting damage shall consist of these liquidated damages until full and final completion is achieved.

(d) Interest shall accrue upon all damages, liquidated or otherwise, at the statutory rate of interest provided pursuant to the Maryland Constitution and the Maryland Code, as applicable and as amended.
TERMINATION FOR CONVENIENCE OF THE COUNTY

(a) The performance of Work under this Contract may be terminated for convenience by the County, in whole, or in part, whenever the Engineer shall determine that such termination for convenience is in the best interest of the County. Any such termination for convenience shall be effected by Engineer’s delivery to the Contractor of a Written Notice of termination for convenience specifying the extent to which performance of Work under the Contract is terminated, and the date upon which such termination becomes effective.

(b) After receipt of notice of termination for convenience, and except as otherwise directed by the Engineer, the Contractor shall:

   (1) Stop Work under the Contract on the date and to the extent specified in the Written Notice of termination for convenience;

   (2) Place no further orders or Subcontracts for Materials, supplies, Equipment, services or facilities, except as may be necessary for completion of the portion of the Work under the Contract that is not terminated for convenience;

   (3) Terminate all orders and Subcontracts to the extent that they relate to the performance of Work terminated by notice of termination for convenience;

   (4) Assign to the County in the manner, at the times, and to the extent directed by the Engineer, all of the right, title, and interest of the Contractor under the orders and Subcontracts, in which case the County shall have the right, in its discretion, to settle or pay any or all claims arising out of such orders and Subcontracts, or assume said orders and subcontracts, or do otherwise, as deemed appropriate in the sole discretion of the County;

   (5) Settle all outstanding liabilities and all claims arising out of the termination of orders and Subcontracts, with the approval or ratification of the Engineer, to the extent he may require, which approval or ratification shall be final for all the purposes of this GP-8.10;

   (6) Transfer title and deliver to the County, in the manner, at the times and to the extent, if any, directed by the Engineer, (a) the fabricated or unfabricated parts, Work in process, completed Work, supplies, and other Material produced as a part of, or acquired in connection with the performance of the Work terminated for convenience by the Written Notice of termination for convenience, and (b) as applicable, the completed or partially completed Plans, Contract Drawings, As-Built Drawings, operation and maintenance manuals, warranty certificates, information, and other property which, if the Contract had been completed, would have been required to be furnished to the County;

   (7) Use its best effort to sell, in the manner, at the times, to the extent, and at the price or prices directed or authorized by the Engineer, any property of the types referred to in (6) above; provided, however, that the Contractor (a) may not be required to extend credit to any

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purchaser, and (b) may acquire any such property under the conditions prescribed by and at a price or prices approved by the Engineer; and provided further that the proceeds of any such transfer or disposition shall be applied in reduction of any payments to be made by the County to the Contractor under this Contract or shall otherwise be credited to the price or cost of the Work covered by this Contract or paid in such other manner as the Engineer may direct;

(8) Complete performance of such part of the Work as may not have been terminated by the Written Notice of termination for convenience; and

(9) Take any action that may be necessary, or as the Engineer may direct, for the protection and preservation of the property related to this Contract which is in the possession of the Contractor and in which the County has or may acquire an interest. The Contractor shall submit to the Engineer a list, with Certification as to quantity and quality, of any or all items of inventory not previously disposed of, exclusive of items the disposition of which has been directed or authorized by the Engineer, and may request the County to remove such items or enter into a storage agreement covering them. Not later than fifteen (15) Days thereafter, the County shall accept title to such items and remove them or enter into a storage agreement covering the same; provided, that the list submitted shall be subject to verification by the Engineer upon removal of the items, or if the items are stored, within forty-five (45) Days from the date of submission of the list, and any necessary adjustment to correct the list as submitted shall be made prior to final settlement.

(c) After receipt of a Written Notice of termination for convenience, the Contractor shall submit to the Engineer his termination for convenience claim, in the written form and with Certification prescribed by the Engineer. This claim shall be submitted promptly in accordance with GP-5.14 and GP-5.15 of these Standard Specifications, unless an extension is granted in writing by the Engineer, upon timely request of the Contractor in writing.

(d) Subject to this GP-8.10 (c), the Contractor and the Engineer may agree upon the whole or any part of the amount or amounts to be paid to the Contractor by reason of the total or partial termination for convenience of Work pursuant to this GP 8-10, which amount or amounts may include a reasonable allowance for profit on Work done; provided, that such agreed amount or amounts, exclusive of settlement costs, shall not exceed the total Contract price as reduced by the amount of payments otherwise made and as further reduced by the Contract price of Work not terminated for convenience. If the parties so agree, the Contract shall be amended with a Contract Modification, and the Contractor shall be paid the amount specified therein.

(e) In the event of the failure of the Contractor and the Engineer to agree as provided in GP-8.10 (d), upon any amount to be paid to the Contractor by reason of the termination for convenience of Work pursuant to this General Provision, the Engineer shall pay to the Contractor the amounts determined by the Engineer as follows, but without duplication of any amounts agreed upon in accordance with GP-8.10 (d):

(1) For completed supplies or services accepted by the County (or sold or acquired as provided in GP-8.10 (b)(7) above) and for which payment has not theretofore been made, a sum equivalent to the aggregate price for the supplies or services computed in accordance with the
price or prices specified in the Contract, appropriately adjusted for any saving of freight or other charges;

(2) The total of:

(a) The costs incurred in the performance of the Work terminated for convenience, including initial costs and preparatory expense allocable thereto, but exclusive of any costs attributable to supplies or services paid or to be paid for under GP-8.10 (e)(1) hereof; and

(b) The cost of settling and paying claims arising out of the termination of Work under Subcontracts or orders, as provided in GP-8.10 (b)(5) above, which are properly chargeable to the termination for convenience portion of the Contract (exclusive of amounts paid or payable on account of supplies or Materials delivered or services furnished by Subcontractors or vendors before the effective date of the Written Notice of termination for convenience, which amounts shall be included in the costs payable under GP-8.10 (e)(2)(a); and

(c) A sum, as profit on GP-8.10 (e)(2)(a), determined by the Engineer to be fair and reasonable; provided, however, that if it appears that the Contractor would have sustained a loss on the entire Contract had it been completed, no profit shall be included or allowed under this GP-8.10 (e)(2)(c) and an appropriate adjustment shall be made reducing the amount of the settlement to reflect the indicated rate of loss; and

(d) The reasonable cost of settlement accounting, legal, clerical, and other expenses reasonably necessary for the preparation of settlement claims and supporting data with respect to the terminated portion of the Contract and for the termination and settlement of Subcontracts thereunder, together with reasonable storage, transportation, and other costs incurred in connection with the protection or disposition of property allocable to this Contract.

The total sum to be paid to the Contractor under this GP-8.10 (e) shall not exceed the total Contract price as reduced by the amount of payments otherwise made and as further reduced by any Contract price of Work not terminated for convenience. Except for normal spoilage, and except to the extent that the County shall have otherwise expressly assumed the risk of loss, there shall be excluded from the amounts payable to the Contractor as provided in GP-8.10 (e), the fair value, as determined by the Engineer, of property that is destroyed, lost, stolen, or damaged so as to become undeliverable to the County or to a buyer pursuant to GP-8.10 (b)(7).

(f) The Contractor shall have the right of appeal, under GP-5.15 “Disputes”, from any determination made by the Engineer under this GP-8.10, except that if the Contractor has failed to timely submit its claim within the time provided in this GP-8.10, and has failed to request extension of such time, Contractor shall have no such right of appeal. In any case where the Engineer has made a determination of the amount due under this GP-8.10, the County shall pay to the Contractor the following:

(1) If there is no right of appeal hereunder and/or if no timely appeal has been taken, the amount so determined by the Engineer; or,
(2) If an appeal has been taken, the amount finally determined on such appeal.

(g) In arriving at the amount due the Contractor under this GP-8.10 there shall be deducted:

(1) All unliquidated advance or other payments or account theretofore made to the Contractor, applicable to the terminated for convenience portion of this Contract;

(2) Any claim which the County may have against the Contractor in connection with this Contract; and

(3) The agreed price for, or the proceeds of sale of, any Materials, supplies, or other things acquired by the Contractor or sold, pursuant to the provisions of this GP-8.10, and not otherwise recovered by or credited to the County.

(h) If the termination for convenience hereunder be partial, the Contractor may file with the Engineer a written claim for an equitable adjustment in accordance with GP-5.14 and GP-5.15 of the price or prices specified in the Contract relating to the continued portion of the Contract (the portion not terminated by the Written Notice of termination for convenience), and such equitable adjustment as may be agreed upon shall be made in such price or prices in a Contract Modification.

(i) The County may, from time to time, under such terms and conditions as it may prescribe, make partial payments and payments on account against costs incurred by the Contractor in connection with the terminated for convenience portion of this Contract whenever, in the opinion of the Engineer, the aggregate of such payments shall be within the amount to which the Contractor shall be entitled hereunder. If the total of such payments is in excess of the amount finally agreed or determined to be due under this General Provision 8.10, such excess shall be payable by the Contractor to the County upon demand, together with interest at the legal rate as prescribed by State law for the period from the date such excess payment is received by the Contractor to the date on which the excess is repaid to the County.

(j) Unless otherwise provided for in this Contract, or by applicable statute, the Contractor shall, from the effective date of termination for convenience until the expiration of three (3) years after final settlement under this Contract, preserve and make available to the County at all reasonable times at the office of the Contractor but without direct charge to the County, all Contractor’s books, records, documents and other evidence bearing on the costs and expenses of the Contractor under this Contract and relating to the Work terminated for convenience hereunder, or, to the extent approved by the Engineer, photographs, microphotographs, or other authentic reproductions thereof. If the Contract involves the use of federal or State funds, Contractor shall retain records and documentation as required by GP-7.36.

GP-8.11 SUCCESSFUL TERMINATION OF CONTRACTOR’S RESPONSIBILITY
Full and Final Completion is the date upon which the County acknowledges in writing that the Contractor fully and finally completed all aspects of the Contract and the Contract Work, and met all terms, conditions and obligations of the Contract, as further described herein. Full and Final Completion of a Contract includes Final Acceptance for Maintenance of all Contract Work; the authorization of final payment by the County; the Contractor’s and its Surety’s compliance with all obligations under the Contract; the submission of all Plans, Contract Drawings, As-Built Drawings (as described below), operation and maintenance manuals, and warranty certificates; the completion of all punch list Work; and final payment by the County to the Contractor.

The Contractor shall, as the Work progresses, neatly record on a set of final signed and sealed As-Built Drawings the Work as actually constructed by the Contractor and reflecting all Working Drawings including, but not limited to, any changes and all revisions to the Work made during the course of the Contract wherever it differs from the Contract Documents. Upon Final Acceptance for Maintenance of the Work, the Contractor shall turn over the As-Built Drawings to the County. No Full and Final Completion of the Contract by the County may occur until these As-Built Drawings are submitted to and approved by the County.

GP-SECTION 9
PAYMENT

GP-9.01 SCOPE OF PAYMENT

(a) Payments to the Contractor will be made for the actual quantities of Contract Items performed in accordance with the Plans and Contract Documents and if, upon completion of the Construction and the Work, these actual quantities show either an increase or decrease from the quantities given in any Contract schedule, the Contract unit prices will still prevail, except as provided in GP-4.04 “Variations in Estimated Quantities”, or in a Contract Modification.

(b) Except as may otherwise be provided herein, the Contractor shall accept the compensation as provided by the Engineer under this GP-Section 9:

(1) In full payment for furnishing all Materials, lab, tools, and Equipment and any incidentals necessary to the completed Work and for performing all Work contemplated and embraced under the Contract;

(2) For all loss or damage arising from the nature of the Work, or from the action of the elements, or from any other unforeseen difficulties which may be encountered during the prosecution of the Work until Full and Final Completion of the Contract;

(3) For all risks of every description connected with the prosecution of the Work; and

(4) For all expenses incurred in consequence of suspension of the Work, if any, as herein authorized by the County.
(e) Where provisions in the Contract Documents relating to any unit price for a Contract Item require that the said unit price cover, and be considered, compensation for certain Work or Material essential to that Contract Item, this same Work or Material shall not also be measured or paid for under any other Contract Item which may appear elsewhere in the Contract Documents.

(d) The payment of any partial estimate or of any retained percentage by the County, in no way shall affect the obligation of the Contractor to Repair or renew any defective parts of the Construction and/or Work or to be responsible for all damages due to such defects.

(e) Payment to the Contractor under this section for Materials on hand in no way will be construed as acceptance by the Administration of title to the Material. Title shall remain with the Contractor until Final Acceptance for Maintenance of the Contract Work in accordance with GP-5.13.

The Contractor shall indicate its federal tax identification or social security number on the face of each invoice billed to the County.

(f) If the Contract is in excess of twenty-five thousand dollars ($25,000), the Contractor and any Subcontractor with a lower tier Subcontract, in accepting each Contract payment from the County is making a Certification and representing and warranting to the County, prior to receiving a progress or final payment under this Contract, that the Contractor or Subcontractor has made payment from proceeds of prior payments, and that the Contractor or Subcontractor will make timely payments, from the proceeds of the progress or final payment then due it, to its Subcontractors, materialmen, and suppliers in accordance with Contractor or Subcontractor contractual arrangements with them and pursuant to State Finance and Procurement Article of the Maryland Annotated Code, as amended. This Certification may be required by the Engineer even if the Contract is for twenty-five thousand dollars ($25,000) or less.

If the Contract is in excess of twenty-five thousand dollars ($25,000), the Contractor further represents and warrants that it shall also obtain from each Subcontractor a Certification that payment from proceeds of prior payments have been made to any lower tier Subcontractors and that timely payments will be made to the lower tier Subcontractors and suppliers in conformance with contractual arrangements with those lower tier Persons. This Certification is not required from Subcontractors who have no lower tier Subcontracts. These Certifications may be required by the Engineer for contract of twenty-five thousand dollars ($25,000) or less.

(g) For all Contract Items of Work, other than those to be paid by lump sum, after Final Acceptance for Maintenance of the Work and before final payment is made, the Engineer will make final measurements to determine the quantities of various Contract Items of Work performed as the basis for final settlement. The Contractor in case of unit price Contract Items will be paid for the actual amount of Work performed and for the actual amount of Materials in place, in conformance with the Contract Documents as shown by the final measurements made by the Engineer. All Work completed under the Contract will be measured by the Engineer in conformance with the standards of weights and measures recognized by the NBS and NIST.
The term lump sum when used as a Contact Item will mean complete payment for the unit of Work described and will be construed to include all necessary fittings and accessories for that Contract Item of Work.

(1) All longitudinal measurements for area will be made along the actual surface and not horizontally, and no deductions will be made for individual fixtures in the pavement having an area of nine (9) square feet or less. For all transverse measurements for area of Base Course and pavements, the dimensions to be used in calculating the pay area will be the neat dimensions shown on the Plans or as ordered in writing by the Engineer.

(2) Structure measurements will conform to the neat lines shown on the Plans or as ordered in writing by the Engineer, unless otherwise provided for elsewhere in the Contract Documents.

(3) Volumes of excavation, tamped fill and borrow pits will be calculated per cubic yard from the cross section and the use of average end area formulas. Volumes of other Work including, but not limited to, masonry and removal of masonry will be calculated by using arithmetical formulas. Where the volume is bounded by varying dimensions and there are no simple volumetric formulas applicable, frequent cross sections will be taken and the cubic yard volume computed from average end area formulas.

(4) Cement will be measured by weight.

(5) All items which are measured by the linear foot, including, but not limited to, pipe culverts, traffic barriers, underdrains, will be measured parallel to the base or foundation upon which such Structures are placed unless otherwise specified in the Contract Documents.

(6) The term gauge when used in connection with the measurement of uncoated steel sheet and light plates shall mean the USSG, except that when reference is made to the measurements of galvanized or aluminum sheets used in the manufacture of corrugated metal pipe, metal plate pipe culverts and arches, and metal cribbing, the term gauge shall mean that specified in M 36, M 167, M 196 or M 197.

(7) When the term gauge refers to the measurement of wire, it shall mean the Washburn & Moen wire gauge as referenced in the New Departure Handbook. A tolerance of plus or minus 0.003 inch shall apply.

(8) The term ton shall mean the short ton consisting of two thousand (2,000) pounds avoirdupois. All Materials which are specified for measurement by the ton shall be weighed on accurate, approved scales conforming to the requirements of the NBS Handbook 44. A digital recorder and printout shall be required on all truck scales. The digital recorder shall produce a printed record of the gross, tare, net weights, the time, date, truck identification and Contract Number. Provisions shall be made so that the scales may not be manually manipulated during the printing process. The system shall be interlocked to allow printing only when the scale has come to rest.
(9) Except for computer operated scales, all weights shall be certified by a bonded weigh Person supplied by the Contractor, producer or supplier. The security bond shall be one hundred thousand dollars ($100,000.00).

(10) If the Material is shipped by rail, the car weight may be accepted but the payment will be limited to the actual weight of Material. Car weights will not be acceptable for Material to be passed through mixing plants.

(11) All Materials for which measurements are obtained by the cubic yard shall be hauled in approved vehicles and measured at the point of delivery. No allowance will be made for the settlement of Material in transit. Approved vehicles for this purpose shall be of any size or type acceptable to the Engineer, provided that the body is of such shape that the actual contents may be readily and accurately determined. Unless all approved vehicles are of uniform capacity, each approved vehicle must bear a plainly legible identification mark indicating the specific approved capacity. All vehicles shall be loaded to at least their water level capacity, and all loads shall be leveled when the vehicles arrive at the point of delivery.

(12) When requested by the Contractor and approved by the Engineer in writing, Material specified to be measured by the cubic yard may be weighed, and such weights will be converted to cubic yards for payment purposes. Factors for conversion from weight measurement to volume measurement will be determined by a qualified laboratory and shall be agreed to by the Contractor before such method of measurement of pay quantities will be approved by the Engineer.

(13) Liquid asphalt Material delivered for the project will be measured by volume in each railroad tank car, tank truck, distributor tank or drums in which it is delivered. The measurements will be taken when the asphalt Material is of a uniform temperature and free from air bubbles, and the temperature of the Material will be recorded at that time by the Contractor.

The volumetric measurement of the asphalt material will be based upon a temperature of sixty degrees Fahrenheit (60° F). Only the quantity of asphalt Material actually placed in the Work and accepted will be considered in determining the amount due the Contractor.

Reference is hereby made to D 1250, Petroleum Measurement Tables.

(14) Timber will be measured by the thousand feet board measure (MBM) actually incorporated in the structure. Measurement will be based on nominal widths and thicknesses and the extreme length of each piece.

(15) Rental of Equipment will be measured in hours of actual Work time by the Contractor, moving-in and moving-out costs, if any, and necessary traveling time of the Equipment within the limits of the Contract, except when special conditions make some other method of measurement desirable as determined by the Engineer.

(h) Payment will not be allowed for stored Materials except in specific instances approved in writing by the Engineer involving specially manufactured Contract Items or Contract Items Revised October 11, 2013
requiring a long lead time for delivery and as further described in GP-9.01(i), (j) and (k). No payment for stored Material will be made if it is anticipated that the Material will be incorporated into the Work within thirty (30) Days of the delivery of said Material to the Contractor or Work site.

(i) When the Contractor requests payment allowance for stored Materials and the Engineer gives written approval of those Materials stored, the following terms and conditions shall apply:

(1) For Superstructure members delivered and stored on the Work site, an allowance of one hundred percent (100%) of the Material cost plus freight charges as invoiced may be made provided the cost does not exceed ninety percent (90%) of the Contract price of the applicable Contract Item. The allowance will be based upon validated invoices or bills for Material including freight charges, and a copy thereof shall be made a part of the documented records for the Contract.

(2) For reinforcement steel, piling, pipe, traffic barrier, signs and sign assemblies, and other nonperishable Material in storage on the Contract, but excluding aggregates, cement, seed, plants, fertilizer or other perishable Contract Items, an allowance of one hundred percent (100%) of the invoiced cost of the Material plus freight charges to the Contractor may be made provided the cost does not exceed ninety percent (90%) of the Contract price of the applicable Contract Item. Such Material shall be delivered and stockpiled at the Contract Work site, and shall be tested by the Administration and found to conform with the Contract Documents or have been accepted under a County-approved Certification program prior to the allowance.

(3) No payment allowance will be made for fuels, form lumber, falsework, temporary Structures or other Materials of any kind which will not become an integral part of the finished Work.

(4) Only end product manufactured Material or fully fabricated products that are awaiting installation or incorporation into the finished Work are eligible for prepayment. Components, elements, or ingredients of a finished product are not eligible for prepayment or payment allowance.

(5) Stored Material for which a payment allowance is requested shall be stored in an approved manner in areas within the County where damage is not likely to occur. If any of the stored Materials are lost or become damaged in any manner, the Contractor shall be responsible for Repairing or replacing the damaged Materials. The value of the lost or damaged Material will be deducted from the Contractor’s subsequent estimates until replacement has been accomplished. The request for payments allowances for any Materials stored on private property within the County shall be accompanied by a release from the applicable owner and/or tenant of such property agreeing to permit the removal of the Materials from the property without cost to the County.

When it is considered impractical to store Materials on the Work site, the Engineer may approve storage areas in the vicinity of the Work site which will be considered as the Work site for purposes of those stored Materials.
When storage of the Materials within the County is not practical, written approval shall be obtained from the Engineer for storage elsewhere. Storage of Materials outside the County will be subject to the conditions set forth in this GP-9.01 and limited to Materials exceeding twenty-five thousand dollars ($25,000), which are designed and fabricated exclusively for use on the Contract.

(6) Stored Material for which payment has been made, either wholly or partially by the County, shall not be removed from the approved location or Work site until such time that it is to be incorporated into the Work, unless authorized by the Engineer in writing.

(j) The following items shall accompany any written request by the Contractor for payment allowance for stored Materials:

(1) Consent of the Contractor’s Surety specifying the Material type and the Contract Item(s) in which the Material is to be used.

(2) Validated invoices with the signature of an officer of the company supplying the Material showing actual cost.

(3) A notarized statement from the Contractor attesting that the invoices as submitted from the supplier do not include charges or fees for placing, handling, erecting or any other charges or markups other than the actual Material cost, sales tax(es), if applicable, and freight charges.

(4) Bills of lading showing delivery of the Material.

(5) The request for allowances for any Materials stored on property outside the County shall be accompanied by a release from the owner or tenant of such property agreeing to permit verification by the Department’s Division of Construction Contracts Administration that the Material is stored at the approved location, and to permit the removal of the Materials from the property without cost to the County.

(6) Inspection test reports, Certifications and/or a written statement from the Department’s Division of Construction Contracts Administration attesting to the inspection and approval of the Material.

Upon receipt of the above by the Engineer and verification by the Department’s Division of Construction Contracts Administration that the Material is stored at the approved location, the Engineer will authorize payment.

The Contractor shall pay the Material supplier the amount shown on the invoice within seven (7) Calendar Days of receipt of payment from the Administration. Failure to make invoice payments as specified will be cause for the County to deduct the monies from future estimates to the Contractor.

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Copies of all pertinent data relating to any stored Materials shall be made by the Contractor and distributed to the Department’s Division of Construction Contracts Administration for retention as part of the documented records for the Contract.

(k) The Engineer may withhold, or on account of subsequently discovered evidence, nullify the whole or a part of any payment for stored Materials to such extent as may be necessary to protect the County from loss on account of:

(1) Defective Work not remedied.

(2) Claims filed, or reasonable evidence indicating probable filing of claims, by parties other than the Contractor.

(3) Failure of the Contractor to make payments properly to Subcontractors or for material or labor.

(4) A reasonable doubt that Full and Final Completion of the Contract can be achieved for the balance then unpaid.

(5) Damage to another contractor.

(6) Failure of the Contractor to submit data required within the time limits stated in the Contract Documents.

Upon removal of the Engineer’s hold and resolution of all related issues, payment shall be made for any amounts withheld.

GP-9.02 FORCE ACCOUNT WORK

When the Contractor is required to perform Extra Work as a result of a Change Order or Contract Modification to the Contract for which there are no applicable unit prices in the Contract, the Engineer and the Contractor shall make every effort to come to an agreed price for the performance of such Extra Work. If an agreement cannot be reached by the parties prior to the time that Extra Work must commence, the Engineer may, in writing, order the Extra Work done on a force account basis by the Contractor, to be compensated in accordance with the following:

(a) Labor. For all labor and for foremen in direct charge of the specific operations of the Work, the Contractor shall receive the rate of wage agreed upon in writing by the County and the Contractor in either the Contract or a Contract Modification before the Contractor begins such Extra Work for each and every hour that said labor and foremen are actually engaged in such Extra Work, to which cost shall be added an amount equal to the percentage of the sum shown below. No additional allowance will be considered for Contract Bond, insurance, taxes or other fringe benefits, except as permitted in the County’s discretion in a Written Notice or a Contract Modification. The number of laborers and foremen engaged in the Extra Work will be subject to
regulation by the Engineer and shall not exceed the number the Engineer deems most practical and economical for the Extra Work. The Contractor shall submit certified payrolls in conformance with the Contract Documents and pursuant to GP-9.02(g) signed by a legally authorized officer of the Contractor. Superintendent’s time will not be allowed.

Highway Contracts ...............65%
Utility Contracts ..................75%
Building Contracts ..............65%

(b) Materials. For Materials accepted by the Engineer and used for the Extra Work, the Contractor shall receive the actual cost of such Materials delivered to the Work site. This cost includes transportation charges paid by Contractor (exclusive of machinery rentals as specified in GP-9.02(d)), to which cost shall be added an amount equal to twenty percent (20%) plus prevailing State sales tax.

To substantiate Materials and transportation cost, original receipted invoices shall be submitted to the County by the Contractor, as further specified in GP-9.02(g).

If the Materials used in the force account Extra Work are not specifically purchased for the Extra Work but are taken from the Contractor’s stock, then in lieu of the original invoices, the statements shall contain or be accompanied by an affidavit and Certification from the Contractor that shall certify that the Materials were taken from the Contractor’s stock, that the quantity claimed was actually used, and that the price and transportation cost of the Material as claimed represents the actual cost.

The Administration reserves the right to furnish Materials as it deems appropriate, and the Contractor shall have no claim for any costs, overhead, or profit on these Materials.

(c) Subcontractor’s Works.

(1) When a Contract Item of Extra Work is performed on a force account basis by a Subcontractor who is approved for this Extra Work by the Engineer, as may be required under GP-8.01, an amount equal to ten percent (10%) of the total cost shall be added to the final payment under GP-9.04 for such force account Extra Work and such amount of compensation shall be full and final compensation to the Contractor for the administration of the Extra Work performed by the Subcontractor under the force account basis.

(2) This additional ten percent (10%) compensation to the Contractor for administration shall only be allowed if the Extra Work requires particular trades or specialty work for which the Contractor is not prequalified, and not for Extra Work assigned to a Subcontractor for the convenience of the Contractor.

(d) Equipment. For any machinery or special Equipment approved by the Engineer for use on Extra Work (expressly excepting all small tools), including fuel and lubricants, the Contractor shall receive the rental rates and operating costs agreed upon in writing by the County and the Contractor in either the Contract or a Contract Modification before such Extra Work is begun by the Contractor for the actual time such Equipment is authorized on the Extra Work.

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(1) Rental rate shall be based on the weekly rate converted into hours. To compute hourly rate use forty (40) hours per week.

(2) The rental rates and operating costs, including fuel and lubricant but excluding operators, forExtra Work shall be the current rates from the “Rental Rate Blue Book for Construction Equipment,” published by the Equipment Guide Book Company and/or the “Rental Rate Blue Book for Older Construction Equipment.” Both rental rate and operating rate will be subject to area adjustment per the “Rental Rate Blue Book for Construction Equipment.” No other allowances or additions will be paid to the Contractor by the County.

(3) In the Engineer’s discretion, rental rates will be applied to both idle time and actual operating time authorized by the Engineer, and operating rates will be applied to operating time only. Or, if the Engineer determines it to be in the County’s best interest, standby rates shall apply when a piece of Equipment is required to remain on the Work site on standby status as authorized by the Engineer. For purposes of standby rates, when a unit of Equipment works for a portion of a day and is on standby for a portion, the total time allowed for rental rates shall not exceed eight (8) hours for that day and will be allowed for Working Days only. Standby rates shall be half of the normal hourly base rental rates without the operating expenses.

(4) Transportation costs of the Equipment directly attributable to force account Extra Work will be allowed. When it is necessary to obtain Equipment exclusively for force account Extra Work from sources beyond the Contract limits, the cost of transferring the Equipment to the Work site and return, including the use of any hauling unit, will only be allowed as an additional expense if the Contractor receives prior written approval from the Engineer.

(e) Superintendence/Use of Small Tools. No additional allowance shall be made for general superintendence, the use of small tools, or other costs for which no specific allowance is herein provided. For the purpose of definition under this GP-9.02, Equipment with a new cost of one thousand dollars ($1,000) or less will be considered small tools.

(f) Compensation. The compensation provided for in this GP-9.02 shall be received by the Contractor as full and final payment, including, but not limited to, overhead and profit, for Extra Work, Change Order Work, and/or Contract Modification Work done on a force account basis. The Contractor may request partial payment for force account Extra Work prior to submitting final documentation under GP-9.02(g). Partial payment will be limited to fifty percent (50%) of the amount for the Extra Work fully and finally accomplished until all documentation has been received and approved by the County. The final force account payment request from the Contractor for any Extra Work will be subject to audit as specified in GP-7.36 “Retention of Records”.

At the end of each applicable Day, the Contractor and the Engineer shall compare records of the cost of all Extra Work as ordered on a force account basis and mutually agree on a final record of the costs of Extra Work for that Day. This record must be signed by both the Engineer and the Contractor on a daily basis. Daily force account records for Extra Work performed and signed by a Subcontractor, must also be signed by the Contractor and the Engineer. Each party shall
retain a copy of these records as substantiation of all labor, Equipment, and Materials used by the Contractor and any of its Subcontractors in the performance of the force account Extra Work.

(g) **Statements.** No payment will be made by the County for Extra Work performed on a force account basis until the Contractor furnishes the Engineer with duplicate itemized statements of the cost of such force account Extra Work detailed as to the following:

1. Name, classification, date, daily hours, total hours, rate, and extension for such laborer, or foreman.

2. Designation, dates, daily hours, total hours, rental rate, and extension for each unit of machinery and Equipment.


4. Transportation of Materials.

5. Payments of items under this GP-9.02(g)(1) shall be accomplished by copies of certified payrolls. Under this GP-9.02(g)(2), original receipted invoices for rentals must be provided. GP-9.02(g)(3) and GP-9.02(g)(4) shall be accompanied by original receipted invoices for Materials used and related transportation charges. Any request for payment for force account Extra Work shall be submitted by the Contract in strict compliance with this Section GP-9.02.

**GP-9.03 PROGRESS PAYMENTS**

(a) **Current Estimates.**

1. **Lump Sum Contracts.** If requested by the Administration, the Contractor shall furnish an acceptable breakdown of the lump sum Contract price showing the amount included therein for each Pay Item of the Work. Said breakdown shall be in such detail so as to provide a basis for estimating monthly progress payments in connection with the Contract.

2. **Monthly Estimates.** Except as otherwise stated in the Contract, each month the Administration will pay the Contractor for the Contract Work satisfactorily performed during the preceding calendar month, including Extra Work less five percent (5%). The five percent (5%) of the total Contract value retained by the Administration will not be released until final payment pursuant to GP-9.04 (unless partially released in a semi-final payment in the County’s sole discretion). Current estimates will be based upon the Engineer’s estimate of quantity (including Materials and/or Equipment complete in place) satisfactorily performed. In the instance of lump sum Contract Items, the Engineer’s estimate shall be the proper fraction of the lump sum Contract Items satisfactorily performed during the preceding month. All quantities, estimates and fractions will be reasonably accurate approximations and are subject to correction (a) in subsequent current estimates, (b) in any semi-final estimate and, (c) in final payment. Any and/or all partial payments or monthly payments may be withheld in the event current requirements of the Contract Documents have not been complied with by the Contractor. Should

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either the Engineer or the Contractor be of the opinion that any estimates, quantities and/or fractions (either as to an individual current estimate or accumulations thereof) do not represent a reasonably accurate approximation of actual Work satisfactorily performed, then details questioned shall be reviewed by the Engineer and then any corrections adjusted by the Engineer for in the next current estimate.

Deferred Monthly Payment. Should the amount(s) due the Contractor for any one month be less than five hundred dollars ($500.00), payment will be deferred until such time as the amount(s) due the Contractor under subsequent estimates, combined with that month for which the amount(s) due was less than five hundred dollars ($500.00), shall equal five hundred dollars ($500.00) or more.

(b) Semi-Final Estimate Payments and Partial Semi-Final Estimate Payments.

(1) Semi-Final Estimate Payments. Upon Final Acceptance for Maintenance by the Administration of the Contract Work, pursuant to GP-5.13(b), the Administration, at the Contractor’s request and with consent of the Contractor’s Surety, will pay the Contractor, within forty-five (45) Calendar Days of said request, what is hereby known as a semi-final estimate payment. Such a semi-final estimate payment will be based upon (a) quantities the Administration has computed and set up as proposed final quantities and (b) a reasonably accurate estimate for those quantities for which the Administration has not yet completed computations. The quantities which the Administration sets forth as proposed final quantities shall be so designated. To arrive at the amount of semi-final estimate payment there shall be deducted from the apparent estimated value of the Contract (a) total of all amounts previously paid to the Contractor as current estimates and (b) sums deemed chargeable against the Contractor properly deductible, including liquidated damages, and as a retainage, an amount equal to two percent (2%) of the total Contract value or two thousand dollars ($2,000), whichever is greater.

(2) Partial Semi-Final Estimate Payments. In cases where there has been Partial Acceptance for Maintenance for a majority of the Contract Work as determined in the County’s sole discretion and there are remaining only inconsequential or minor Contract Items such as painting, seeding, mulching, or planting to be completed and such Contract Items cannot be completed for an extended period of time because of seasonal or weather conditions, the Administration, within forty-five (45) Days from the most recent Partial Acceptance for Maintenance, upon request of the Contractor and with consent of Surety, shall pay to the Contractor, what is hereby known as a partial semi-final estimate payment. Such a partial semi-final estimate payment will be based upon (a) quantities the Administration has computed and set up as proposed final quantities and (b) a reasonably accurate estimate for those quantities for which the Administration has not yet completed computations. The quantities which the Administration sets forth as proposed final quantities shall be so designated. To arrive at the amount of the partial semi-final estimate payment, there shall be deducted from the apparent estimated value of the Contract (a) total of all amounts previously paid to the Contractor as current estimates, and (b) sums deemed chargeable against the Contractor properly deductible, including liquidated damages, and as a retainage, a sum equal to two percent (2%) of the total value of the Contractor or two thousand dollars ($2,000), whichever is greater.
GP-9.04  FINAL ACCEPTANCE AND FINAL PAYMENT

(a) When the Contractor believes it has completed a Contract, and there has been a Final Acceptance for Maintenance in accordance with the provisions of GP-5.13(b), the Engineer will promptly proceed:

(1) To make any necessary final surveys;

(2) To complete any necessary computation of quantities; and

(3) To submit to the Contractor, within sixty (60) Calendar Days after Final Acceptance for Maintenance of the Work by the Engineer, for the Contractor’s consideration, a written tabulation of the proposed final quantities. This written tabulation shall be accompanied by a written statement setting forth, as applicable: (a) the Additional Work performed under Change Orders and/or Contract Modifications; (b) the County-authorized extension of Contract Time; (c) the number of Days which have been charged against the Contractor as having been used to complete the Contract; and/or (d) any deductions, charges or liquidated damages which have been made or imposed against the Contractor by the County.

(b) The Contractor shall then have a period of twenty (20) Calendar Days, dating from the date upon which it received the written tabulation from the Engineer under Section GP-9.04(a), in which:

(1) To decide whether or not the Contractor will accept final payment based upon the Engineer’s written tabulation; and

(2) To notify the Engineer, in writing, of the Contractor’s decision. The Contractor may request an additional period up to ten (10) Calendar Days in which to notify the Engineer of its decision. In the event the Contractor notifies the Engineer that it protests final payment based on the Engineer’s written tabulation, that notification shall outline the reason(s) for said protest.

(c) Upon receipt of a notification of acceptance as provided for in GP-9.04(b)(1) above (or in the event of no response), the County shall prepare the final estimate and final payment forms and submit the final payment check to the Contractor. Such action by the County shall be deemed to constitute final payment for all Work under the Contract.

(d) If, under the provisions of GP-9.04(b)(2) above, the Contractor notifies the Engineer of its protest and nonacceptance of the Engineer’s written tabulation, the Engineer shall pay the Contractor a semi-final estimate, or an additional semi-final estimate in the event a semi-final estimate has already been paid, based upon the Engineer’s written tabulation, with deductions for all prior payments. A retainage equal to one and one-half percent (1.5%) of the total value of the Contract shall be withheld by the Engineer. The acceptance of such semi-final estimate, or additional semi-final estimate, shall not be considered as a waiver on the part of the Contractor of its right to pursue its protest and press for Full and Final Completion and final payment.
(e) In the event the Contractor does not accept the Engineer’s tabulation from GP-9.04(a) above and/or has outstanding a claim filed in accordance with GP-5.14, the Engineer and the Contractor shall confer at mutually convenient times and endeavor to reconcile all points of disagreement expeditiously. If such reconciliation is accomplished, the Engineer will promptly proceed with final payment on the reconciled basis and in accordance with the provisions of GP-9.04(c) above. If reconciliation is not accomplished within thirty (30) Days, the decision of the Engineer shall be submitted to the Director with a copy to the County Office of Law, Attention: County Attorney, as a dispute in accordance with GP-5.15 “Disputes”. The Contractor’s failure to timely comply with the provisions of GP-5.15 shall constitute a waiver by the Contractor of its right under GP-5.15, and final payment may be made by the County based on the Engineer’s recommendation.

(f) All prior partial estimates and payments shall be subject to correction by the Engineer at the time of final payment and if the Contractor has been previously overpaid, as determined by the Engineer, the amount of such overpayment shall be set forth in the final payment forms and the Contractor hereby agrees that it will reimburse the Administration for such overpayment within six (6) months of receipt of such notice by the Engineer, and the Contractor’s Surety will not be granted release from obligations under the terms of the Contract until reimbursement has been made in full by the Contractor. It is further agreed that the County can withhold any overpayment from any other accounts due and payable to the Contractor under any County contract.

(g) Payment for the full apparent value of the Contract thus determined shall become due and payable to the Contractor within ninety (90) Days after Full and Final Completion of the Contract, as provided in GP-8.11. Contractor’s acceptance of final payment shall be considered a general release of any, all, and every claim and/or dispute against the County arising out of, or in any way connected with, this Contract and the Work.

(h) Neither Full and Final Completion nor final payment nor any provision in the Contract shall relieve the Contractor of responsibility for faulty Materials and workmanship. Unless otherwise specified, the Contractor shall remedy any defects and pay for any damage to other Work resulting therefrom that appears within the applicable warranty period. The County shall give notice of observed defects to the Contractor with reasonable promptness.

GP-9.05 LATE PAYMENTS – Reserved.

GP-9.06 INTEREST

Notwithstanding any other provision in the Contract, the Contractor hereby waives the right to predecisional interest. For purposes of this GP-9.06 and the Contract, “predecisional” means a decision by any Engineer or the County Administrative Officer, or his designee, or a decision by any Person including but not limited to an administrative hearing officer. The Contractor shall only be entitled to postdecisional interest, and for purposes of this GP-9.06 and the Contract,
"postdecisional" interest shall only begin to accrue, after the exhaustion of all administrative remedies and the rendering of a judgment by a court of competent jurisdiction.

GP-SECTION 10
PRIVATE CONTRACTS

GP-10.01 PRIVATE CONTRACTS

(a) A Private Contract is used in land development projects when, with the permission of the Director of the County Department of Permits, Approvals and Inspections, the Construction Contract is let by a developer and processed through the County. The applicable developer shall obtain the Bid privately and the cost estimates will be processed using County contract forms provided by the Department’s Division of Construction Contracts Administration or as approved by County for use with a UA and/or RA. No public funds may be used in a Private Contract. UA and RA are not governed by those provisions of these Standard Specifications which involve payment by developers to contractors.

(b) The following sections, as amended by the County, apply to Private Contracts:

107.03.02 (4)
204.03.07 B
1001.03.01(b)(2)
501.03.14
501.04.05
504.03.03 B
504.04

For Private Contracts, all references to the County (including Administration) in this GP-10.01 shall be construed to mean the developer as defined in the governing UA and/or RA in the Standard Specifications and in all references to making payments under the contract.

(c) IN ALL OTHER PORTIONS OF THESE STANDARD SPECIFICATIONS, REFERENCES TO THE COUNTY SHALL REMAIN UNCHANGED, WHETHER THE CONTRACT IS PUBLIC OR PRIVATE.

(d) Private Contracts may include fixed price Contingent Items to provide for certain contingencies encountered during Highway and utility Construction. If included in the Bid, unit prices shall be those established by the County.

(1) Fixed Price Highway Contingent Items - Private Contract Only
See Section 109 of Category 100 “Preliminary”.

(2) Fixed Price Utility Contingent Items - Private Contract Only
See Section 109 of Category 100 “Preliminary”.

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(3) Award and Execution of Contract - Private Contract Only [GP-3.03 Performance Bond and Payment Bond Requirements].

In GP-3.03(b) delete the words “twenty-five thousand dollars ($25,000)” and substitute “two thousand dollars ($2,000)”.

(4) Unauthorized Work - Private Contracts Only [GP-4.08 Unauthorized Work].

Add the following new paragraph:

Any Work performed in excess of one hundred ten (110%) percent of the Private Contract Bid, or one hundred ten (110%) percent of the Private Contract Bid plus any Contract Modifications, between the developer and the Contractor, shall be considered unauthorized Work and shall not be paid for. The Contractor is advised to bring to the attention of the developer and the County, in writing, any impending overrun of the one hundred ten (110%) percent upset limitation at least two (2) weeks before having to stop work due to this limitation.

(5) Interest - Private Contracts Only [GP-9.06 Interest].

Payment by the developer under GP-9.03(b)(1) “Semi-Final Estimate Payments” and GP-9.04 “Final Acceptance and Final Payment”, shall be due on receipt of the monthly estimates, semi-final estimates, and final estimates prepared by the Department and submitted to both parties in the amount shown as payable on this estimate. Any monies not paid within fifteen (15) Days of the date of such estimates shall bear interest at the rate of eighteen percent (18%) per annum. Interest shall be computed and invoiced by the Contractor and shall not be subject to a review or approval by the Department. However, the Department will not consider the developer’s Public Works Agreement obligations complete as long as the Contractor reports an outstanding indebtedness under the Private Contract.

(6) Interim Acceptance - Development Bonds - Private Contract Only GP-9.03(b).

Add the following new paragraph:

When the Contractor postpones Road surfacing (during the course of completing a two-phased, 4-inch, paving section) its retainage shall be 2.0 percent after the bituminous Base Course has been accepted. Following a satisfactory re-inspection one (1) year after that acceptance, the retainage may be reduced to 0.0 percent.

GP 10.02 UTILITY/ROAD AGREEMENTS

These UA and/or RA are for projects wherein the applicant (developer, Persons, or property owners) constructs and installs improvements to utilities or Roads all at no cost to the County. The County Department of Permits, Approvals and Inspections (PAI), or any successor County department, in accordance with the applicable provisions of the County Code, as amended from
time to time, and the PAI Construction Policy Manual, approves the cost estimates and Construction Drawings and collects, except for County departments and agencies, the security and all fees. An applicant must provide to PAI, in writing, the name, address and phone number of an authorized Work site representative. The applicant must use a County prequalified Contractor who provides a certificate of insurance and performs the work in accordance with the Department's Standard Specifications and Standard Details in effect on the date of the Notice to Proceed. It is the applicant's responsibility to schedule an on-site pre-Construction meeting with the Department, the Department of Environmental Protection and Sustainability, or any successor County department, and the County prequalified Contractor. No Construction is to be performed prior to receiving a written Notice to Proceed from the Department.
TC - SECTION 1
REFERENCES AND DEFINITIONS

TC-1.03  METRIC SYSTEM – Reserved.

TC-1.04  LANGUAGE – Reserved.

TC - SECTION 2
BIDDING REQUIREMENTS AND CONDITIONS

TC-2.01  PROJECT CLASSIFICATION.

The Administration will estimate the cost of the Contract and classify it within one cost group and letter designation as follows:

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<tr>
<th>COST GROUP ESTIMATE</th>
<th>COST GROUP LETTER CLASS</th>
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<tbody>
<tr>
<td>Up to $ 100 000</td>
<td>A</td>
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<tr>
<td>$ 100 001 to $ 500 000</td>
<td>B</td>
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<td>$ 500 001 to $ 1 000 000</td>
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<td>$ 50 000 001 to $ 75 000 000</td>
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<td>$ 75 000 001 to $ 100 000 000</td>
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<tr>
<td>Over $ 100 000 000</td>
<td>L</td>
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</table>

The letter designation will be published as part of the Bid Package.

TC-2.02  IN-STATE PREFERENCE – Reserved.

TC-2.03  VALUE ENGINEERING CHANGE PROPOSALS.

The Contractor may submit to the Engineer, in writing, value engineering change proposals (VECP) for modifying the Contract Documents for the purpose of reducing the total cost of Construction without reducing design capacity or quality of the finished product. The Engineer will then forward the VECP to the Department’s Chief of the Bureau of Engineering and
Construction with recommended action. The decision to accept or deny the VECP will be made by the Department’s Chief of the Bureau of Engineering and Construction. The Department’s Chief of the Bureau of Engineering and Construction will be the sole and final judge of the acceptability of a VECP. The County will not consider appeals once this final decision is made. If a VECP is accepted by the County, net savings resulting from that VECP will be equally divided by the County and the Contractor. The Contractor may elect to pursue one of the following options when submitting a VECP:

Option 1 - Submit revised Plans, Contract Documents and estimate of savings to reflect the VECP; or

Option 2 - Submit a written concept of the VECP for tentative approval and if accepted, submit the detailed Plans, Contract Documents, and estimate for final approval at a later date.

Each VECP shall result in a net savings to the Contract cost without impairing essential functions and characteristics of the Contract Items or of any other part of the Work, including but not limited to service life, reliability, economy of operation, ease of maintenance, desired aesthetics and safety.

As a minimum, the Contractor shall submit the following information before final approval of a VECP may be given:

(a) A statement that the revised Plans, Contract Documents, and estimate of savings are submitted as a VECP.

(b) A statement concerning the basis for the VECP and benefits to the County together with an itemization of the Contract Items and requirements affected by the VECP.

(c) A statement describing in detail any and all potential impacts to public convenience and/or safety.

(d) A detailed estimate of the cost under the existing Contract and under the VECP.

(e) Plans, Contract Documents and recommendations as to how the VECP changes shall be accomplished.

(f) A statement as to the time by which an Extra Work Order adopting the VECP must be issued so as to obtain the maximum cost effectiveness. Typically, the County will require at least four (4) weeks to review and approve a VECP.

(g) A revised Baseline schedule showing the impact of the VECP, and including in that revised Baseline schedule a four (4) week allowance for the County’s review of such VECP.

(h) The Contractor’s engineering cost for the VECP.
The County will process the VECP in the same manner as prescribed for any other Contract Modification which would necessitate issuance of an Extra Work Order. The County may accept in whole or in part any VECP by issuing an Extra Work Order which will identify the VECP on which it is based. The County will not be liable to the Contractor for failure to accept or act upon any VECP submitted pursuant to these requirements nor for any delays to the Work attributable to any VECP. Until a VECP is effected by a Contract Modification, the Contractor shall remain obligated to the terms and conditions of the existing Contract. If an executed Extra Work Order has not been issued by the date upon which the Contractor’s VECP specifies that a decision thereon should be made, or any other date as the Contractor may subsequently have specified in writing, the VECP shall be deemed rejected. The Extra Work Order effecting the necessary Contract Modification will establish the net savings agreed upon, will provide for adjustment in the Contract prices and/or Contract Time and will indicate the net savings to be equally divided between the Contractor and the County. The Contractor’s costs for preparation of the VECP and the County’s costs to review and administer the VECP will be deducted from the gross savings. The County reserves the right to include in the Contract any conditions it deems appropriate for consideration, approval and implementation of the VECP. The Contractor’s fifty (50%) percent share of the net savings shall constitute full compensation for effecting all changes pursuant to the Contract. Acceptance of the VECP and performance of the Work thereunder will not change the Contract Time, unless specifically provided for in the Contract Modification authorizing the VECP.

The County expressly reserves the right to adopt a VECP for general use in contracts administered by the County when it determines that the VECP is suitable for application to other contracts. VECPs identical or similar to previously submitted VECPs will be eligible for consideration and compensation under these provisions if such VECPs were not previously adopted for general application to other contracts administered by the County. When a VECP is adopted for general use, compensation pursuant to these requirements will be applied only to those contracts Awarded and for which the subject VECP has been submitted prior to the date of adoption of the specific VECP.

Proposed changes in the basic design of a Bridge or pavement type, or requiring modification to the Right-of-Way limits, will not normally be considered as an acceptable VECP. Quantity decreases or elimination of any Contract Items as a result of changing field conditions, errors, etc. will not be considered as an acceptable VECP. If a VECP is based upon or similar to a change in the Plans, Contract Documents or Special Provisions adopted by the County prior to submission of the VECP, the County will not accept the VECP.

These requirements apply to all VECPs initiated and developed by the Contractor and which are identified as such by the Contractor at the time of its submission to the Engineer; however, nothing herein shall be construed as requiring the Engineer to consider or approve a VECP submitted by the Contractor.

Subject to the provisions contained herein, the County or any other public agency shall have the right to use all or part of any accepted VECP on other contracts without obligation or compensation of any kind to the Contractor.
In the event a VECP is accepted by the County, the provisions of the Contract Documents which pertain to adjustment of Contract unit prices due to alterations of Contract quantities will not apply to the items adjusted or deleted as a result of effecting the VECP by Contract Modification.

**TC-2.04 OWNER/OPERATOR.**

For the purpose of labor compliance, the term “Owner/Operator” shall be defined as being the individual who owns and operates his/her own vehicle.

The prevailing wage rates shall not apply to a “Owner/Operator”. However, they shall appear on the payroll of the Contractor or Subcontractor with the notation “Owner/Operator”.

Employees of an “Owner/Operator” shall be subject to prevailing wage rates and shall appear on a certified payroll.

**TC-2.05 DEBARMENT/SUSPENSION.**

Pursuant to the emergency regulations which were approved by the AELR Committee of the State General Assembly on July 27, 1982, and which went into effect on July 28, 1982, the State Department of Transportation, State Highway Administration, pursuant to applicable laws and regulation, established a list of “Debarred or Suspended Contractors.”

The current list of “Debarred or Suspended Contractors or Suppliers” is available at the Baltimore County Department of Public Works, 111 West Chesapeake Avenue, Room 300, Towson, Maryland 21204, for inspection by all interested parties.

**TC - SECTION 3
SCOPE OF WORK**

**TC-3.01 GOVERNING ORDER OF CONTRACT – Reserved.**

**TC-3.02 CONSTRUCTION DOCUMENTS TO SUCCESSFUL BIDDER – Reserved.**

**TC-3.03 CONTINGENT ITEMS – Reserved.**

**TC-3.04 WARRANTY OF CONSTRUCTION – Reserved.**

**TC-3.05 RIGHTS IN AND USE OF MATERIALS FOUND ON THE WORK SITE.**
The Contractor may use on the Contract any excavated stone, gravel, sand or other Material found on the Work site that conforms to the requirements of the Contract Documents and are approved by the Engineer.

When these Materials are used for select, capping, modified, or common borrow and conform to the pertinent Contract provisions and Contract Documents, payment will only be made at the Contract unit price for the class of excavation from which the Materials are obtained.

In the event these Materials are processed through a crushing, screening, washing or sorting plant for use as another Pay Item, the Contractor will be paid both for the excavation of such Materials at the Contract unit price and at the Contract unit price for which the Material is used. The Contractor shall replace at its own expense with other acceptable Material all of the portion of the excavated Material removed and used which was needed for use in the embankments, backfills, approaches or otherwise.

If, however, these Materials are not processed and paid for as described in the preceding paragraph, and their use creates a shortage of embankment or other Material, the Contractor shall provide acceptable replacement Material for all Material needed for embankment, backfill, approaches or otherwise.

The replacement Material shall be paid for at the Contract unit price Bid for the Contract Item that the Class I Excavation is used for, or the Contract unit price Bid for Class I Excavation, whichever is the lowest Contract unit price Bid.

The Contractor shall not excavate nor remove any Material which is not within the limits of excavation, as indicated by the Slope and grade lines, without written authorization from the Engineer.

TC-3.06 SAFETY HAZARDS IN CONFINED SPACES – Reserved.

TC - SECTION 4
CONTROL OF WORK

TC-4.01 WORKING DRAWINGS.

(a) General. The Plans will be supplemented by Working Drawings as necessary to adequately control the Work. All alterations affecting the requirements and information given on the Working Drawings shall be authorized in writing to the Engineer. When at any time reference is made to the Working Drawings, the interpretation shall be the Working Drawings as affected by all authorized alterations then in effect.

Working Drawings will show details of all Structures, lines, grades, typical cross section of Roadway, general cross sections, location and designation of all units and elements.
The Contractor shall provide, at the Contractor's expense, 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 Contract Items involving the Working Drawings shall be incorporated into the Work until those Working Drawings have been accepted for use by the Engineer; however, acceptance shall not relieve the Contractor of any responsibility in connection therewith. All Working Drawings shall be furnished in duplicate for preliminary examination for Contracts prepared by the Administration and in triplicate for Contracts prepared by consultant engineering firms for the Administration. After Working Drawings have been accepted for use by the Engineer, the Contractor shall furnish additional copies as requested.

All Working Drawings shall be on sheets measuring twenty-two inches (22") by thirty-six inches (36") or as required by the Engineer and shall have a standard title block at the lower right corner approximately four inches (4") by eight inches (8") (two inches (2") for the revision column on the left side and the remaining six inches (6") for the title) indicating the following information in the order named:

- Name of Contractor (and Subcontractor, if applicable)
- Address of Contractor (and Subcontractor, if applicable)
- Sheet Title (Reinforcement Details, etc.)
- Name of Structure Crossing
- For (Baltimore County)
- By (Indicate name of Contractor's official or engineer, or other parties authorized to sign official documents.)

All Working Drawings shall list all County Contract Numbers, complete federal aid number, if any, and the date the Working Drawing was completed. The left portion of the title block shall be headed “Revisions” and the space used as needed.

Working Drawings for standard scuppers are not required. A sketch or statement specifying the type and number of standard scuppers required and the length of the downspout is acceptable.

(b) Working Drawings for Falsework Systems. Falsework systems Plans (design and Construction) shall be the responsibility of the Contractor, including submitting and obtaining written acceptance of the design and Plans by the Engineer before erection. The Contractor shall utilize a professional engineer (P.E.) registered in the State who has a minimum of five (5) years experience in falsework design for Bridge Construction and Repair. The falsework design calculations and Plans shall be signed by the P.E. and bear the seal of the P.E. The submittal of the design and falsework Plans shall include the P.E.'s resume showing evidence of the required experience.

The P.E.'s Plans and design calculations shall evaluate and qualify all products and components including manufactured products and proprietary items for their intended service. Acceptance by the Engineer of falsework systems shall not in any way relieve the Contractor of the responsibility for the safety and adequacy of the design and Construction for the falsework
systems and operations, including all components. Every Structure in the Contract will require a separate falsework design analysis, separate Plans, and separate design submittals as set forth above. This applies even though Structures may appear to be identical.

Each falsework system shall be designed to have the capacity to support all vertical and horizontal loading with enough redundancy to prevent progressive failure. Vertical loading, differential settlement forces, live load where applicable and all horizontal lateral and longitudinal forces shall be taken into account. Unbalanced temporary loading caused by placement sequence shall also be provided for in the design. Adequate diagonal bracing in all planes shall be employed.

All falsework systems designs and Plans shall provide for adequate foundations with bearings below the frost line or on rock or on piling and for possible settlement. If additional subsurface data is necessary, it shall be obtained and analyzed by the Contractor for proper design of the Plans and performance of Construction.

Falsework designs and Plans shall include protection against impact from uncontrolled Highway vehicles, accidental collision of a crane boom or other Construction Equipment and vehicles, traffic vibration, flood waters, high winds and any other envisioned contingent situations.

TC-4.02 FAILURE TO ADEQUATELY MAINTAIN PROJECT – Reserved.

TC-4.03 USE PRIOR TO COMPLETION – Reserved.

TC-4.04 WORK SUSPENSION – Reserved.

TC - SECTION 5
LEGAL RELATIONS AND PROGRESS

TC-5.01 INSURANCE – Reserved.

TC-5.02 NOTICE TO PROCEED – Reserved.

TC-5.03 SUBCONTRACTORS – Reserved.

TC-5.04 CULTURAL RESOURCES – Reserved.

TC-5.05 DETERMINATION AND EXTENSION OF CONTRACT TIME – Reserved.
TC - SECTION 6
RESTRICTIONS AND PERMITS

TC-6.01 MOVING OF EQUIPMENT.

(a) The Contractor will not be permitted to move over or operate on any Road (except on the Road under Construction) any power shovels, rollers, concrete mixers, cranes, tractors or any other heavy Equipment of weight or dimensions in excess of State Motor Vehicle Law or Administration’s regulations without first obtaining the applicable permit. In case of permits for oversize and overweight vehicle movements, attention is directed to State Motor Vehicle Laws requiring the Administration to collect a fee on every such vehicle movement using Highways of the State. The payment of and securing of such permit is required irrespective of whether the movement is in connection with a subject Contract or for other purposes.

(b) The Contractor shall adhere to all State and local laws and regulations including but not limited to all State Motor Vehicle Laws and safety regulations.

TC-6.02 RESTORATION OF SURFACES OPENED BY PERMIT.

The right to construct or reconstruct any utility in a County Highway or to grant permits for same at any time is reserved by the Administration.

Upon the presentation of a duly authorized and satisfactory permit which provides that all necessary Repair Work shall be paid for by the party to whom such permit is issued, the Contractor shall allow parties bearing such permits to make openings in a County Highway.

The Contractor shall, when ordered by the Engineer, make in an acceptable manner all necessary Repairs due to such openings, and such necessary Work will be paid for as Extra Work, as provided in these Standard Specifications, and will be subject to the same conditions as original Work performed.

TC-6.03 RAILROAD HIGHWAY GRADE CROSSINGS AND SEPARATIONS.

When the Contractor is required to haul Materials across the tracks of any railroad, or elects to do so, the Contractor shall coordinate with and make arrangements with that railroad for any new private crossings or for the use of any existing private crossing in accordance with the terms and conditions of any permit issued by the applicable railroad.

All Work to be performed by the Contractor in the Construction of railroad-Highway separation Structures on the railroad right-of-way shall be done in a manner satisfactory to the railroad company and shall be performed at such times and in such manner as not to unnecessarily interfere with the movement of trains or traffic upon the tracks of the railroad company. The Contractor shall use care and precaution in order to avoid accidents, damage, or unnecessary delay or interference with the railroad company’s trains or other property. In addition to the insurance specified in GP-7.14 and when Work covered under the Contract is to be performed on
or about the rails of a railroad's tracks, the Contractor shall be required to carry Contractor and railroad public liability and property damage insurance as specified in the Contract Documents and/or required by the applicable railroad.

Prospective Bidders on Contracts crossing railroad right-of-way are advised that the railroad company will require the Contractor to obtain, pay for and have approved by the railroad, certain railroad forms of public liability and property damage insurance policies before entering upon the railroad property. Details of such policies may be set forth in the Contract Documents; but in case of omission from the Contract Documents, the Contractor shall and is required to communicate with the railroad to ascertain the type of insurance required, if any, and make provisions for same in its Bid.

Unless otherwise specified, cost for the insurance policies whether described in the Contract Documents or ascertained by the Contractor will not be paid for by the County. The cost for any and all insurance related to a railroad company will be incidental to the other Contract Items specified in the Contract Documents and be the sole responsibility of the Contractor.

All Work on portions of Structures over railroad right-of-way shall conform to all rules and regulations of the owners of the right-of-way, including, but not limited to, any applicable railroad company. The Contractor is responsible for acquiring full knowledge of these rules and regulations and complying therewith to the satisfaction of the owners of the railroad right-of-way, including, but not limited to, any applicable railroad company.

**TC-6.04 BRIDGES AND OTHER WORK IN OR OVER WATERS OF THE STATE.**

All Work in, on or over waters under control of the United States Department of the Army and the Environmental Protection Agency of the United States shall conform to all applicable federal permits, rules and regulations. All such rules and regulations are hereby part of and incorporated into the Contract. The Contractor is cautioned and charged with the responsibility of obtaining complete knowledge thereof and compliance therewith.

The Contractor shall also comply with the provisions of all other applicable federal, State and local laws, permits, rules and regulations, and shall be knowledgeable of any and all pertinent laws and regulations of the State Department of Natural Resources and Maryland Department of Environment. All such laws, permits, rules and regulations are also hereby part of the Contract.

**TC-6.05 USE OF EXPLOSIVES.**

All blasting operations, including the storage and handling of explosives and blasting agents, shall be performed in conformance with the applicable provisions of the Standard Specifications and all other pertinent federal, State, and local laws and regulations. Whenever explosives are used, they shall be of such character and in such amount as is permitted by the State and local laws and ordinances and all respective agencies having jurisdiction over them.

The Engineer will at all times have the authority to prohibit or halt the Contractor's blasting operations if it is apparent that, through the methods being employed, the required results are not
being obtained, an unstable condition exists, or the safety and convenience of the public is being jeopardized. The Contractor shall not damage any adjacent property or Structures. A pre-blasting and post-blasting survey inspection is required to be performed by the Contractor.

(a) **Blasting Plan Required.** Not less than two (2) weeks prior to commencing drilling and blasting operations, or at any time the Contractor proposes to change the drilling and blasting methods, the Contractor shall submit a blasting plan to the Engineer for review. The blasting plan shall contain the full details of the drilling and blasting patterns and controls the Contractor proposes to use. The blasting plan submittal is for quality control and record keeping purposes.

Review of the blasting plan by the Engineer shall not relieve the Contractor of the responsibility for the accuracy and adequacy of the plan when implemented in the field. If at any time during the progress of the Work the method of drilling and blasting does not produce the desired result, the Contractor shall submit a revised blasting plan until a technique is arrived at that shall produce the desired results.

(b) **Responsibility.** Control of blasting is a major responsibility of the Contractor. The Contractor shall execute vibration control and shall at all times be responsible for damage caused by vibrations due to blasting or any of the Contractor’s other operations.

(c) **Extraordinary care.** When the use of explosives is necessary for the prosecution of the Work, the Contractor shall use extraordinary care so as not to endanger life or property. Before the firing of any blast in areas where flying rock may result in personal injury or unacceptable damage to property or the Work, the rock to be blasted shall be covered with approved blasting mats, soil, or other equally serviceable material, to prevent flyrock.

(d) **Safeguard of Public.** The Contractor must safeguard the traveling public during dynamiting operations. The Contractor shall use enough watchmen, flagmen, signs, etc. to warn the public including, but not limited to, motorists and pedestrians during blasting.

(e) **Storage.** The Contractor shall store all explosives in a secure manner and shall clearly mark storage places “DANGEROUS - EXPLOSIVES”. The storage places must be in the care of competent watchmen at all times and all explosives shall be stored and handled according to the provisions of the statutes of the State and local laws and ordinances.

(f) **Permits & Insurance.** Before any blasting is done, the Contractor shall apply for and obtain a blasting permit from the applicable governing authority. Insurance shall be maintained and certified as specified in GP-7.14.

(g) **Protection of Underground Utilities.**

(1) The Contractor shall ensure the protection of underground utilities. The Contractor shall notify each public utility company and those applicable Utility Companies having Structures close to the site of Work of the Contractor’s intentions to use explosives. The notice must be given far enough in advance to enable all Persons and the Utility Companies to take such steps as they deem necessary to protect their property from injury. Such notice does
not relieve the Contractor of responsibility for any damage resulting from Contractor’s blasting operations.

(2) At and below the elevation of the top of the buried utility line, the vertical depth of blast holes shall be restricted to one-half the horizontal distance to the closest portion of the utility. The blast hole shall be restricted to a maximum of three inches (3”), with no more than one hole per delay.

(h) **Peak Particle Velocity.** When blasting has to be done next to a Structure, the Contractor shall ensure that the “Peak Particle Velocity” at the Structure does not exceed 0.50 inches/second for frequencies less than 40 Hz. The “Peak Particle Velocity” is the maximum of the three-velocity components measured at a point with a three-component vibration recording instrument capable of producing a permanent record.

(i) **Maximum charge weight.** If a scaled distance, as defined below, of seventy (70) or greater is used with minimum delays of ten (10) milliseconds, the following formula may be used to determine the maximum charge weight per delay which can be used without seismic instrumentation:

\[
\text{Scaled Distance} = \text{Actual Distance to Damage Point in Feet (Charge Weight in Pounds per delay)}^{1/2}
\]

\[
\text{Charge Weight in } = (\text{Actual Distance to Damage Point in feet}) \text{ squared pounds per Delay (Scaled Distance)} \text{ squared}
\]

(j) **Blast holes.** Blast holes are to be limited to three inches (3”) in diameter. Prepackaged material only shall be used with no free flowing explosive permitted.

(k) **Use of Explosives Within State Road Right-of-Way.**

(1) The use of explosives is not permitted within rights-of-way of the State Highway Administration (SHA) except when specifically allowed under a SHA permit or by amendment of the same. The Contractor shall conduct and perform all blasting operations according to the permit and/or any addenda issued.

(2) Before using any explosives, notify the following office:

Utility Division  
Maryland State Highway Administration  
District No. 4  
320 West Warren Road  
Hunt Valley, Maryland 21030  
Telephone (410) 229-2300

(l) Each blasting shall be seismographically recorded by the Contractor and the Contractor shall send a copy of the report to the SHA Highway District Utility Engineer at the above
(m) **Use of explosives.** The use of explosives is not permitted within railroad rights-of-ways except when specifically allowed under a railroad permit or by amendment of the same. All blasting operations shall be conducted and performed according to the permit and/or any addenda issued.

(n) **Payment for blasting.** Payment of all blasting operations, control measures and monitoring systems shall be included in the unit price bid for each Contract Item for which blasting is required.

### TC-6.06 **AERIAL ELECTRIC LINES (750 VOLTS OR MORE).**

The Contractor shall be aware that State law requires that a ten foot (10') radial clearance shall be maintained for all Construction Equipment and Materials in relation to electric lines carrying seven hundred fifty (750) volts or more. Because the State law is more stringent than the federal laws, the State law shall be considered the minimal distance.

The Contractor shall also be aware of, and comply with, all other federal, State, County and local laws, utility company requirements and regulations, as specified in GP-7.01 “Compliance With Laws”.

### TC-6.07 **LOAD AND SPEED LIMITATIONS – Reserved.**

### TC-6.08 **HAZARDOUS MATERIAL.**

If the Contractor encounters or exposes during Construction any abnormal conditions which indicate the presence of a hazardous material or toxic waste, Work in the area shall immediately be suspended and the Engineer notified in writing. The Contractor’s operations in this area shall not resume until permitted in writing by the Engineer; however, the Contractor may continue working in other areas of the Work site, unless directed otherwise.

Abnormal conditions shall include, but not be limited to, the presence of barrels, obnoxious or unusual odors, excessively hot earth, smoke, or any other condition which could be a possible indicator of hazardous material or toxic waste.

Disposition of the hazardous material or toxic waste shall be made in conformance with all applicable laws, requirements and regulations. Where the Contractor performs necessary Work required to dispose of these Materials and no Contract Items have been identified in the Contract Documents, the Work shall be performed under an Extra Work Order.

For any Material furnished in connection with the Contract and/or on the Work site by the Contractor that is suspected to be hazardous or toxic, the Engineer may require the Contractor to have it tested and certified to be in conformance with all applicable requirements and regulations. 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. Testing and Certification shall be at the Contractor’s sole expense.

**TC-6.09 RECYCLED OR REHANDED MATERIALS.**

For recycled or rehandled Material furnished on the Work site by the Contractor for use in embankment, base, Subbase or drainage media, the Engineer may require the Contractor to have the Material tested and certified to be in conformance with all applicable environmental requirements. 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 and be based on the Work site environment. Testing and Certification shall be at the Contractor’s sole expense.

**TC-6.10 CONSTRUCTION AND WASTE MATERIAL.**

All wood, trash, debris, and other foreign matter shall be removed from within the Right-of-Way limits and disposed of by the Contractor. The Contractor shall make all necessary arrangements to obtain suitable disposal locations at the Contractor’s sole expense. Disposal shall be in conformance with all federal, State and local ordinances.

**TC - SECTION 7 PAYMENT**

**TC-7.01 MEASUREMENT OF QUANTITIES** – Reserved.

**TC-7.02 PAYMENT ALLOWANCES FOR STORED MATERIALS** – Reserved.

**TC-7.03 FORCE ACCOUNT WORK** – Reserved.

**TC-7.04 PROGRESS PAYMENTS** – Reserved.

**TC-7.05 FINAL ACCEPTANCE AND FINAL PAYMENT** – Reserved.

**TC-7.06 LATE PAYMENTS** – Reserved.
(b) Water Samples. Baltimore City Bureau of Water and Wastewater will perform bacteriological testing for the disinfection of water mains and storage facilities according to ANSI/AWWA C651, Section 5.1.1, 5.1.2, 5.1.4, and 5.2. It is required that two consecutive sets of samples be taken at least 24 hours apart and deemed acceptable by bacteriological standards before a water main or storage facility can be placed into service.

The engineer will collect water samples and provide for their analysis for bacteriological quality. Samples must arrive at the Water Quality Lab no later than 6 hours after being taken. Because bacteriological analysis will be run on samples received in the lab by 1:00 pm, all field sampling must be completed by 12:00 noon. Results will be available after 3:00 pm the following day, as the results require a full 24 hour incubation period.
MAINTENANCE BOND

Per the Baltimore County Department of Public Works Standard Specifications for Construction and Materials, Section GP --4 .10 ( C) of the Errata Addenda states, the contractor is required to post a maintenance bond in the amount of five (5) percent of the total cost of the contract or withhold five (5) percent retainage for two (2) years from the date of Final Acceptance. Maintenance Bond forms are located within this Errata Addenda.
BALTIMORE COUNTY, MARYLAND

BOND NO. ______

CONTRACT NO. ______

MAINTENANCE BOND

THIS MAINTENANCE BOND is entered into on this ____________ day of ________, 20__, by and between ___________________________ as principal ("Principal") and ____________________________, a business entity that is authorized to transact business in the State of Maryland and is organized and existing under the laws of the State of ___________________________ as surety ("Surety"), are held and firmly bound unto Baltimore County, Maryland, a body corporate and politic of the State of Maryland ("County"), as Obligee.

WHEREAS, the above-named Principal has entered into a written contract known as _______________ No. ___ dated ____________, 20__ with Obligee for _______________________________ (the "Agreement"), the terms of which are hereby incorporated by reference; and

WHEREAS, Principal has completed construction under the Agreement; and

WHEREAS, the Agreement includes a warranty on the quality of the Work performed that runs for a period of two (2) years from the date of the County’s final acceptance and that runs for two (2) additional years beyond the repair date if any repair is done during the warranty period; and

WHEREAS, Principal is required to cause this instrument to be executed and delivered to Obligee as security for maintenance during the warranty period in an amount equal to 5% of the total value of the Contract.

NOW, THEREFORE, the Principal and Surety are held and firmly bound unto the Obligee in the sum of $ ________________ Dollars ($ ________________), lawful money of the United States of America, for the payment of which sum of money the Principal and Surety do bind themselves and their personal representatives, legal representatives, successors, and assigns, jointly and severally, firmly by this maintenance bond.

The conditions of this bond are as follows:

1. The Principal shall, for a period of two (2) years from and after the date of completion and acceptance of same by Obligee, replace all defects arising in the Work, whether resulting from defective materials, equipment, design furnished or workmanship. After such period, this obligation shall be null and void; otherwise it shall remain in full force and effect.
2. In the event of a default on the part of the Principal that may be the subject of a claim under this bond, Obligee shall mail, by certified mail, to Surety at the address listed below, a written statement that a claim is being made under the bond and, with substantial accuracy, the amount of the claim. Surety shall have no obligation to Obligee under this bond until the notice of claim is mailed.

3. When the Obligee has satisfied the condition of Paragraph 2 that a notice of claim be mailed, the Surety shall promptly and at the Surety's expense send an answer to Obligee within 30 days after the date of the claim. The answer shall state the amounts that are undisputed and the basis for challenging any amounts that are disputed. The answer shall be accompanied by payment (or arrangements for immediate payment) of any undisputed amounts.

4. Surety expressly waives any right to receive notice of extensions of time or alterations or modifications to the Agreement that may be granted by Obligee and agreed upon by Principal, and any such extensions, alterations, or modifications shall not affect the obligation of the Surety under this bond.

5. This bond is a specialty governed by the twelve-year statute of limitations period set forth in the Annotated Code of Maryland Courts and Judicial Proceedings §5-102.

WITNESS OR ATTEST:

________________________
(Principal – Contractor Name)

By: _______________________
Type Name: ________________
Type Title: ________________
Date: ________________

________________________
(Surety)

By: _______________________
Type Name: ________________
Type Title: ________________
Type Address: ________________
Date: _______________________

REVISED
OCTOBER 6, 2016

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SECTION III

SPECIAL PROVISIONS
SPECIAL PROVISIONS
BIDDER PROTEST AND APPEAL
DPW CONSTRUCTION CONTRACTS

STEP 1A – Bidder Protest of Award
Bidder must file a written bid protest pursuant to Section GP-2.23 of the Standard Specifications – see below.
A bid protest must be in writing and filed with the Engineer.
Oral objections, whether or not acted on, are not protests.

(a) Time for Filing.
   (1) A bid protest shall be filed not later than three (3) business days after the date of award.
   (2) A protest based on alleged improprieties in the solicitation which are apparent before the bid opening or the
       closing date for receipt of initial proposals shall be filed not later than five (5) business days before the opening
       date.

(b) Content of Written Protest.
   (1) Name and address of protestor.
   (2) Bid or Contract number.
   (3) Reasons for protest.
   (4) Supporting exhibits, evidence or documents to support claim.

STEP 1B – Bidder Protest of Bid Rejection
Bidder must file a written bid protest with the Engineer not later than three (3) business days from the date of
the bid rejection. Oral objections, whether or not acted on, are not protests. The written bid protest must comply
with Section GP-2.23(b) of the Standard Specifications.

STEP 2 – DPW Response to Bidder Protest
The Department of Public Works (DPW), Chief of Division of Construction Contracts Administration will
review the bidder’s protest and respond to the bidder in writing within ten (10) working days of receipt of
protest.

STEP 3 – Bidder Appeal
Bidder may appeal the decision by the Chief of Division of Construction Contracts Administration (a) to the
Director of the Office of Budget & Finance for all MBE/WBE-related protests or (b) to the Director of Public
Works for all other protests.

Bidder must file a written appeal with the relevant Director not later than three (3) business days from the date
of the DPW Response in Step 2. Oral objections, whether or not acted on, are not appeals. The appeal must
comply with Section GP-2.23(b) of the Standard Specifications, but may include any additional documentation
as deemed necessary and appropriate by the bidder.

STEP 4 – Director Response to Bidder Appeal
The Director of the Office of Budget & Finance or the Director of Public Works will review the bidder’s appeal
and respond to the bidder in writing within fifteen (15) working days of receipt of appeal.

STEP 5 – Second Bidder Appeal
Bidder may appeal the decision by the Director of the Office of Budget & Finance or the Director of Public
Works to the County Administrative Officer (CAO).

Bidder must file a written appeal with the CAO not later than three (3) business days from the date of the
Director Response in Step 4. Oral objections, whether or not acted on, are not appeals. The appeal must comply
with Section GP-2.23(b) of the Standard Specifications, but may include any additional documentation as
deemed necessary and appropriate by the bidder.

STEP 6 – CAO Response to Bidder Appeal
The CAO, or his duly authorized designee, will review the bidder’s appeal and respond to the bidder in writing
within Twenty (20) Working days of receipt of appeal. The CAO’s, or his duly authorized designee’s, written
decision is final and binding.
TECHNICAL SPECIFICATIONS

Sparks Water Pumping Station & Elevated Tank Improvements
Sparks, Maryland
J.O. No. 231-203-0035-0514

FOR

BALTIMORE COUNTY
DEPARTMENT OF PUBLIC WORKS
BUREAU OF ENGINEERING & CONSTRUCTION

On-Call Engineering Services for Pumping Stations
Baltimore County Project 2008-05

BID DESIGN DOCUMENTS
SEPTEMBER 2020
## TECHNICAL SPECIFICATIONS

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- 15050 BASIC MECHANICAL MATERIALS AND METHODS
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SECTION 01000
GENERAL REQUIREMENTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. The site at which the system is to be constructed is the Sparks Pumping Station, located at 14010 York Rd, Sparks MD 21152, and Sparks Elevated Water Storage Tank, located at 14501 York Rd, Sparks MD 21152.

B. The elevated water tank is a 10-column elevated tank of welded steel construction and is equipped with a torus bowl. The 1,000,000 gallon tank was erected in 1975 by Pittsburg-Des Moines Steel Company under Baltimore County contract number 14094. Refer to the Summarize Tank Information Sheet in Appendix C attached at the end of this specification section.

C. Division of the specification into divisions and sections is for the purpose of simplification alone. Responsibility for the coordination of work of the various trades shall rest with the Contractor.

D. The Contract Drawings and Specifications along with the 2007 edition of Baltimore County’s Standard Specifications for Construction and Materials, General Provisions, or other sections of the Contract are complementary. Where conflicts arise, the more durable, high quality (i.e. more expensive, as judged solely by the Engineer) component shall be utilized, and assumed to be part of the price bid for the respective Bid Item, unless such alternate has been agreed to in writing by the Owner prior to submission of bids.

E. Due to the proximity to residential neighborhood(s), the Contractor shall perform work in full compliance with the former MDE noise regulations. Noise levels at the property line shall be limited to:

1. 7:00AM to 9:00PM: 65 dBA
2. 9:00PM to 7:00AM: 55 dBA

F. All work to be performed under this Contract shall be done in strict compliance with the 2007 edition of Baltimore County’s Standard Specifications for Construction and Materials and Standard Details for Construction as amended, of either Baltimore County or the State Highway Administration, insofar as the same may be applicable except as modified herein.

G. Hazardous Materials: The Contractor shall be responsible for ensuring compliance with the provisions of the applicable occupational safety and health statutes and regulations of the State of Maryland and the U.S. Department of Labor, Occupational Safety and Health Administration (OSHA). Further, the Contractor shall ensure that all methods of performing the work do not involve danger to the personnel employed thereon, other contractors at the site, and the general public whether or not these methods are cited in the contract documents. The Limited Hazardous Material Survey provided in Appendix B of this specification has been included for the Contractor’s use and reference.
1.02 DESCRIPTION OF WORK

A. Work Covered by Contract Documents

1. The work to be done under this Contract includes furnishing all labor, tools, materials and equipment and performing all work required for the construction of the Sparks Water Pumping Station and Elevated Tank Improvements complete in place, and ready to operate.

2. The work includes all requirements to provide a fully finished and operable pumping station facility including miscellaneous items and operations as shall be indicated, shown, specified or required to complete the work in strict conformity with the Contract Documents. The work also includes all specified, indicated and shown civil site work, plumbing, structural, mechanical and electrical equipment, appliances, appurtenances, furnishings, instrumentation and controls, accessories, tests and sundry parts and material as shall be necessary and required for a completely operable installation satisfactory to the Engineer.

3. The work under this Contract related to the Pumping Station includes, but is not limited to:

   a. Demolition of the existing water pumping system A, B, and C; installation of new water pumping system, including pumps, motors, cone valves, isolation valves, suction piping system, and discharge piping system.

   b. Demolition and replacement of suction and discharge pressure sensor instruments and gauges.

   c. Replacement of the building heating system, plumbing system and improvements to the ventilation system.

   d. Demolition and replacement of suction and discharge surge relief valves.

   e. Inspecting and cleaning all station and vault drain lines.

   f. Demolition and replacement of chlorine gas system with sodium hypochlorite system.

   g. Improvements to the electrical service and distribution, and installation of emergency generator.

   h. Integration of the new equipment to the existing PLC control system as well as station emergency pressure control panel.

   i. Installation of new Verizon 4G wireless service and required coordination with Municipal Telephone Exchange (MTE), and City of Baltimore Department of Public Works IT for the new wireless service as well as the existing dial-up telephone service to remain.

   j. Replace existing Pumping Station roof system.
4. The work under this Contract related to the Elevated Tank includes, but is not limited to:
   a. Replacement of the valves within the valve vault, vault heater, and access hatch.
   b. Provision of temporary hydro pneumatic tanks to maintain distribution system pressure when the elevated tank is offline.
   c. Inspecting and cleaning vault drain line.
   d. Complete cleaning and repainting of the 1,000,000 gallon steel elevated water tank on the interior surfaces; the scrubbing, pressure washing, spot cleaning, and topcoating of the entire tank exterior, including accessories; spot cleaning and coating of all areas of exterior coating damaged during tank modifications/repairs; and surface preparation and coating of new items to be installed on the tank exterior. Additional work items include; the furnishing and installation of a new center hub, new main roof stiffeners, new roof knuckle stiffeners, and new circumferential stiffeners, together with all welding, pit filling and surfacing, and interior chipping and/or grinding required to properly attach these new elements and prepare them to receive the required coating. Further work includes performing abrasive blast cleaning of all interior surfaces for evaluation of metal loss; furnishing and application of seam sealer at the roof vent, roof manhole, and along the top and bottom of interior shell stiffeners; furnishing and application of flexible polyurethane sealant (after finish coat has cured) to unwelded lapped container roof access seams and along the intermittently welded stiffeners; furnishing and installation of a PAX submersible mixer with power and controls, tank level sensor, tank overflow sensor, interior container ladder, interior ladder safe climbing device, roof manhole, antenna mounting bracket, and clog-resistant roof vent. Also included are incidental but required work such as construction coordination, dechlorination, disinfection, First Anniversary evaluation, disposal of debris, and site restoration, etc.

5. The work under this Contract related to miscellaneous site improvements includes, but is not limited to:
   a. Removal and replacement of Pump Station site fencing including any shrubbery.
   b. Removal and replacement of Elevated Storage Tank site fencing including any shrubbery.

6. The Contractor shall note that York Road is a State road and work in a State right-of-way is restricted.

B. Drawings

1. Due to the small scale of the Drawings, it is not possible to indicate all fittings, accessories, or incidentals required to complete the work. However, this does not
relieve the Contractor of his obligation to provide such fittings, accessories, or incidentals in order to complete the Contract in every respect, and in strict conformance with the Drawings, the Special Provisions, conditions and covenants of the Contract Documents in accordance with their true intent and full meaning.

2. It is not intended that the Drawings be scaled to determine dimensions or elevations. The Contractor shall conduct his work in accordance with the survey data, dimensions, and elevations specifically noted on the Drawings.

C. Pumping Capacity Requirements

1. Work may only be performed from the months of September through April. During this time, the Contractor is made aware that the following pumping capacity must remain available. No full shutdown will be allowed;

   System Demand
   - 2 small pumps (25HP existing/ 30HP new each)

2. A maximum 8-hour complete station shutdown can be permitted only under non-peak demand times, and following approval from the City. The Contractor shall coordinate all utility, process and piping shutdowns with the City in writing, a minimum of twenty (21) days prior to the date of complete station shutdown.

D. Elevated Tank Requirements

1. Work may only be performed from the months of September through April. During this time, the Contractor is made aware that the system pressure shall be maintained at no less than 60 psi at the hydropneumatic tank system discharge defined within Specification 02760 – Temporary Hydro-Pneumatic Tank Systems.

1.03 WORK CONDITIONS

A. The work under this Contract may be performed under adverse environmental conditions. These conditions include, but are not limited to the following:

1. High temperature and humidity.
2. High noise level.
3. Close proximity to operational equipment.
4. Slippery floor conditions.
5. Low headroom.
7. Limited ventilation.
8. Work in close proximity to chlorine/gas solution.

B. The Contractor shall provide all necessary equipment and facilities to accommodate these conditions.

1.04 FAILURE TO COMPLETE WORK ON TIME

A. Should the Contractor fail to complete fully and to all intents and purposes the work as specified in the proposal and Contract on or after the time specified, the said Contractor shall pay the County such sum as is specified in the proposal.

1.05 FORCE MAJEURE

A. “Force Majeure” means, for the purposes of this Contract, an event arising from causes beyond the control of the Contractor and County which delays or prevents the performance of any obligation under this contract. Unanticipated or changed financial circumstances of the Contractor shall not, in any event, be considered a Force Majeure event.

B. The Contractor shall file written notice to the County within fifteen (15) calendar days after the Force Majeure event is known or should have been known to the Contractor, whichever is earlier. The Contractor’s written notice shall include, but not be limited to, a description of the event and an explanation of the reasons for the delay, the anticipated duration of the delay, all actions taken or to be taken to prevent or mitigate the delay or the effect of the delay, the timetable by which those measures will be implemented, whether the Contractor claims that the delay should be excused as a Force Majeure event, and the Contractor’s rationale for attributing such delay to a Force Majeure event.

C. If a delay of performance is, or was, caused, in the sole discretion of the County, by a Force Majeure event, the time for performance of the construction shall be extended for a period to compensate for the delay resulting from such event. Extensions of a completion date based on a particular event shall not automatically extend any other completion date under this Contract. The Contractor will make a showing of proof by a preponderance of the evidence that the Force Majeure event was the cause of the delay in performance for each requirement or completion date for which an extension is sought. In the event of a dispute regarding application of this Special Provision to a delay in performance, the Contractor shall comply with all County statutes, regulations, and requirements and shall have the burden of proving by preponderance of the evidence that the delay is, or was, caused by a Force Majeure event, and that the amount of additional time requested is necessary to compensate for that event.

D. The Contractor is also notified that copies of any reports, plans, permits, and documents related to this Contract shall be maintained for a period of 5 years from the date of Notice of Award.
1.06  DAMAGES

The Contractor understands that TIME IS OF THE ESSENCE UNDER THIS CONTRACT. In the event the Contractor fails to achieve Final Completion and Final Acceptance (as defined in the Specifications) as required by this Contract then the Contractor shall pay the County the sum of Five Hundred Dollars ($500.00) for each Calendar Day after the expiration of the Contract Period until the Contractor achieves Final Completion and Final Acceptance of the Project. The Contractor agrees that:

A. These Liquidated Damages are a reasonable estimate of the County’s damages solely due to the public’s loss of use of the Project during the delay period and are not a penalty.

B. It is very difficult, if not impossible, to accurately measure the damages to the County due to the public’s loss of use of the Project during the delay period.

C. Notwithstanding GP 8.09 of the Baltimore County Standard Specification for the Construction, in addition to the damages due to the public’s loss of use of the Project during the delay period, the County is likely to incur additional direct costs during the delay period, including but not limited to, costs for construction management, consultants, architectural services, office trailer and supplies, utilities, County employees’ time, County vehicles, and such other costs that the County will incur to continue administration of the construction and the Contract during the delay period, all of which will be monitored by the County, and if so required by the County, The Contractor shall pay such actual damages incurred during the delay period. THE PARTIES HERETO UNDERSTAND AND AGREE THAT CONTRACTOR’S OBLIGATION TO PAY THE COUNTY FOR ACTUAL DAMAGES DURING THE DELAY PERIOD SHALL BE IN ADDITION TO THE CONTRACTOR’S OBLIGATION TO PAY THE LIQUIDATED DAMAGES DUE TO THE PUBLIC’S LOSS OF USE OF THE PROJECT.

D. The County shall have the right, but not the obligation, to deduct the Liquidated Damages due to the public’s loss of use of the Project, and the County’s actual costs and costs to continue administration of the construction and the Contract, from any monies due or any monies that may become due to the Contractor.

1.07  TEMPORARY SERVICES

A. The Contractor shall provide, subject to the approval of the Engineer, and pay for the acquisition, maintenance and removal of such temporary water, heat, light, power, working telephone, laptop, high speed internet, fence around excavated area or enclosed storage, watchman and all other temporary services as may be required in the prosecution of this Contract.

B. The Contractor shall provide and maintain one temporary portable chemical toilet on the site for the full term of the Contract.

C. The Contractor shall provide for the sole use by the resident Engineers and Inspectors, an equipped, air conditioned, ventilated, lighted, and heated field office. The equipped field office shall include telephone service, scanner, and copier. The type of field office to be provided shall be Office Type Number 1 as specified in Section 103 of the Standard Specifications and further subject to the approval of the Engineer. The resident
Engineer’s office shall be a separate entity from any field office the Contractor intends to supply for his own use. The field office shall be set up, furnished and functional within 30 days of receipt of notice to proceed and shall remain so for the entire duration of the contract. Upon completion of the work, the resident Engineer’s office shall be removed from the site by the Contractor and the site cleaned up and left in a neat, acceptable condition. If there is insufficient space to locate the field office on the County’s property at the project site, the Contractor shall be responsible for securing offsite office space equal or greater than that offered by a Type 1 trailer that is suitable to the County.

D. The Contractor shall provide a laptop computer and high speed internet service for use at the field office. The laptop computer shall meet performance requirements as indicated below. The Contractor shall coordinate the type and supplier of high speed internet with the County prior to Construction. The Contractor shall be responsible for all costs associated with the services for the entire duration of construction contract. Provide latest available platform for MS Windows Professional and MS Office Professional. The microcomputer system must be provided no later than 5 work days after the Engineer’s Office is established or 5 days prior to the scheduled start of work, whichever is earlier. Also, the system must be maintained and fully equipped until 20 days after physical work has been satisfactorily completed, unless released earlier by the Engineer. The Engineer may direct that the system be maintained for more than 30 days after physical work has been satisfactorily completed, as necessary, to allow time for County personnel to process outstanding project records.

Laptop – Provide latest available model meeting minimum hardware and software requirements as noted herein:

HP Business Laptop 8530p
Intel Core 2 Duo T9600 2.8GHz, 6MB Cache
1066 FSB
4GB DDR2-800/PC2-6400 RAM
320GB Hard Drive
DVD-RW DL Drive with Lightscribe
15.4in LCD Display
ATI Radeon HD3650 Controller with 256MB
Gigabit NIC, Wi-Fi, BT, 56K Modem
Webcam
MS Windows 10 Professional
Microsoft Office 365 Professional License Kit
1 Year On-Site Warranty
MS Exchange Client
MS Network Client
Norton Ghost V14.0
Norton Anti-Virus – Latest Version
Belkin 3’ CAT5e Yellow Cable
APC Pro 8
HP USB Optical Mouse (DC172)
HP Universal Carrying Case (RR315)
Uplift Warranty to 3 Years On-Site with ADP (Warranty-Upg)
One (1) 3M 3C888 Office Connect dual 56K LAN modem, or compatible, with Ethernet cable
E. The cost of any temporary electric and telephone service installation or use for the construction of this Contract and the testing of all electrical and mechanical equipment and other related work shall be borne by the Contractor up to and including the date of the final acceptance.

1.08 CONTRACTOR TO SUBMIT BREAKDOWN AND CONSTRUCTION SCHEDULE

A. In order to determine the amount of the monthly estimate, the successful Contractor shall furnish a complete breakdown of his total bid and the number of working days necessary to complete the work. The Contractor shall furnish this information within three (3) days after being requested. The breakdown will, in general, follow the outline of the specification items. Upon approval by the Engineer, the breakdown shall become part of the Contract Documents and form the basis for calculating the amount of monthly estimates specified in Section GP-9.03 of the Standard Specifications.

1. The Contractor is responsible for developing reasonable cost breakdown. Items in the bid breakdown may be used as a basis for development of credits in the event of deletion of work item(s).

B. In order to provide a definite basis for determining job progress, a construction schedule shall be prepared by the Contractor at no additional cost to the County and be submitted to the County within 10 days of the Notice to Proceed. Following review and approval by the Engineer, the approved schedule shall become part of the Contract Documents and shall constitute the basis for determining satisfactory progress of the work. The time of project completion shall be included in the Contractor’s Construction Schedule.

1.09 SEMI-FINAL PAYMENT

A. If within sixty (60) calendar days from the date of conditional acceptance of the Contract, the County does not present the final quantities to the Contractor, the County will at the Contractor’s request, within 15 calendar days after the aforesaid 60 calendar day period, partially pay the Contractor (without consent of surety) what is known as a semi-final payment.

1.10 CODES-RULES-PERMITS-FEES

A. General: The Contractor shall give all necessary notices, obtain all permits, and pay all governmental taxes, charges, fees and other costs necessary and incidental to the due and lawful prosecution of the work; file all necessary plans, prepare all Documents and obtain all necessary approvals of all governmental departments having jurisdiction; obtain all required Certificates of Inspection and Approval for the work, deliver same to the Engineer, and pay all expenses associated with them.

B. Compliance: All materials furnished, and all work installed shall comply with the rules and regulations of the National Fire Protection Association (NFPA), with all requirements of local utility companies, with the recommendations of the fire insurance rating organization having jurisdiction and with the requirements of all governmental departments having jurisdiction. Any items or requirements specified or indicated on the drawings in excess of minimum code requirements and permitted under the code shall be provided, unless special permission is obtained from the Engineer to the contrary.
1.11 ENGINEERING SERVICES BY CONTRACTOR

A. The Contractor shall provide competent Engineering services as necessary to establish the property lines and benchmarks, and all other lines and grades to furnish, set, and drive grade stakes, and do all other work necessary to lay out the work in accordance with the dimensions and elevations shown on the Drawings. The Contractor shall employ properly qualified personnel to perform the work herein described. The Contractor shall furnish and set all templates and batter boards. The Contractor will be held responsible for the maintenance of all baselines, control points and benchmarks established by the County, and if any of these are carelessly or willfully disturbed, the Contractor shall replace them at no additional cost to the County. The Engineer reserves the right to check any or all layouts established by the Contractor prior to placing concrete or other materials or installing equipment and all errors discovered by the Engineer during such checks shall be remedied by the Contractor at no additional cost to the County before work on that item proceeds.

B. The Contractor shall furnish, at no additional cost to the County, all technical personnel, labor instruments, and materials, including grade stakes, necessary for establishing, marking, and maintaining lines, grades, and measurements necessary to the prosecution of the work.

C. All finished surfaces shall conform with the lines and grades shown on the Drawings.

1.12 PHOTOGRAPHIC REPORTS

A. The Contractor shall submit each month during construction not less than ten (10) 8” x 10” digital photographs (electronic files) to the Chief, Construction Contracts Administration Division, Department of Public Works, as outlined and stipulated hereinafter. All CD labels and filenames shall include the contract number, job name, Owner’s name, Engineer’s name, date and a short description. The Contractor shall provide a minimum of 5 CDs containing electronic files of the construction progress photos at every progress meeting.

B. The County, or its representative, will designate the origin points of the photographs and the desired scope or perception of the photographs which are intended to give a complete picture of the status of the project. The photographs shall be taken by a person or firm experienced in such work and approved by the Engineer.

C. The cost of the aforementioned will not be a pay item but shall be included in the lump sum price bid and no additional compensation to the Contractor will be considered.

1.13 BORINGS AND TEST PITS

A. The Engineer has not conducted subsurface test borings in the area where the work will be performed, except at the proposed generator location (Refer to Appendix D). The Contractor is solely responsible for the method of dewatering, excavating, and sheeting and shoring he elects to use, and it is assumed that all costs associated with these site activities are included in the price bid for either Bid Item 1 or Bid Item 2, as appropriate.
B. Bidders shall determine to their own satisfaction the actual subsurface conditions including the character and type of soil and other material he will encounter in the conduct of the work at no additional cost to the County. Information and data, and any reference to information and data, in these Contract Documents are available for the Contractor’s information and for whatever use the Contractor may find therefore. The subsurface and other physical data, such as those mentioned herein and contained in the Contract Documents, or otherwise made available to the Contractor by the County or Engineer are not intended as representations or warranties. It is expressly understood that neither the County nor the Engineer will be responsible for the completeness or accuracy thereof, or for any deductions, interpretations, or conclusions drawn thereof. The information is made available in order that the Contractor may have the same information as is available to the County and Engineer.

C. Soil borings or test pits for soil determination in improved roads are not to be excavated by the Contractor unless application is made by the Contractor prior to, and permit is issued by the Baltimore County Bureau of Highways and Maryland State Highway Administration (MSHA) access permits for work within MSHA Right-of-Way.

D. All known subsurface lines, pipes, conduits and structures are shown on the plan and profiles. These lines are shown based upon the best available plans and maps. The locations have not been verified by test pits and Baltimore County and the Engineer assume no responsibility for the accuracy of the Drawings. In any area where the Contractor must make connections to or cross existing lines, it shall be his responsibility to test pit the lines and verify the locations to his satisfaction. In the event that lines are not found located as shown on the plans, the Contractor shall notify the Engineer so that an evaluation can be made as to the magnitude and methods of any adjustments in the plans.

E. The Contractor shall be solely responsible for all damage to underground or aboveground lines encountered in any manner during construction. When crossing and working in the vicinity of existing lines, it shall be the Contractor’s responsibility to properly support and maintain the operation of the lines. Extreme care must be exercised in excavation and backfill operations. The Contractor shall correct at his own expense all damage caused to existing lines.

1.14 STORAGE AND PROTECTION OF MATERIALS

A. The Contractor shall maintain a neat and orderly construction site at all times.

B. The Contractor shall define the limits of a storage area(s) within the Limits of Disturbance as shown on the Contract Drawings. The Contractor shall be fully responsible for the security of this area(s), including fencing, watchman, and other means of security. Under no circumstances will the County be responsible for the security of any property belonging to the Contractor, his subcontractors, or any of his work forces.

C. All equipment and materials provided, and work performed under this Contract shall be protected from damage before and after installation. The Contractor shall be responsible for work, equipment, and materials until inspected, tested and finally accepted.

D. During construction, the open ends of work shall be effectively closed with temporary covers or plugs to prevent the entry of foreign material.
E. Where permanent equipment called for under this Contract is installed before the erection of adequate protective structures, the Contractor, without additional compensation therefore, shall provide approved effective and durable covers for fully protecting such equipment against damage from the elements or from any other cause.

F. Electrical equipment shall be carefully and effectively covered with waterproof material and otherwise protected at all times from the elements.

G. All structures, machinery, equipment, piping, electric conduit, wiring and accessories and appurtenances shall be adequately supported and safeguarded against all damage or injury during performance of work under this Contract. The Contractor shall be responsible for all damage or injury resulting from his operations and shall repair such damage immediately and to the satisfaction of the Engineer.

H. The Contractor shall make all arrangements and provisions necessary for the storage of materials and equipment. All excavated material, construction equipment, and materials and equipment to be incorporated into the work shall be placed so as not to injure any part of the work or existing facilities, and so that free access can be achieved at all times to all parts of the work and to all public utility installations in the vicinity of the work. Materials and equipment shall be kept neatly and compactly stored in locations that will cause a minimum of inconvenience to other Contractors, public travel, adjoining owners, tenants, occupants and County personnel.

I. No delivery of materials and equipment will be accepted by the County, and all expenses incurred by the County in handling materials or equipment which have been consigned or directed to the County will be charged to the Contractor.

J. Following completion of the work, but before final payment, the Contractor shall remove all trailers, paving, stockpiled soil, stone, fencing, and other items used by him/her during the construction of the project and/or contained in his storage area(s). The Contractor shall be responsible for placing topsoil, seeding and mulching in accordance with the Contract Drawings.

1.15 INTENT

A. It is the intent of the Drawings and Specifications to provide the Contractor with such information and instructions as may be necessary to complete this contract and to provide a complete and workable installation. The Contractor shall perform all work in accordance with the lines, grades, cross sections and dimensions shown on the plans. The Contractor shall furnish, unless otherwise provided in these plans and specifications, all materials, implements, machinery, equipment, tools, supplies, transportation and labor necessary for the prosecution and completion of the work. All materials and equipment installed as part of the permanent installation shall be new. It is intended that the Drawings and Specifications shall supplement each other. However, where variances occur between the Drawings and the Specifications or within the Document itself, the item or arrangement of better quality, greater quality or higher cost shall be included in the Contract price. The Engineer will decide on the item and manner in which the work shall be installed.
B. Completeness: Any apparatus, appliance, material or work not shown on the drawings but mentioned in the specifications, or vice-versa, or any incidental accessories necessary to make the work complete and perfect in all respects and ready for operation, even if not particularly specified, shall be provided by the Contractor without additional expense to the County.

C. Schematics may not be shown to scale on drawings, but the work shown on the schematic shall be provided by the Contractor without additional cost to the County.

D. Adequacy: With submission of bid, the Contractor shall give written notice to the Engineer of any materials or apparatus believed inadequate or unsuitable; in violation of laws, ordinances, rules or regulations of Authorities having jurisdiction; and any necessary items of work omitted. In the absence of such written notice, it shall be understood that the Contractor has included the cost of all required items in his/her proposal and that he/she will be responsible for the approved satisfactory functioning of the entire system without extra compensation.

1.16 SUBMITTALS

A. Ten (10) days after notice to proceed, the Contractor shall submit a submittal schedule listing as near as practicable by specification section number, all submittals required, and approximate date submittal will be forwarded.

B. Submittals shall be provided in proper sequence and time with due regard to the time required for the review approval and transmittal as per the approved project schedule.

C. Submittals are generally defined as all drawings, diagrams, illustrations, catalog cut sheets, product data sheets, brochures, schedules, bills of material, and other data, certified correct for construction, which are prepared by the Contractor, his subcontractors, suppliers or distributors, or equipment fabricators or manufacturers, and which illustrate the manufacture, fabrication, construction, installation of the work, or a portion thereof.

D. The Contractor’s attention is specifically directed to the fact that working drawings are required, and shall be submitted, for each and every element of the work including, but not limited to, excavation support systems, reinforced concrete formwork systems, reinforcing steel details, concrete pours, construction joints, waterstops, structural steel and miscellaneous metals, masonry work, roofing systems, each and every item of mechanical and electrical equipment, electrical conduit systems showing proposed field assembly, piping regardless of size or whether fabricated on or off the project site, and all other shop drawings which may be necessary, in the opinion of the Engineer, to comply with the all-inclusive intent of this requirement.

E. Each submittal shall be assigned a sequential number; Submittal No. 1, 2, 3, 4, etc. for purposes of easy identification, and shall retain its assigned number, with appropriate subscript, on required resubmissions. Changing manufacturers or models during the course of the submittal process shall not be cause for assigning a new submittal number. Once an item of work has been assigned a submittal number, that item of work shall retain the same number for the duration of the project. The following stamp shall be affixed to each submittal and appropriately completed.
Resubmittals shall be labeled with the letter “R” followed by the number of the resubmission. Example: The Contractor’s tenth submittal, being resubmitted for the first time shall be numbered Submittal No. 10R1, resubmitted for the second time shall be numbered Submittal No. 10R2, etc.

F. All shop drawings shall be in conformity with the Contract Drawings and Special Provisions. All shop drawings except diagrams, illustrations, brochures and schedules shall be to appropriate scale, but in no case smaller than $\frac{1}{4}'' = 1'-0''$, and shall give all dimensions required for manufacture, fabrication, assembly, installation and incorporation in the work. All shop drawings shall be complete, accurate and distinct, and shall show outline and section views, details, kinds of materials to be used, the kind of machine work and finish to be applied, and the installed locations of the said materials, equipment, accessories, appurtenances and related items. Shop drawings showing field assembly of piping and/or conduit systems shall incorporate sufficient views, sections, plans and elevations to show each and every fitting, specialty, and item of equipment, including locations and spacing of hangers and supports. Reproduction of Contract Drawings is not acceptable. Piping and/or conduit systems 2-inches in diameter and smaller may be shown as a single line. Equipment and specialties installed within and/or connected to piping and conduit systems shall be cross referenced to equipment and specialty shop drawings by submittal identification number, manufacturer name, and catalog or model number. Such cross reference data may be shown at each individual equipment or specialty item on the system assembly drawing or, at the Contractor’s option, may be incorporated in a coded bill of materials prepared integral with, and as part of, the applicable shop drawing.

G. Electrical shop drawings include, but are not necessarily limited to, complete terminal identification diagrams and schedules, complete point-to-point interconnection diagrams, and complete single line and elementary wiring diagrams for all power, signal, control and lighting systems, together with panel layout drawings. Diagrams shall be oriented to display the general arrangement and location of wiring and equipment which is seen when facing the appropriate panels for maintenance and adjustment purposes, i.e.; for panels wired and serviced from the front, diagrams shall depict a front view, and for panels wired and serviced from the rear, diagrams shall depict a rear view. Mirror image diagrams are prohibited. Terminal point and wire identification on all shop drawings shall be identical to related terminal point and wire identification on equipment and panels, and absolutely no deviation from this requirement will be permitted.
H. Panel shop drawings shall contain the following:

1. Top and base plan, showing location of equipment and all conduits to and from equipment, supports, doors and clearances.

2. Point-to-Point connection diagrams.

3. Front and rear elevations, showing general arrangement, complete with dimensions.

4. Elevation sections (right and left sides minimum; others as required).

5. Mounting details of all principal equipment.

6. All panel and accessory drawings shall be drawn to a scale not less than 1-inch equals 12-inches.

7. All principal items shall be identified with an encircled number, which will correspond to an individual item in a “List of Principal Equipment”. The List of Principal Equipment shall be arranged in columnar form, reading from left to right as follows:

   a. Item Number
   b. Quantity
   c. Description
   d. Make
   e. Size
   f. Material
   g. Form
   h. Type
   i. Bulletin or Catalog Number
   j. Rating in Volts, Amperes, and Horsepower or KVA
   k. Remarks

Under “Remarks” column shall be other pertinent information not covered by the above column headings.

The panel information shall be printed on the electrical shop drawings; separate submission of anything other than the electrical shop drawings, or in any other form than hereinbefore described, will not be acceptable.
8. **Wiring diagram:**

   a. A complete wiring diagram showing all electrical apparatus, both within the equipment and connections to external equipment, shall be submitted. All wires shall be shown continuous from end to end and identified by numbers. A wire connected to one side of a contact, such as pushbuttons, relays, or selector switches shall change its identifying number when leaving the opposite side of such contacts. Any and all wires passing from panel to panel across the panel joints, which must be disassembled for shipping, must have matched terminal blocks at these joints. The terminal blocks shall be identified with the respective wire numbers.

   b. All wires entering and/or leaving the equipment shall be brought to the terminal blocks and identified. Motor terminals shall be identified individually, that is Pump “E” terminals can be designated E-1, E-2, E-3 and Pump “F”, F-1, F-2, F-3, and so on.

   c. All wiring diagrams shall be provided with point-to-point connections clearly labeling terminal points within equipment as well as within field panels.

   d. Wireless or numbered type diagrams will not be accepted, nor will blank blocks with separate drawing reference numbers be considered. It shall be the responsibility of the equipment manufacturer or assembler to obtain internal wiring diagrams of all foreign equipment and coordinate or reproduce these diagrams into a single complete wiring diagram outlining all separate parts. The physical relationship of all controls shall be identical to the finally developed general arrangement drawing hereinbefore described.

9. A complete schematic, elementary drawing with all wiring numbers corresponding to the wire diagram shall also be submitted. There shall be printed on this drawing, adjacent to the schematic diagram, a complete “Sequence of Operations”, stating what must be done to put the facility in operation for the first time, starting from the main incoming service. The sequence of operations shall start with a general heading under which the normal starting sequence will be described, along with any special functions of the individual parts or combinations of control devices, including all interlocking. The next heading shall be “Operations Normal-Automatic”, under which shall be described the complete normal-automatic sequence of the controls, making reference to the schematic control diagram, reading from left to right, indicating wire numbers, coils, relay contacts, etc. Following shall be the heading “Operation Normal-Hand Control”, under which will be described the complete hand operation of the facility, when bypassing the automatic sequence. Finally, the heading “Power Failure”, under which will be described precisely what can and will happen upon the failure of power and on restoration of power after a power failure in both the “Hand” and “Automatic” sequences. This drawing shall be of a scale such that all symbols, lines and notes can easily be read by maintenance forces under emergency conditions.
10. All electrical information described herein shall be shown on the electrical shop drawings. Separate submission of electrical information on anything other than these electrical shop drawings or in any other form than hereinbefore described will not be acceptable, except that manufacturers’ printed bulletins shall be submitted in addition to the information on the electrical shop drawings where necessary to provide complete understanding of the construction, maintenance, repair and operation of any basic component.

11. Panel shop drawings shall be provided for motor control centers, instrument panels, telemetry panels, valve terminal panels, switch gear panels and VFD panels.

I. All shop drawings shall be 22-inches by 34-inches in size with a 1 ½-inch binding margin on left hand side of sheet. The Contractor may incorporate one (1) or more small drawings on prints 22-inches by 34-inches in size. Diagrams, illustrations, brochures, schedules, and other data may be prepared and executed, complete, on sheets measuring 8 ½-inches by 11-inches. Shop drawings submitted other than as specified herein will be returned for resubmittal without being reviewed.

J. After checking and verifying all field measurements, the Contractor shall submit to the Engineer, for approval, a minimum of ten (10) copies of all submittals, which shall have been checked by and stamped with the approval of the Contractor and identified as shown herein. The information shown on the submittals shall be complete with respect to dimensions, design criteria, materials of construction and other requirements as specified or shown in the Contract Documents to enable the Engineer to review the information as required. Machinery outline drawings alone are not acceptable. All submittals covering related items of equipment or integrated systems of equipment shall be submitted at the same time in order that their complete operation can be adequately reviewed. Partial submissions will not be reviewed but will be retained for subsequent review after related submittals have been submitted. At the time of each submission, the Contractor shall call to the Engineer’s attention, in writing, any deviations that the submittals may have from the requirements of the Contract Documents. Upon receipt of submittal approval, the Contractor shall provide five (5) final hard copies to the Engineer. In addition to the final hard copies, the Contractor shall provide the final approved submittal in electronic (PDF) format.

K. The Engineer will check submittals with reasonable promptness, but his checking and approval shall be only for conformance with the design concept of the project and for compliance with the information given in the Contract Documents. The approval of a separate item as such shall not indicate approval of the assembly in which the item functions. The Contractor shall make any corrections required by the Engineer and shall resubmit the required number of corrected copies of each submittal until approved. The Contractor shall direct specific attention to revisions called for by the Engineer on previous submissions.

L. A maximum of two submittals of each submittal will be reviewed, checked, and approved or commented upon without charge to the Contractor. Any additional submissions which are ordered by the Engineer to fulfill the stipulations of the Contract Documents, and which are required by virtue of the Contractor’s neglect or failure to comply with the requirements of the Contract Documents or to make those modifications and/or corrections ordered by the Engineer in the review of the first two submissions of
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J.O. 231-203-0035-0514

each submittal, will be reviewed and checked as deemed necessary by the Engineer, and the cost of such review and checking, as determined by the County, and based upon a maximum rate of $190.00 per hour will be deducted from the Contractor’s monthly invoices or from monies retained under the provisions of the Contract Documents. It is therefore incumbent upon the Contractor to make all modifications and/or corrections, and/or to cause such modifications and/or corrections to be made by his subcontractors, suppliers, distributors, equipment fabricators and/or manufacturers, as may be required by the Engineer in an accurate, complete, and timely fashion.

M. Shop Drawings for Equipment which require the provision of Equipment Certification Forms defined in Specification 01780, shall be accompanied with a completed, unmodified Equipment Certification Form. Shop drawings submitted without the required Equipment Certification Form will be returned without review.

N. The Engineer’s approval of submittals shall not relieve the Contractor from his responsibility for any deviations from the requirements of the Contract Documents unless the Contractor has in writing called the Engineer’s attention to such deviations at the time of submission and the Engineer has given written approval to the specific deviation, nor shall any approval by the Engineer relieve the Contractor from responsibility for errors or omissions in the submittals. Submittals shall be submitted with sufficient time provided for checking, return to the Contractor, and/or resubmission as required. The words “APPROVED” or “APPROVED AS NOTED” or words of similar import placed by the Engineer on a submittal means that all items and details of the submittal are fully approved with the exception of those items or details that are specifically marked for further action. When the submission is marked “RESUBMIT” it means that the material or product can probably fulfill the intent of the plans and specifications but that enough questions or comments have arisen to require a corrected or updated submission. If the material submitted represents a product that is totally unsatisfactory and probably will not under any circumstances meet contract requirements, it will be marked “REJECTED” and will not be reconsidered by the Engineer. The withholding of an approval by the Engineer of any submittal in its entirety, including required certifications, shall under no circumstances constitute a basis for delay in arranging for and proceeding with the manufacturing, fabricating, delivering and installing, in accordance with the Contract, of those items or details in such submittals which may have been approved.

O. The Contractor’s attention is specifically directed to the fact that no work shall be fabricated, nor equipment or materials ordered, nor any construction performed, prior to approval by the Engineer of submittals applicable thereto.

Construction performed in violation of this requirement will be neither approved nor certified for payment until applicable submittals have been approved. If the Engineer so directs, the Contractor shall disassemble, raze, and remove any such construction performed prior to approval by the Engineer of submittals applicable thereto, and the Contractor will be allowed neither additional compensation nor extension of Contract time thereto.

If the Contractor orders or causes to be ordered or delivered any equipment, machinery or materials in violations of this requirement, he/she does so at his/her own risk, and such equipment, machinery or materials shall neither be installed in the work nor stored on the site of the work. If, after submission and review of applicable submittals, the Engineer determines that any such equipment, machinery or materials do not meet the
requirements of the Contract Documents, such equipment, machinery or materials will be rejected, and the Contractor will be allowed neither additional compensation nor extension of time therefore.

The Contractor’s attention is specifically and especially directed to the fact that because manufacturer’s standards and procedures are subject to unilateral changes over which the County has no control, the stipulations herein are applicable, and will be enforced, even for those elements of equipment, machinery, and/or materials which may be specified by manufacturer and model or catalog number in the Contract Documents.

1.17 AS-BUILT DRAWINGS

A. The Contractor shall keep one copy of all Contract Documents, including shop drawings, at the site, in good order, and annotated to show all changes made during the construction process. These as-built drawings shall be available to the Engineer and shall be delivered to the Engineer upon completion of the project. The Engineer will return to the Contractor all “Mylar” reproducible copies of shop drawings which require as-built corrections and the Contractor shall make all corrections and return the annotated “Mylar” reproducible copies to the Engineer not later than eight (8) weeks after the date the Contractor has received them. If the Contractor fails to maintain the as-built drawings as required herein, final payment with respect to the Contract as a whole will be withheld until proper as-built drawings have been furnished to the Engineer, or the County may, at its option, Contract for independent correction of shop drawings to as-built conditions, and the cost of such contracted services will be deducted from monies retained under the provisions of the Contract Documents.

B. The Contractor shall furnish, in quadruplicate on linen backed white prints, ¼-inch per foot minimum scale charts of all piping and conduit arrangements, as approved, giving the number and location of all control valves, their functions, and section of piping they control. Three sets shall be bound for filing and shall be neatly folded and bound as a part of the “Operating and Maintenance Manuals”. One set of corrected and approved “Mylar” reproducible copies shall be delivered to the Engineer.

C. Contractor shall provide two (2) full size hard copies, one (1) copy for the Owner, and (1) for the Engineer for review. Additionally, two (2) CDs with PDF files identical to the hard copies shall be provided. All changes shall be legibly made in red. As-builts received that are illegible will be returned without review. Where items are relocated, the dimensions of the installed location shall be clearly indicated from fixed structures or other fixed reference points. Where coordinate tables are included on the drawings, Contractor shall revise coordinate tables for as-built conditions. References to RFIs, PCOs, etc. shall be noted where applicable.

D. In order to maintain an accurate set of as-built drawings, the Contractor shall meet with the County Inspector monthly to review the status of as-built drawings. The Contractor is responsible for clearly indicating all changes on the drawings. Where changes are made due to a submittal, RFI, or PCO, the document resulting in the change shall be referenced for clarity. Contract drawings where coordinates are listed shall be updated to match field installed conditions.

E. The Contractor shall bring the as-built drawing set to every monthly progress meeting so that changes can be captured within the monthly minutes.
1.18 EQUAL OR APPROVED EQUAL

A. Where any article is specified by a proprietary name, trade name, and/or name of manufacturer, with or without the addition of such expressions as “or equal”, it is to be understood that the article named or the equal thereof, is intended, subject to the approval of the Engineer as to the quality thereof, and it is distinctly understood that (1) the Engineer is to use his own judgment in determining, from time to time, whether or not any article proposed to be substituted is the equal of any article so specified; (2) that the decision of the Engineer on all such questions of equality shall be final, and (3) that in the event of any adverse decision by the Engineer, no claim of any sort shall be made or allowed against the Engineer or the County.

B. An offer of any article or material by the Contractor for an article or material specified, will raise the presumption that it is for the purpose of saving money. If, in such a case, the article or material is approved, the County shall be given a credit as follows: The difference in the net cost to the Contractor of the article or material submitted and the price at which the Contractor could have obtained the lowest priced article or material specified. For convenience in checking the credit, if any, the Contractor shall submit these figures in writing when the offer is made, and no article or materials will be considered without such figures.

C. If the County approves a substituted item, the Contractor will not be entitled to any additional compensation.

D. The use of brand names is not intended to unduly restrict competition or to be exclusionary or discriminatory as to requirements other than those based upon performance or other salient requirements of procurement, and when so used, the specified features of the named brand, which must be met, are clearly specified.

E. The Contractor shall submit a point by point comparison list comparing the named product with the proposed substitution product to determine whether or not the proposed product is “equal”.

1.19 VIBRATION

A. It shall be the responsibility of the Contractor to protect and isolate from the existing structures all vibrations resulting from equipment operation. Insofar as practical, all electrical equipment and its installation shall be vibration free. Under no circumstances shall any vibration be transmitted to the structures. Vibration isolators used in the installation shall be subject to the Engineer’s approval.

1.20 GUARANTEE

A. The Contractor hereby guarantees all of the work including all components, for a period of at least two (2) years after the date of final acceptance thereof by the County, as follows:

1. Against all faulty or imperfect materials and against all imperfect, careless and/or unskilled workmanship.
2. That the equipment and each and every part thereof shall operate with proper care and attention in a satisfactory and efficient manner, and in accordance with the requirements of these Contract Documents.

3. That the structure, above and below grade, shall be entirely watertight and leak-proof at every joint and point of penetration for pipes, hatches, doors, etc.

4. The Contractor agrees to replace with proper workmanship and materials, and to re-execute, correct, or repair, without cost to the County, any work which may be found to be improper and/or which does not operate in a satisfactory manner or fails to perform as specified.

5. The guarantee obligations assumed by the Contractor under these Contract Documents shall not be held or taken to be in any way impaired because of the specifications, indication or approval by or on behalf of the County of any articles, materials, means, combinations or things used or to be used in the construction, performance and completion of the work or any part thereof.

6. No use or acceptance by the County of the work or any part thereof, nor any failure to use the same, nor any repairs, adjustments, replacements or corrections made by the County due to the Contractor’s failure to comply with any of his obligations under the Contract Documents, shall impair in any way the guarantee obligations assumed by the Contractor under these Contract Documents.

7. The Contractor shall also, during this two-year guarantee period, be responsible for the proper operation and adjustment of all systems, equipment, apparatus or devices installed by him.

8. During the guarantee period, the Contractor shall respond to the site for required repair or replacement work within 48 hours of notification.

1.21 FACILITY START-UP, DEMONSTRATION PERIOD AND OPERATOR TRAINING

A. When specified in individual sections of these Specifications, upon completion of all work for a particular section, the Contractor shall furnish at no extra cost to the County, the necessary manufacturer’s engineers, representatives, technicians, skilled labor and helpers and shall perform all startup activities as required. During startup, the manufacturer’s designated personnel shall fully inspect, test, calibrate, lubricate, operate and certify the equipment for which they are responsible.

B. When a manufacturer’s representative is not required to perform startup activities for a particular piece of equipment, the Contractor shall perform any required startup activities in strict accordance with the manufacturer’s instructions.

C. If the Operation and Maintenance Manuals specified hereinafter are not available at the time of the startup, the Contractor shall provide one copy of the manufacturer’s operating literature for each system or item of equipment. Installation and operating sheets or booklets normally shipped with equipment may be used for this purpose.
D. Prior to starting up and operating any and all equipment installed in the pumping station, the Contractor shall notify the Baltimore City Environmental Services Division. All lubrication and starting up of the equipment shall be done in the presence of and to the complete satisfaction of authorized representatives of the Baltimore City Environmental Services Division, and in accordance with all manufacturer’s recommendations.

E. The Contractor shall schedule startup activities for a time mutually agreeable with the County, City, and Engineer and shall provide a minimum of one week notice prior to the desired date. All preparatory work shall be completed prior to arrival of County, City, and Engineer. Start-up schedule shall include the time the County, City, and Engineer need to be on-site. Testing may be canceled and rescheduled in the event the Contractor or any of the Contractors representatives are not prepared to start at the time mutually agreed to start time. The Contractor will not be due any additional time or compensation should testing need to be rescheduled. Contractor shall be charged for the time lost by testing cancelations and rescheduling at the cost determined by the County, and based on a maximum rate of $190.00 per hour, which will be deducted from the Contractor’s monthly invoices or from monies retained under the provisions of the Contract Documents.

F. After all startup activities have been completed, the Contractor shall coordinate with the City the start of the demonstrational basis for a period of thirty (30) days.

G. Prior to beginning the 30-day demonstration period, the Contractor shall complete the following:
   1. All shop drawings shall be submitted and approved.
   2. All Equipment Warranty and Certification Forms and manufacturer’s certifications shall be completed and submitted, and all witness testing conducted and completed as required.
   3. All startup activities shall be completed.
   4. All test reports shall be submitted and approved.
   5. All project photographs shall be submitted.
   6. All Operation and Maintenance Manuals shall be submitted and approved.
   7. A final walk-through of the facility shall be conducted by the Contractor with the County, City and Engineer in order to generate the punchlist for the project. Provide the County and Engineer two weeks notice prior to the desired date.
   8. Any items on the punchlist that are designated as requiring completion prior to the 30-day demonstration period shall be completed.
   9. Any item on the punchlist not designated as requiring completion prior to the 30-day demonstration period shall be completed prior to the end of the 30-day demonstration period.
10. All spare parts shall be delivered to the City and signed receipts submitted for record.

11. All SCADA communications between the station and the overall SCADA network shall be installed and fully operational.

12. The facility shall be thoroughly cleaned, and any finishes requiring touchup shall be completed.

H. After all of the above items have been successfully completed, the Contractor shall receive notice from the County that they may begin the 30-day demonstration period.

I. During the 30-day demonstration period, the Contractor shall conduct all required training for the newly installed equipment. Training activities shall be performed separately from manufacturer’s startup activities and shall be held on separate days unless approved otherwise. Coordinate schedule of training with County and City. Provide a minimum of two weeks notice for each session.

J. If problems occur during the 30-day demonstration period that are designated by the County, City and Engineer to be significant magnitude, the problems shall be satisfactorily corrected, and the 30-day demonstration period shall restart from the beginning.

K. After successful completion of the 30-day demonstration period, all required training, all punchlist work, and all final cleanup, the Contractor shall schedule a follow up walkthrough with the County, City and Engineer to verify compliance with all requirements.

1.22 OPERATION AND MAINTENANCE MANUALS

A. Upon completion of the work, the Contractor shall furnish for the Engineer’s review, three (3) complete hardcopies of the Operation and Maintenance Manual and two (2) matching electronic copies on CD for review and approval. Manuals shall include operating and maintenance information on all systems and items of equipment per the following table:

<table>
<thead>
<tr>
<th>SECTION</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>08310</td>
<td>Access Hatches</td>
</tr>
<tr>
<td>11220</td>
<td>Submersible Mixer with Tank Disinfection</td>
</tr>
<tr>
<td>11300</td>
<td>Centrifugal Water Pumps</td>
</tr>
<tr>
<td>15110</td>
<td>Valves</td>
</tr>
<tr>
<td>15260</td>
<td>Sodium Hypochlorite Supply System</td>
</tr>
<tr>
<td>15500</td>
<td>Heating and Ventilation Equipment</td>
</tr>
<tr>
<td>16055</td>
<td>Overcurrent Protective Device Coordination and Arc Flash Study</td>
</tr>
<tr>
<td>16400</td>
<td>Service and Distribution</td>
</tr>
<tr>
<td>16461</td>
<td>Low Voltage Transformers</td>
</tr>
<tr>
<td>16500</td>
<td>Lighting</td>
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<tr>
<td>16700</td>
<td>Standby Power Generator System</td>
</tr>
<tr>
<td>16710</td>
<td>Automatic Transfer Switch with Solid-State Logic</td>
</tr>
<tr>
<td>17100</td>
<td>Motor Control Center</td>
</tr>
<tr>
<td>17110</td>
<td>Variable Frequency Controllers</td>
</tr>
</tbody>
</table>
B. The Contractor shall submit complete operation and maintenance instructions for every item of operable equipment furnished under this Contract. The cost associated with providing these manuals shall be included in the lump sum price.

C. Manuals shall consist of catalogs, brochures, bulletins, charts, schedules, shop drawings corrected to as-built conditions and assembly drawings and wiring diagrams describing location, operation, maintenance, lubrication, operating weight, and other information necessary for the Engineer to establish an effective operating and maintenance program. All information provided shall be of the most current publications and literature supplied by the manufacturers. Outdated or irrelevant information will not be accepted. Multiple items listed on a single page, which are not relevant, shall be clearly crossed out. The following data shall also be included:

1. Title page giving name and location of facility.

2. Four 8-inch by 10-inch pictures of the facility, views as directed by the County. Each photograph shall be provided on photo quality paper and inserted into a clear plastic sleeve. Photos shall be taken near the completion of the project, when all temporary measures and Contractor equipment are removed, and final site improvements, including landscaping, are completed.

3. Two unique photographs 8-inch by 10-inch of each piece of equipment in place. Each photograph shall be provided on photo quality paper and inserted into a clear plastic sleeve. Photos of equipment shall be taken at an orientation such that the permanent equipment marker is visible (e.g. Pump A, Pump B, etc.). When this is not practical, a temporary identification marker shall be provided and included in the photo for each piece of equipment.

4. “Name Plate” data of all equipment.

5. Performance curves and performance data for the pumps and equipment installed.

6. Initial parameter settings for all equipment, as well as corresponding factory default settings. Initial parameter settings for equipment that differ from factory default settings shall be emphasized.

7. All approved shop drawings for each piece of equipment, including required certifications.

8. Manufacturers’ cut sheets and dimension drawings of each piece of equipment, and details of all replacement parts.

9. Manufacturers’ erection, operation and lubrication instructions for all equipment and apparatus.
10. Complete as-built wiring diagrams of all individual pieces of equipment and systems including one line diagram; schematic or elementary diagrams; complete point-to-point interconnection diagrams, and terminal board identification diagrams.

11. Complete underground piping and conduit layout and interconnecting drawings.

12. Manufacturer’s certifications for specified equipment.

13. A list of all local manufacturers’ representatives.

14. Complete parts list with parts assembly drawing (by exploded view), names and addresses of spare parts suppliers, recommended list of spare parts to be kept “in stock” and sample order forms for ordering spare parts. Lead time required for ordering parts shall be estimated and provided.

15. Instructions with easily understood schematics or diagrams for disassembling and assembling the equipment for overhaul or repair.

16. The manual shall also include detailed written procedures to be used for all modes of operation including any precautions for personal safety or for prevention of damage to the equipment (mechanical or electrical). This includes initial start-up, interim operation when necessary, normal operation, emergency operation, shutdown and restarting. Required operating checks, calibration and field performance measurements shall be described.

17. Preventive maintenance measures and their frequency shall be listed in tabular form. A troubleshooting chart containing symptoms, probable cause, and remedies shall be included. A lubricating schedule listing equipment (parts), frequency and lubricant (including equivalent major brand lubricants) shall be provided. In addition, a lubrication schedule shall be included for periods when the equipment is in standby or in storage.

18. Section dividers shall be provided with non-removable labels. Dividers and labels shall be consistent throughout each equipment section and O&M binder.

19. Binder spines shall be provided with permanent labels in accordance with the following template.

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SPARKS WATER PS AND ELEVATED TANK O&M’s
CONTRACT NO.
Volume X of Y
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D. Operation and Maintenance information shall be bound in loose leaf 3-ring binders with black plastic-coated covers. Binders shall be 4-inch thick maximum, high quality, turned edge construction with piano metal hinges and rings that stay closed and not allow pages to fall out. Binders shall be United Innovations, Inc. DBA Specialty Loose Leaf Model 87-784 for 3-inch binders, 98-984 for 4-inch binders, or approved equal. Binders shall be organized sequentially with section dividers for each applicable specification section as listed in the Special Provisions table of contents.
E. Binders shall be organized numerically by specification and CDs shall contain individual files for each specification division.

F. Shop drawings 22-inches by 34-inches in size shall be folded to approximately 11-inches by 8-1/2 inches with drawing title box exposed along either edge. Drawings descriptive of a single item of equipment shall be grouped together. All drawings shall be placed in clear plastic pockets that fit within the binders.

G. All approved shop drawings shall be included in the Operation and Maintenance Manuals. All shop drawings included in the binders shall be those copies previously submitted for review and approval and shall bear the Engineer’s stamp of approval and comments as originally noted thereon.

H. In additional to the O&M Manual, the Contractor shall provide the following information. All drawings and pages provided shall be laminated, bound, and located as follows. Provision for storage and hanging devices shall be provided by the Contractor.

1. 11x17 As-built Electrical Drawings shall be stored inside or adjacent to the associated electrical equipment in a dedicated plastic pocket.

2. 11x17 As-built Instrumentation Drawings shall be stored inside or adjacent the associated electrical equipment in a dedicated plastic pocket.


5. All MSDS Sheets located in a steel painted wall mounted file holder. Coordinate file holder location with the Count and City.

I. Subsequent to the Engineer’s approval of the Operation and Maintenance Manuals, the Contractor shall submit three (3) complete sets of manuals for distribution by the Engineer. In addition, the Contractor shall submit two (2) CDs, each containing an electronic copy of the entire Operation and Maintenance Manuals as Portable Document Format (PDF) file. CDs shall contain individual files for each specification section, matching the section dividers of the Operation and Maintenance Manuals.

J. Final inspection and/or beneficial occupancy will positively not be undertaken until approved Operation and Maintenance Manuals have been submitted and approved. Partial approvals will not be made.

K. Contractor shall furnish a two (2) drawer file cabinet for O&M Manuals and flow charts, HON 530 Series with hang rails, or approved equal.

1.23 STREAM FLOW PROTECTION

A. The dewatering or pumping out of trenches, utility lines, structures or newly excavated areas directly into a stream which causes turbidity and/or possible erosion of stream banks will be prohibited. The Contractor must make use of sediment traps, filters, or other methods as stated in Section 308 “EROSION AND SEDIMENT CONTROL PROVISIONS”, included in of the Standard Specifications and Details for Construction.
The restrictions contained therein shall be strictly enforced and the Contractor is cautioned to make every effort possible to comply with these regulations and shall conduct his operations in such a manner to keep to an absolute minimum the amount of sedimentation introduced into any stream.

B. Upon completion of the project and after such devices have served their purpose, such devices shall be removed from the project by the Contractor at his own expense.

1.24 SOIL EROSION AND SEDIMENT CONTROL

A. Adequate control of soil erosion and sedimentation of both a temporary and permanent nature in areas disturbed by this work shall be provided at no extra cost to the County, subject to the approval of the Engineer.

B. It shall be the Contractor’s responsibility to adhere to the Standards and Specifications for Soil Erosion and Sediment Control as approved and adopted by the State of Maryland Water Management Administration. The Contractor shall also be responsible for adhering to the approved Soil Erosion and Sediment Control Plan, which is included in the Contract Documents.

1.25 O.S.H.A. STANDARDS AND SAFETY

A. The Contractor shall comply with the U.S. Department of Labor, Safety, and Health Regulations for Construction promulgated under the Occupational Safety and Health Act of 1970 (Public Law 91-596) and under Section 107 of the Contract Work Hours and Safety Standards Act (Public Law 91-54).

B. Nothing in the Occupational Safety and Health Act of 1970 shall be construed to supersede or in any manner affect any workmen’s compensation law or to enlarge or diminish or affect in any manner the common law or statutory rights, duties, or liabilities of employees arising out of or in the course of employment.

C. The Contractor shall comply with all regulations and requirements of the Maryland Occupational Safety and Health Administration (MOSHA).

D. Precaution shall be exercised at all times for the protection of persons (including employees) and property. The safety provisions of applicable laws and building and construction codes shall be observed.

1.26 DEMOLITION

A. Exterior Dust Control: To prevent unnecessary spread of dust during performance of exterior demolition work, thoroughly moisten surfaces and debris as required to prevent dust from being a nuisance to the public, neighbors and concurrent performance of other work on the site. Water for use in dust control shall be obtained from the Contractor’s own source.

B. Protection: Exercise care during demolition work to confine demolition operations to those as indicated on the Drawings. The physical means and methods used for protection are at the Contractor’s option.
1. Additionally, if public safety is endangered during the progress of the demolition work, provide adequate protective measures to protect public pedestrian and vehicular traffic on streets and walkways.

2. Signs, signals and barricades used shall conform to requirements of Federal, State and local laws, rules, regulations, precautions, orders and decrees.

C. Materials needed or required for temporary protection in the form of barricades, fences, enclosure, etc., may be pre-used construction materials of sound condition and reasonably clean. However, the condition of same materials shall meet or exceed the requirements of governing agencies or approving bodies as may be involved with the work.

D. The means and methods of performing demolition (and removal) operations are the sole responsibility of the Contractor. However, equipment used and methods of demolition (and removal) will be subject to approval of the Engineer.

E. Perform backfilling in the area of demolished structures (and removed items) in accordance with the Earthwork Section of these Specifications.

F. Following demolition of the above grade portions of the items indicated or noted, completely remove the below grade portions of same wherever possible and practical. Where impossible or impractical to completely remove below grade portions, then remove such to a depth at least 12 inches below existing grade. However, should such below grade items interfere with prosecution of the work at a later time, perform removal of such items at that time at no additional expense to the County.

G. Noise Levels: Due to the proximity to residential neighborhood(s), the Contractor shall maintain sound levels as noted within Specification 01000, Section 1.01F.

1.27 CONSTRUCTION SITE SIGN

A. The Contractor shall provide and erect a Baltimore County Construction Site Sign at the construction site in a location approved by the County. The sign shall conform to the sketch provided in Appendix A of the specification documents.

1.28 NAMEPLATES

A. The Contractor shall provide and install corrosion-resistant metal nameplates, with data engraved or stamped, for permanent attachment on all equipment. The data shall include the manufacturer, product name, model number, serial number, capacity, size, operating and power characteristics, and other essential data, as applicable for the particular equipment. The nameplates shall be permanently fastened to the equipment in a location that is accessible and visible, in a manner suitable for the particular equipment.

B. In addition to the manufacturer’s nameplates, all equipment, including such items as unit heaters, fans, pumps, compressors, tanks, etc. shall be permanently identified by name and number corresponding to the as-built drawings with nameplates which shall be engraved and laminated black-on-white finish phenolic nameplates. Data and installation shall be approved by the Engineer. Nameplate letters shall be minimum 2-inch high etched white letters and beveled white trim. Nameplates for control center, and control and metering or instrument panels shall be provided with 3/8-inch high letters. Motors shall be identified by the same number as the driven unit. Identifying characters shall be
not less than 2-inches high and shall be painted. Decals, Rotex, or Dymo field applied labels will not be acceptable. All nameplate data shall be reproduced in the Operating and Maintenance Manuals.

1.29 PROGRESS MEETINGS

A. Project progress meetings will be held monthly to review the progress and schedule of the work. The Contractor shall make their field superintendent available for said progress meetings and to meet the Engineer on-site.

1.30 MEASUREMENT AND PAYMENT

A. General

1. Payment for the work completed under this Contract will be made at the lump sum and unit prices bid, which lump sum and unit prices shall include the furnishing of all labor, tools, equipment and materials and the performance of all work required to complete the project as indicated and specified in accordance with all requirements of the Contract Documents and to the entire satisfaction of the Engineer.

2. When the term “as ordered by the Engineer” is used in describing the method of measurement or basis of payment for an item of the Proposal, it shall be understood that the order from the Engineer to the Contractor will be either (1) a written direction, or (2) a verbal directive to be followed by written confirmation of it from both the Contractor to the Engineer and from the Engineer to the Contractor to minimize the possibility of a misunderstanding between the two.

B. Contingent Items

Items in the Proposal designated as “Contingent” are for work not included in any of the other lump sum or unit price items of the Proposal and is work that may not be ordered by the Engineer to be used in the project depending on the Engineer’s evaluation of the actual field conditions encountered. The Engineer may order that contingent items be used in smaller or larger quantities than is indicated in the Proposal. Such work shall be performed only as, and when, ordered by the Engineer and the Contractor shall be aware that payment will be made under these items only for the quantities actually ordered by the Engineer to be used. The Contractor shall not have any right to demand payment for loss of profit and overhead due to the fact that these items were not used in the work or used in smaller quantities than that indicated in the Proposal. Quantities ordered by the Engineer to be used greater or longer than that indicated in the Proposal will be paid for at the Contract unit price bid therein.

C. For reference, the County can make available viewing of copy of the first anniversary evaluation report of the exterior coating of the elevated water tank, dated April 3, 2014, and an interior evaluation report, dated December 5, 2015. Interpretation of information within the reports is the responsibility of the Bidder, and Bidder shall note that conditions may be encountered which vary from those included in the reports.

D. Payment

The method of measurement and payment for the various pay items under this Contract are listed in the “Schedule of Prices” in the Bid Proposal.
E. Payment Items

1. Item 1 – Sparks Water Pumping Station Improvements

The lump sum price bid for Item 1 shall include full compensation for all labor, materials, equipment, tools and incidentals necessary to complete all improvements to the water pumping station, together with the associated mobilization, testing, cleanup, restoration of disturbed areas, and all related work as shown, specified or directed.

Major work items include, but are not limited to, improvements to pumps A, B, and C, improvements to yard valve vaults, improvements to the station heating and ventilation system, improvements to the station electrical and power distribution, installation of emergency power generator, improvements to the station instrumentation and control system to integrate the new equipment installed under this contract, integration of station controls and signals (including alarms) at Ashburton TCC, complete roof replacement, provision of new sodium hypochlorite system, site improvements for fencing and shrub and tree removal around the site, inspection of existing vault drains, and provision of bypass pumping necessary to maintain continuous station operation.

2. Item 2 – Elevated Tank Improvements

The lump sum price bid for Item 2, also referred to as the Base Bid, shall include full compensation for all labor, materials, equipment, tools and incidentals necessary to complete all improvements to the elevated storage tank and associated altitude valve vault station, together with the associated mobilization, testing, cleanup, restoration of disturbed areas, and all related work as shown, specified or directed.

Major work items include, but are not limited to,

a. Complete cleaning and repainting of the interior tank surfaces.

b. Furnishing and installation of a new center hub, new main roof stiffeners, new roof knuckle stiffeners, and new circumferential stiffeners; together with all welding, pit filling and surfacing, and interior chipping and/or grinding, required to attach these new elements and provide them and their adjacent attachment locations with surfaces that are sufficiently smooth for the application of a uniform thickness coating without voids and free from defects. To achieve the required smooth surfaces, the Contractor shall remove all irregular surfaces, including but not limited to, surface protrusions, burrs, fitting scars, sharp edges, sharp corners, weld spatter, weld overlap, and rough weld beads from the new elements listed above and their adjacent attachment locations.

c. Performing abrasive blast cleaning for evaluation of metal loss for all areas of apparent metal loss.
d. Furnishing and application of seam sealer to the roof vent intersection, roof manhole, and along the top and bottom of the interior shell stiffeners to seal these intersections from moisture.

e. Following the curing of the finish coat, furnishing and application of a flexible polyurethane sealant (or approved equal) to the unwelded lapped container roof access seams and along the intermittently welded stiffeners.

f. Furnishing and installation of a PAX submersible mixer with power and controls, tank level sensor, tank overflow sensor, interior container ladder, interior ladder safe climbing device, roof manhole, antenna mounting bracket, and clog-resistant roof vent. Included with installation of the interior container ladder shall be all welding, pit filling and surfacing, and chipping and grinding required for proper attachment and coating. Included with installation of the roof manhole, antenna mounting bracket, and roof vent shall be all welding, pit filling and surfacing required for proper attachment and coating.

g. Surface preparation and coating of new items (antenna mounting bracket, roof manhole, and steel roof vent flange) to be installed on the tank exterior as part of the tank modifications.

h. Spot cleaning and coating of all areas of exterior coating damaged during tank modifications/repairs.

i. Scrubbing, pressure washing, spot cleaning, and topcoating of all exterior surfaces of the tank, including accessories.

j. Providing incidental items such as construction coordination, de-chlorination, disinfection, First Anniversary evaluation, disposal of debris, and site restoration, etc.

k. Provision of hydro pneumatic tanks to maintain distribution system pressure when the tank is out of service.

l. Improvements to the altitude valve vault valves, vault heating, inspection of existing vault drains, improvements to the electrical and power distribution.

m. Site improvements for fencing and shrub and tree removal around the site.

3. Item 3 – Site Fencing Improvements – Pumping Station

The lump sum price bid for Item 3 shall consist of replacing fencing and gates as identified on the contract drawings and ordered by the Owner in writing. Payment shall include full compensation for all labor, materials, equipment, tools, and incidentals, necessary to complete the work. Major work items include removal of fencing, gates, and surrounding brushes and shrubs and replacement with new fencing and gates.
4. **Item 4 – Site Fencing Improvements – Elevated Tank**

The lump sum price bid for Item 4 shall consist of replacing fencing and gates as identified on the contract drawings and ordered by the Owner in writing. Payment shall include full compensation for all labor, materials, equipment, tools, and incidentals, necessary to complete the work. Major work items include removal of fencing, gates, and surrounding brushes and shrubs and replacement with new fencing and gates.

5. **Item 5 – Contingent Class 3 Excavation and Selected Backfill**

Class 3 Excavation and Selected Backfill is a fixed price item. Measurement and payment for Contingent Class 3 Excavation and Selected Backfill shall be made in accordance with Section 301 and 302 of the Standard Specifications.

6. **Item 6 – Electrical, Instrumentation, and Controls Contingent Allowance**

This item of work consists of providing all material, labor, equipment, tools and incidentals necessary for construction of miscellaneous additional work efforts, as discussed in Section 01020, beyond the scope of work otherwise defined by the Contract Documents, as ordered by the Engineer. This Payment Item shall be in accordance with Section 01020, entitled ALLOWANCES.

This allowance shall include material cost, receiving, handling, installation, and Contractor’s overhead and profit.

7. **Item 7 – Contingent Tank Rehabilitation Welding**

This item of work consists of providing all material, labor, equipment, tools and incidentals necessary for performing rehabilitation welding identified by the abrasive blast cleaning operation and not included in the description of work for Bid Item 2, as ordered by the Engineer.

After the initial abrasive blast cleaning, any pits defined for pit welding by the Engineer shall be repaired by welding. All areas of apparent seam deterioration shall be initially abrasive blast cleaned, and any seam corrosion or undercut defined by the Engineer shall be repaired by arc-gouging or grinding the deteriorated weld seam and welding. Any areas of extensive metal loss or holes in the roof or bowl identified by the Contractor, and agreed to by the Engineer, shall be repaired by welding a patch plate, the same thickness as the roof or bowl, over the area. Edges of the holes shall be grinding and installing the patch plate. No patch plate shall be smaller than 6 inches in diameter. Edges of the patch plate shall lap no less than 2 inches from the edge of a hole. Corners on the patch plate shall be rounded to 2 inches radius minimum, or the plates shall be circular. All exposed edges of the patch plates shall be ground to 1/16 inch radius minimum. The plates shall be installed in accordance with API 653. Patch plates shall be a minimum of 3 inches from existing weld seams, or if an existing weld seam must be overlapped, the patch plate shall be rectangular with radiused corners and extend a minimum of 6 inches beyond the existing weld seam. The patch plates shall be welded all around with continuous fillet welds. All welds shall be multi-pass welds. Contractor shall anticipate that the roof or
bowl is likely to be thin in the areas of the patch plates, and as such attachment welds and the weld procedures, e.g. electrode size and heat input, shall account for this likelihood.

The cost of this work shall be paid for by the unit price per man hour.

8. Item 8 – Contingent Pit Filling and Surfacing

This item of work consists of providing all material, labor, equipment, tools and incidentals necessary for performing pit filling and surfacing identified by the abrasive blast cleaning operation and not included in the description of work for Bid Item 2, as ordered by the Engineer.

After the specified surface preparation, all pits, rough areas or seams defined for pit filling or surfacing by the Engineer shall be filled with solventless polyamide epoxy seam sealer of the type recommended by the supplier of the interior paint system.

The cost of this work shall be paid for by the unit price per gallon of seam sealer applied and accepted by the Engineer.

9. Item 9 – Contingent Interior Chipping and/or Grinding

This item of work consists of providing all material, labor, equipment, tools and incidentals necessary for performing interior chipping and/or grinding identified by the abrasive blast cleaning operation and not included in the description of work for Bid Item 2, as ordered by the Engineer.

Any irregular surfaces, including but not limited to, surfaces protrusions, burrs, fitting scars, sharp edges or corners, weld spatter, weld overlap and rough weld beads shall be removed from all interior surfaces of the tank.

The cost of this work shall be paid for by the unit price per man hour.

10. Item 10 - Contingent Roofing Allowance

This item of work shall consist of labor, materials, equipment, tools, and incidentals necessary for any additional work efforts involving the replacement of damaged wood rafters and/or roof substrate beyond the scope of work otherwise defined by the Contract Documents, as ordered by the Engineer. This Payment Item shall be in accordance with Section 01020, entitled ALLOWANCES.

Measurement under this item will be made on the basis of percentage of work completed.

Payment under this item will be made on the basis of percentage of work completed. Total amount of said payment for any item of Contingent Roofing Allowance work shall be in accordance with the Contractor’s proposal as approved by the Engineer.
11. Item 11 – Contingent Allowance for Relocation of Existing Electric Service Equipment and/or Utility Infrastructure.

The lump sum allowance for Item 11 shall be included to cover miscellaneous charges from BGE for modifications to and/or relocation of existing electric service equipment and/or utility infrastructure to complete the project, in accordance with Specification Section 01020.

12. Item 12 – Contingent Allowance for Miscellaneous Elevated Tank Rehabilitation

The unit cost per man-hour for Item 12 shall be payment to cover miscellaneous tank rehabilitation work, beyond the scope of work otherwise defined by the Contract Documents, as ordered by the Engineer, in accordance with Specification Section 01020.

13. Item 13 – Contingent Miscellaneous System Integrator Programming

The unit cost per man-hour for Item 13 shall be payment to cover miscellaneous programming by the Systems Integrator, beyond the scope of work otherwise defined by the Contract Documents, as ordered by the Engineer, in accordance with Specification Section 01020.

14. Item 14 – Contingent Allowance for Vault Drain Replacement

The lump sum allowance for Item 14 shall be included to cover the replacement and/or repair related to the vault drains from the inspections performed in accordance with Specification 02661.

15. Item 15 – Facility online training

This item of work consists of provision of online learning modules, quizzes, tests, etc. from an online learning modules provider as described in the Contract Documents.

PART 2 - PRODUCTS

(NOT USED)

PART 3 - EXECUTION

(NOT USED)

END OF SECTION
APPENDIX A

CONSTRUCTION SITE SIGN
Baltimore County
Baltimore County Executive John A. Olszewski Jr.
and the Baltimore County Council

SPARKS WATER PUMPING STATION & ELEVATED TANK IMPROVEMENTS

DEPARTMENT of PUBLIC WORKS
Contract No. XXXXXX
For Additional Information
Call 410-887-3531

ENGINEER
JOHNSON, MIRMIRAN & THOMPSON
CONTRACTOR

ADD CONTRACTOR'S NAME

FULL COLOR COUNTY SEAL

GREEN BORDER

3/4" EXTERIOR PLYWOOD

NOTE:
ALL COSTS OF FURNISHING, ERECTING, AND MAINTAINING THE "IMPROVEMENT SIGNS", INCLUDING POSTS, SHALL BE INCLUDED IN THE "LUMP SUM" BID. CONTRACTOR TO PROVIDE 1 SIGN.

GREEN LETTERS ON LUMINOUS WHITE BACKGROUND

EX. GRADE

4"x4" POST (TYP.)
APPENDIX B

LIMITED HAZARDOUS MATERIALS SURVEY
Limited Hazardous Materials Survey

SPARKS PUMPING STATION AND ELEVATED TANK VAULT
14073 York Road
Sparks, Maryland

Prepared for:

Johnson, Mirmiran & Thompson, Inc.
72 Loveton Circle
Sparks, MD  21152

Prepared by:

EBA Engineering, Inc.
4813 Seton Drive | Baltimore, MD 21215
(410) 358-7171 | www.ebaengineering.com

EBA Project No.  4232-00-000

August 6, 2015
LIMITED HAZARDOUS MATERIALS SURVEY

SPARKS PUMPING STATION AND ELEVATED TANK VAULT
14073 York Road
Sparks, Maryland

EBA Project No. 4232-00-000

August 6, 2015

Submitted To: Mr. David Cox, P.E.
Johnson, Mirmiran & Thompson, Inc.
72 Loveton Circle
Sparks, Maryland 21152

Submitted By: Sylvan Bonsignore Burch
Environmental Engineer
EBA Engineering, Inc.
4813 Seton Drive
Baltimore, Maryland 21215

Reviewed By: Sherri D. Waldron
Project Manager
EBA Engineering, Inc.
<table>
<thead>
<tr>
<th>Acronyms</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC</td>
<td>Air Conditioner</td>
</tr>
<tr>
<td>ACBM</td>
<td>Asbestos-Containing Building Material</td>
</tr>
<tr>
<td>ACM</td>
<td>Asbestos-Containing Material</td>
</tr>
<tr>
<td>AHERA</td>
<td>Asbestos Hazard Emergency Response Act</td>
</tr>
<tr>
<td>AST</td>
<td>Aboveground Storage Tank</td>
</tr>
<tr>
<td>C&amp;D</td>
<td>Construction &amp; Demolition</td>
</tr>
<tr>
<td>CAA</td>
<td>Clean Air Act</td>
</tr>
<tr>
<td>CFC</td>
<td>Chlorofluorocarbon</td>
</tr>
<tr>
<td>CFL</td>
<td>Compact Florescent Light</td>
</tr>
<tr>
<td>CFR</td>
<td>Code of Federal Regulations</td>
</tr>
<tr>
<td>COMAR</td>
<td>Code of Maryland Annotated Regulations</td>
</tr>
<tr>
<td>CT</td>
<td>Ceiling Tile</td>
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<tr>
<td>EPA</td>
<td>Environmental Protection Agency</td>
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<tr>
<td>FT</td>
<td>Floor Tile</td>
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<tr>
<td>HCFC</td>
<td>Hydro Chlorofluorocarbons</td>
</tr>
<tr>
<td>HID</td>
<td>High Intensity Discharge</td>
</tr>
<tr>
<td>LBP</td>
<td>Lead-Based Paint</td>
</tr>
<tr>
<td>LF</td>
<td>Linear Feet</td>
</tr>
<tr>
<td>M</td>
<td>Miscellaneous</td>
</tr>
<tr>
<td>MDE</td>
<td>Maryland Department of the Environment</td>
</tr>
<tr>
<td>NESHAP</td>
<td>National Emission Standards for Hazardous Air Pollutants</td>
</tr>
<tr>
<td>NVLAP</td>
<td>National Voluntary Laboratory Accreditation Program</td>
</tr>
<tr>
<td>ODC</td>
<td>Ozone Depleting Compound</td>
</tr>
<tr>
<td>OSHA</td>
<td>Occupational Safety &amp; Health Administration</td>
</tr>
<tr>
<td>PACM</td>
<td>Presumed Asbestos-Containing Material</td>
</tr>
<tr>
<td>PCB</td>
<td>Polychlorinated Biphenyl</td>
</tr>
<tr>
<td>PLM</td>
<td>Polarized Light Microscopy</td>
</tr>
<tr>
<td>PPM</td>
<td>Parts Per Million</td>
</tr>
<tr>
<td>RACM</td>
<td>Regulated Asbestos-Containing Material</td>
</tr>
<tr>
<td>S</td>
<td>Surfacing Material</td>
</tr>
<tr>
<td>SF</td>
<td>Square Feet</td>
</tr>
<tr>
<td>TEM</td>
<td>Transmission Electron Microscopy</td>
</tr>
<tr>
<td>TSCA</td>
<td>Toxic Substances Control Act</td>
</tr>
<tr>
<td>TSI</td>
<td>Thermal System Insulation</td>
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<tr>
<td>UST</td>
<td>Underground Storage Tank</td>
</tr>
<tr>
<td>UW</td>
<td>Universal Wastes</td>
</tr>
<tr>
<td>XRF</td>
<td>X-Ray Fluorescence</td>
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</tbody>
</table>
Executive Summary

EBA Engineering, Inc. (hereafter referred to as EBA) was retained by Johnson, Mirmiran & Thompson, Inc. to perform a Limited Hazardous Materials Survey of the Sparks Pumping Station and Elevated Tank Vault located at 14073 York Road, Sparks, Maryland (hereafter referred to as the Subject Property). It is EBA’s understanding that the purpose of the survey is to identify hazardous materials that could be impacted during planned renovation activities.

The pumping station building is a two-story building with one floor below grade level. The first floor (at grade) includes one bathroom, the pumping station’s control equipment and switches, a chlorine room, and access ways to the below grade level. The below grade level includes pumping systems and catwalks above the associated piping. The building is of brick and steel construction with a slate-shingled roofing system.

The elevated tank vault is below grade and consists of one area with piping and valves. The vault is of concrete construction (floor, walls, and ceiling) with two manholes providing ladder access to the interior of the vault.

Photographs taken during the survey of the pumping station and vault are included in Appendix A.

This Limited Hazardous Materials Survey was performed to identify hazardous materials that may be impacted when renovation activities occur. The hazardous materials of concern include Asbestos-Containing Building Materials (ACBMs), Lead-Based Paints (LBPs), liquid phase Polychlorinated Biphenyls (PCBs), Ozone-Depleting Compounds (ODCs), Universal Wastes (UW) and Miscellaneous Materials (MM). The survey was limited to the interior areas and exterior walls of the pumping station and the interior of the vault.

The results of the survey, performed on July 29, 2015, have identified hazardous materials at the Subject Property. The following sections summarize EBA’s findings.

Asbestos-Containing Building Materials

The results of the survey have identified asbestos-containing building materials at the Subject Property. A summary of the asbestos-containing building materials (material types and quantities) is provided in the following Tables. The tables also contain a column for information indicating whether or not the material is a regulated asbestos-containing material (RACM) per federal regulations.
As indicated in the previous Tables, fire doors, packings, and gaskets were assumed to contain asbestos. These items were assumed to contain asbestos (rather than sampled/tested), as sampling posed safety risks and/or would have required significant disassembly/dismantling of equipment/components (by industry professionals) to access and collect samples of the suspect materials.

It may be cost effective to have these assumed materials sampled and analyzed at an appropriate time so that they can be definitively classified as asbestos-containing building materials. The most appropriate time to sample these materials is typically after the project has been turned over to the renovation contractor and dismantling has occurred.

The identified asbestos-containing materials were classified as non-friable at the time of the survey. EPA regulations do not apply to non-friable asbestos-containing materials, including RACM, unless they are disturbed and become friable during renovation/demolition activities. If the identified ACMs will be disturbed during planned renovation activities and the materials rendered friable, the EPA requires removal of such materials before renovation/demolition activities commence.

The OSHA “Asbestos in Construction Standard” (29 CFR 1926.1101) imposes restrictions on the disturbance of asbestos during demolition, remodeling, and renovation activities. Removal of any asbestos-containing building materials identified at the Subject Property is considered Class II asbestos work by OSHA regulations. Class II asbestos work must be performed by trained employees using work practices required by the OSHA standard.

### Pumping Station Building

<table>
<thead>
<tr>
<th>Material Type</th>
<th>Quantity</th>
<th>Unit of Measure</th>
<th>RACM*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire Door (Assumed)</td>
<td>5</td>
<td>Each</td>
<td>Y</td>
</tr>
<tr>
<td>Gasket on 6” Pipe (Assumed)</td>
<td>4</td>
<td>Each</td>
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<td>Gasket on 8” Pipe (Assumed)</td>
<td>1</td>
<td>Each</td>
<td>N</td>
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<tr>
<td>Gasket on 10” Pipe (Assumed)</td>
<td>1</td>
<td>Each</td>
<td>N</td>
</tr>
<tr>
<td>Gasket on 12” Pipe (Assumed)</td>
<td>25</td>
<td>Each</td>
<td>N</td>
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<td>Gasket on 16” Pipe (Assumed)</td>
<td>19</td>
<td>Each</td>
<td>N</td>
</tr>
<tr>
<td>Gasket on 20” Cover (Assumed)</td>
<td>3</td>
<td>Each</td>
<td>N</td>
</tr>
</tbody>
</table>

*RACM – Regulated Asbestos-Containing Material

### Elevated Tank Valve Vault

<table>
<thead>
<tr>
<th>Material Type</th>
<th>Quantity</th>
<th>Unit of Measure</th>
<th>RACM*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packing on 4” Bypass Valve (Assumed)</td>
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<td>Each</td>
<td>N</td>
</tr>
<tr>
<td>Packing on 16” Valve (Assumed)</td>
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<td>N</td>
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<td>Gasket on 4” Bypass (Assumed)</td>
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<td>Gasket on 16” Pipe (Assumed)</td>
<td>8</td>
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<td>N</td>
</tr>
</tbody>
</table>

*RACM – Regulated Asbestos-Containing Material
Lead-Based Paints

Lead-based paints (LBP) were identified throughout the pumping station building atop exterior and interior building components. Specifically, LBP was identified on certain metal substrates. LPB were not identified in the vault. In addition, lead-containing paints (i.e., paints containing lead but at concentrations less than the threshold for lead-based paint) were identified on various surfaces within the pumping station building and the vault. The presence of lead in paint in any concentration triggers OSHA regulatory standards (29 CFR 1926.62) and the presence of lead-based paint triggers EPA regulatory standards.

Demolition debris with LBP may be disposed of as non-hazardous provided the material is not classified as a hazardous waste in accordance with 40 CFR Part 261 and SW-846 (Test Methods for Evaluating Solid Waste Physical/Chemical). Metal objects coated with LBP can be recycled.

Liquid Polychlorinated Biphenyls

EBA identified the following types of equipment suspected of containing liquid phase Polychlorinated Biphenyls (PCBs) at the pumping station building.

<table>
<thead>
<tr>
<th>Pumping Station Building</th>
<th>Quantities for Equipment Containing PCBs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment Type</td>
<td>Quantity</td>
</tr>
<tr>
<td>Ballast</td>
<td>27</td>
</tr>
</tbody>
</table>

EBA inspected a portion of the light ballasts at the Subject Property. Based on the absence of a “No-PCB” stamp, EBA identified at least one type/manufacturer of ballasts suspected of containing PCBs. Further, the inspection included only a portion of the ballasts present at the Subject Property, and the uninspected ballasts are also considered to be suspect at this time. An approximate number of suspect ballasts are listed in the previous Table.

Ballasts marked as “No PCBs” can be disposed of as non-hazardous waste. Ballasts lacking the “No PCBs” mark should be removed and disposed of in accordance with EPA’s Toxic Substances Control Act (TSCA) 40 CFR Part 761. If an unmarked ballast is not leaking, the associated lighting fixture does not require special handling or disposal. If an unmarked ballast is leaking, any material impacted by the leak should be treated as hazardous waste. Containers storing unmarked ballasts must be labeled in accordance with EPA labeling requirements specified in 40 CFR Part 262 Subpart C.

Ozone-Depleting Compounds

EBA did not identify equipment suspected of containing ozone-depleting compounds within the Subject Property.
Universal Wastes

Universal wastes were identified at the pumping station building in the form of mercury-containing fluorescent light tubes, high-intensity discharge (HID) bulbs, and batteries. The types of universal wastes observed and the recorded quantities are provided in the following Table.

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>Quantity</th>
<th>Unit of Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>HID Bulb</td>
<td>11</td>
<td>Each</td>
</tr>
<tr>
<td>4’ Fluorescent Light Tube</td>
<td>56</td>
<td>Each</td>
</tr>
<tr>
<td>Battery</td>
<td>2</td>
<td>Each</td>
</tr>
</tbody>
</table>

All universal waste should be placed in a container that is structurally sound, will prevent damage to the contents, is compatible with its contents, and will be kept closed at all times (except when adding items to or removing items from the container). The container must be without damage, or evidence of spillage, that could lead to leakage of the waste contained inside. The disposal of hazardous waste is outlined in the EPA regulations in 40 CFR Part 260 and in Maryland regulations in COMAR Title 26, Subtitle 13.

Miscellaneous Materials

EBA identified the following miscellaneous materials at the pumping station building.

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>Quantity</th>
<th>Unit of Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire Extinguisher</td>
<td>2</td>
<td>Each</td>
</tr>
<tr>
<td>Water Tight Lead Seals</td>
<td>4</td>
<td>Each</td>
</tr>
</tbody>
</table>

Fire extinguishers were observed within the Subject Property. If permanently removed from service, they should be disposed of in accordance with the publication "Guide to the Disposal of Condemned Fire Extinguishers" published by the Fire Extinguishing Trades Association, Fact File No. 108, dated February 2004.

Water tight lead seals were observed at the interface of piping penetrations and the exterior wall of the Pumping Station Building. The disposal of these lead-containing items is regulated by the EPA in 40 CFR 261.

END OF SECTION
1.0 Introduction

Interior and exterior areas of the Subject Property were inspected to identify certain potentially hazardous materials that may be affected by planned renovation activities. Specifically, the hazardous materials of concern for this type of project include Asbestos-Containing Building Materials, Lead-Based Paints, Liquid Polychlorinated Biphenyls, Ozone-Depleting Compounds, Universal Wastes, and Miscellaneous Materials. Photographs taken during the survey are included in Appendix A.

1.1 Asbestos-Containing Building Materials

Asbestos means the asbestiform varieties of chrysotile, crocidolite, amosite, anthophyllite, tremolite, and actinolite. Asbestos-containing materials (ACM) means any material or product which contains greater than one percent (1%) asbestos. Asbestos-containing building materials (ACBM) means ACM that is found in or on interior structural members or other parts of a building. ACBM is divided into three categories in the EPA regulations (40 CFR Part 763). These categories are thermal system insulation, surfacing materials, and miscellaneous materials. Each category is generally described as follows:

- Thermal System Insulation (TSI) includes those materials applied to pipes, fittings, boilers, breeching tanks, ducts, or other interior/exterior structural components to prevent heat loss or gain, or water condensation, or for other purposes of maintaining temperatures.
- Surfacing (S) Materials include those materials sprayed on, troweled-on, or otherwise applied to surfaces, such as acoustical plaster on ceilings and fireproofing materials on structural members, or other materials on surfaces for acoustical, fireproofing, or other purposes.
- Miscellaneous (M) Materials include interior/exterior building material on structural components, structural members or fixtures, such as roofing, floor and ceiling tiles, caulks, mastics/adhesives, and does not include surfacing material or thermal system insulation.

The EPA requires that Regulated Asbestos-Containing Materials (RACM) be removed before demolition/renovation begins in accordance with the “National Emission Standards for Hazardous Air Pollutants” (NESHAP) 40 CFR Part 61. The State of Maryland also regulates the removal/abatement of asbestos in buildings (COMAR 26.11.21).

RACM includes the following:

- Friable asbestos material;
- Category I non-friable ACM (flooring, asphalt roofing, packings, gaskets) that has become friable;
- Category I non-friable ACM that will be or has been subjected to sanding, grinding, cutting, or abrading; and
• Category II non-friable ACM that has a high probability of becoming or has become crumbled, pulverized, or reduced to powder by the forces expected to act on the material in the course of demolition or renovation operations regulated in 40 CFR 61 Subpart M.

Asbestos is further classified as either ‘Friable’ or ‘Non-Friable’. Friable asbestos material is defined as any material containing more than 1% asbestos that, when dry, can be crumbled, pulverized or reduced to powder by hand pressure. Non-friable asbestos materials are subcategorized as Category I and Category II, where Category I materials include resilient floor covering, asphalt roofing products, packings, and gaskets. Category II materials include all other non-friable asbestos-containing materials.

1.2 Lead-Based Paints

The Maryland Department of the Environment (MDE) definition of lead-based paint (LBP) is used as the basis for this screening. Lead-based paint is defined as paint or coating that contains lead at a concentration greater than 0.7 milligrams per square centimeter, as determined by an X-Ray Fluorescence (XRF) instrument.

XRF is a common quantitative analytical technique used to measure the concentration of elements in solid or liquid materials. In this technique, the sample is bombarded by some form of ionizing radiation such as X-rays, or gamma-rays, which can cause the atoms of the sample to emit characteristic X-rays. These characteristic X-rays from the sample, known as the fluorescent X-rays, can be detected and analyzed to provide information as to what concentration of atoms are contained in the sample. Since this technique does not harm the sample in any way, it is considered a nondestructive testing technique.

Lead-based paint is also defined by the MDE as paint chips containing greater than 0.5% lead by weight, as determined through laboratory analysis (Method SW846-7420). Since removal of paint chips from the substrate are required, this method is considered a destructive testing technique.

1.3 Liquid Polychlorinated Biphenyls

Polychlorinated Biphenyls (PCBs) are man-made mixtures of synthetic organic chemicals known as chlorinated hydrocarbons ranging from oily liquids to waxy solids. Due to their non-flammability, chemical stability, high boiling point, and electrical insulating properties, PCBs were used in a wide range of industrial and commercial applications. These applications included but were not limited to electrical, heat transfer, and hydraulic equipment; as plasticizers in paints, plastics and rubber products; and in pigments, dyes and carbonless copy paper.

Concern over the toxicity and occurrence in the environment of PCBs led Congress in 1976 to enact §6(e) of the Toxic Substances Control Act (TSCA) that included among
other things, prohibitions on the manufacture, processing, and distribution in commerce of PCBs. Thus, TSCA legislated true "cradle to grave" (i.e., from manufacture to disposal) management of PCBs in the United States.

PCB content has been categorized into three classifications by the federal government. Electrical equipment that contains less than 50 parts per million (ppm) of PCBs is defined as non-PCB. Electrical equipment that contains between 50 ppm and less than 500 ppm of PCBs is defined as PCB-contaminated. Electrical equipment with a PCB content of 500 ppm and greater is classified as PCB.

PCBs were commonly sold in the United States of America under the trade name "Arocolor." However, companies that used PCBs in the manufacture of transformers and capacitors often used other trade names. According to the EPA, electrical light ballasts manufactured prior to July 1978 have a greater than 50% chance of containing PCBs at concentrations of 50 ppm or greater. Ballasts manufactured after July 1978 are required to bear a “No PCB” label indicating they do not contain PCBs.

This study did not include inspection or testing for non-liquid PCBs.

1.4 Ozone-Depleting Compounds

Ozone-depleting compounds (ODCs) are generally small organic molecules (less than three carbons) that contain chlorine, fluorine, or bromine. Some uses of ODCs include refrigerants, fire suppressants, and cleaning compounds. Title VI of the United States Clean Air Act Amendments (CAA) of 1990 has classified ozone-depleting substances as belonging to Class I substances (most harmful) or Class II substances (less harmful).

Class I substances are those with a greater ozone-depletion potential. Class I substances identified in Title VI are chlorofluorocarbons (CFCs), halons, carbon tetrachloride, methyl chloroform (1,1,1-trichloroethane), hydrobromofluorocarbon (HBFC) and methyl bromide. These chlorine-based chemicals account for about 80 percent of ozone depletion.

Class II substances are those with a lesser ozone-depletion potential. All hydrochlorofluorocarbons (HCFCs) are Class II substances. These Class II substances are currently replacing the more harmful CFCs which are a Class I substance.

Effective July 1, 1992, Section 608 of the CAA prohibits individuals from knowingly venting ozone-depleting compounds (generally CFCs and HCFCs) used as refrigerants into the atmosphere while maintaining, servicing, repairing, or disposing of air-conditioning or refrigeration equipment.

1.5 Universal Wastes

A universal waste is a common product/material that exhibits low-level hazards. Universal wastes include batteries, pesticides, mercury-containing equipment, and
bulbs/lamps. All universal waste must be handled in a way as to prevent the release of the hazardous substance into the environment, contained in a secure manor, labeled, and safely transported to a destination facility. Definitions of universal waste are detailed in 40 CFR 273.9, and general descriptions of universal wastes are provided as follows.

A battery is an electrochemical cell that receives, stores, and delivers electric energy. Batteries can be disassembled into cells before removal and transportation as described in 40 CFR 273.13 (small quantity handlers) and 40 CFR 273.33 (large quantity handlers).

In general, there are several types of batteries, including primary and secondary. Primary batteries are most common in households and are known as single-use batteries. Primary batteries automatically convert chemical energy into electrical energy using zinc and manganese chemistry. Secondary batteries are known as re-chargeable batteries. Recharging occurs when electrical current is applied to the battery, reversing the chemical reaction that occurs during battery use. Secondary batteries are usually composed of nickel cadmium, nickel metal hydride or lithium ion chemistry. Lead-acid batteries are the oldest type of the secondary batteries and are typically used to power vehicles.

Pesticides include any substance/chemical designed to control and manage pests.

Mercury-containing equipment includes a device or part of a device (including thermostats, but excluding batteries and bulbs/lamps) that contains elemental mercury integral to its function. Thermostats are typically used to control a heating or cooling system. A thermostat is an electro-mechanical on/off switch that is activated by temperature changes. The sensing element is usually a spiral bimetallic strip that coils and uncoils in response to temperature changes because of differential expansion of the two bonded metals. In a mercury-switch thermostat, a ball of mercury rolls between contacts in one or more sealed glass ampoules, which are attached to a metal strip. The switch works when the mercury makes or breaks an electrical circuit, which creates a signal for heating or cooling from a furnace or central air conditioning system. Each glass ampoule contains approximately three grams of mercury, which is approximately the size of a dime. Mercury’s unique properties, high conductivity, high surface tension and liquidity at room temperature, have made it a useful component in many electric switches.

A bulb/lamp, also referred to as a universal waste lamp, is the bulb or tube portion of an electric lighting device specifically designed to produce radiant energy. Examples of common universal waste lamps include, but are not limited to, fluorescent, high intensity discharge, neon, mercury vapor, high pressure sodium, and metal halide lamps.
1.6 Miscellaneous Materials

Other hazardous materials that may be present include fuels and hazardous substances stored in containers, drums, pressurized containers, and aboveground and underground storage tanks. Such fuels and hazardous substances include, but are not limited to, automotive fuels and heating oil, paints, lubricants, degreasers, cleaning compounds, fire suppression chemicals, and other potentially hazardous materials in quantities greater than 5-gallons.

1.7 Limitations and Exclusions

The following limitations and exclusions apply to this project:

- Areas above and behind fixed substrates (e.g., masonry block, concrete, brick, etc.) were not accessed.
- Sampling of energized components was not performed due to risk of electrical hazards.
- Sampling of roofing systems was excluded per the scope of work for this project.
- Ceiling materials (drywall and concrete panels), ceiling support beams, and the Tramrail beams were not included in the survey, as these materials will reportedly not be affected by the planned renovations.
- Quantities of hazardous materials identified herein are approximate at the time of this report. Quantities may change in the future due to daily operations at the Subject Property.
- The conclusions presented in this report are based on the visual findings observed on the date of the survey.
- Subsurface investigation measures were excluded per the scope of work for this project.

END OF SECTION
2.0 Asbestos-Containing Building Materials

The National Emission Standard for Hazardous Air Pollutants (NESHAP) requires the building owner/operator to perform an asbestos inspection of affected portions of facilities prior to demolition or renovation activities.

Asbestos Hazard Emergency Response Act (AHERA) accredited Asbestos Inspectors performed an asbestos inspection of accessible interior and exterior portions of the Subject Property. Certificates of the inspectors are included in Appendix B.

2.1 Inspection and Analytical Methodology

The inspection consisted of performing a records review followed by an investigation to identify suspect asbestos-containing building materials (ACBM) in accessible building areas. The inspection was non-intrusive (i.e., the inspection did not include accessing areas behind walls, above hard ceilings, below hard floors, or behind other hard substrate).

2.1.1 Records Review

A records review consists of reviewing previous asbestos inspection/survey reports, abatement records and/or site drawings, if available, associated with the facility.

2.1.2 On-site Investigation

The on-site investigation involved a combination of visual assessments and minimally destructive sampling methodologies. Visual assessments primarily focused on identifying suspect materials to be assessed during the survey. Sampling was only conducted where suspect ACBM was identified. Where possible, samples were collected from inconspicuous locations. Samples from suspect friable materials were patched in a manner to limit the release of potential asbestos fibers; however, these locations were not permanently repaired.

2.1.3 Sample Collection and Analysis

EBA collected samples of materials that were suspected of containing asbestos in accordance with the Asbestos Hazard Emergency Response Act (AHERA) (40 CFR 763 Subpart E). All areas of surfacing materials, thermal system insulation materials, or miscellaneous materials that were uniform in color and texture were grouped into homogeneous areas and sampled according to the AHERA asbestos sampling protocol as shown in the following Table.
Table – AHERA Asbestos Sampling Protocol Per Category

<table>
<thead>
<tr>
<th>Surfacing Materials</th>
<th>Thermal System Insulation</th>
<th>Miscellaneous Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 samples per area &lt; 1,000 ft²</td>
<td>3 samples for each TSI material</td>
<td>Sample in a manner sufficient to determine</td>
</tr>
<tr>
<td>5 samples per area &gt; 1,000 ft² but &lt; 5,000 ft²</td>
<td>1 sample per area of patched insulation (&lt;6 linear or square feet)</td>
<td>(Note – EBA's Standard Operating Procedure is to collect at least 2 samples per homogenous area)</td>
</tr>
<tr>
<td>7 samples per area &gt; 5,000 ft²</td>
<td>Sample in a manner sufficient per mechanical system not assumed to be ACBM where cement or plaster is used on fittings such as tees, elbows, or valves</td>
<td></td>
</tr>
</tbody>
</table>

Samples were submitted to AMA Analytical Services, Inc. (AMA) for analysis by Polarized Light Microscopy (PLM) in accordance with the EPA Method for the Determination of Bulk Asbestos Samples (EPA 600M4-82-020). In the event sample results were reported as "trace" by the PLM method, further analysis would be performed by Transmission Electron Microscopy (TEM). AMA is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP) for the analysis of bulk asbestos by PLM and bulk asbestos by TEM.

2.2 Results

2.2.1 Records Review

The following drawings were made available by the Client for review. Copies of these drawings are provided in Appendix C.

- Sparks 5th Zone Pump Station, Drawing No. 72-1206, Last Revised 4/21/76
- Sparks 5th Zone Pump Station, Drawing No. 72-1207, Dated 9/24/73
- Sparks 5th Zone Pump Station, Drawing No. 72-1211, Last Revised 4/21/76
- Sparks 5th Zone Pump Station, Drawing No. 72-1212, Dated 9/24/73
- Sparks 5th Zone 1,000,000 Gal Elevated Tank, Drawing No. 72-1216, Dated 2/5/75

No ACBMs were explicitly identified at the Subject Property on these drawings.

2.2.2 On-site Investigation and Sampling Results

As a result of the inspection, suspect ACBMs were identified within the Subject Property. Samples of suspect materials were collected and the samples were analyzed by AMA. As a result of the laboratory analysis, asbestos was not detected in any of the suspect materials sampled during the survey.

AMA’s asbestos laboratory analytical report, including a listing of all samples collected at the Subject Property and the chain-of-custody for the samples, is included in Appendix D.
2.2.3 Presumed Asbestos-Containing Materials

Presumed Asbestos-Containing Materials (PACM) as defined by OSHA include thermal system insulation and surfacing material found in a building constructed no later than 1980. PACM were not observed on the Subject Property.

2.2.4 Assumed Asbestos-Containing Building Materials

Assumed ACM includes any material that is suspected to contain asbestos and that was not sampled. Certain suspect building materials identified during the survey could not be sampled, as sampling posed safety risks and/or would have required significant disassembly/dismantling of equipment (by industry professionals) to access and collect samples of the suspected materials. The following specific types of building materials could not be sampled and are assumed to contain asbestos:

- **Pumping Station Building**
  - Fire Doors
  - Gaskets

- **Vault**
  - Valve Packings
  - Gaskets

Quantities of assumed asbestos-containing building materials are provided in Section 2.2.6.

2.2.5 Homogeneous Areas Documented as Non Asbestos-Containing

The following homogeneous areas were documented as non asbestos-containing based upon laboratory analysis:

- **Pumping Station Building**
  - Exterior Caulk
  - Gasket – Pump Cover

- **Valve Vault**
  - Gasket – 16” Valve
  - Gasket – 24” Cover
2.2.6 Quantities for ACBM

Quantities for ACBMs identified are listed by material type in the following Tables. The tables also contain a column for information indicating whether or not the material is a regulated asbestos-containing material (RACM) per federal regulations.

### Pumping Station Building

<table>
<thead>
<tr>
<th>Material Type</th>
<th>Quantity</th>
<th>Unit of Measure</th>
<th>RACM*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire Door (Assumed)</td>
<td>5</td>
<td>Each</td>
<td>Y</td>
</tr>
<tr>
<td>Gasket on 6&quot; Pipe (Assumed)</td>
<td>4</td>
<td>Each</td>
<td>N</td>
</tr>
<tr>
<td>Gasket on 8&quot; Pipe (Assumed)</td>
<td>1</td>
<td>Each</td>
<td>N</td>
</tr>
<tr>
<td>Gasket on 10&quot; Pipe (Assumed)</td>
<td>1</td>
<td>Each</td>
<td>N</td>
</tr>
<tr>
<td>Gasket on 12&quot; Pipe (Assumed)</td>
<td>25</td>
<td>Each</td>
<td>N</td>
</tr>
<tr>
<td>Gasket on 16&quot; Pipe (Assumed)</td>
<td>19</td>
<td>Each</td>
<td>N</td>
</tr>
<tr>
<td>Gasket on 20&quot; Cover (Assumed)</td>
<td>3</td>
<td>Each</td>
<td>N</td>
</tr>
</tbody>
</table>

*RACM – Regulated Asbestos-Containing Material

### Elevated Tank Valve Vault

<table>
<thead>
<tr>
<th>Material Type</th>
<th>Quantity</th>
<th>Unit of Measure</th>
<th>RACM*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packing on 4&quot; Bypass Valve (Assumed)</td>
<td>4</td>
<td>Each</td>
<td>N</td>
</tr>
<tr>
<td>Packing on 16&quot; Valve (Assumed)</td>
<td>4</td>
<td>Each</td>
<td>N</td>
</tr>
<tr>
<td>Gasket on 4&quot; Bypass (Assumed)</td>
<td>16</td>
<td>Each</td>
<td>N</td>
</tr>
<tr>
<td>Gasket on 16&quot; Pipe (Assumed)</td>
<td>8</td>
<td>Each</td>
<td>N</td>
</tr>
</tbody>
</table>

*RACM – Regulated Asbestos-Containing Material

END OF SECTION
3.0 Lead-Based Paints

Lead-Based Paint (LBP) Inspectors, as certified through the Maryland Department of the Environment (MDE), performed a LBP inspection of accessible interior and exterior portions of the Subject Property. Certificates of the inspectors are included in Appendix E.

3.1 Inspection and Analytical Methodology

EBA performed a limited (screening) survey to identify locations of LBP that may be disturbed by renovation activities. The survey was intended to determine:

- Whether or not lead-based paint is present at the Subject Property; and,
- If lead is present, which building components contain lead-based paint.

Building areas and components that appear to have a similar painting history and substrate were grouped together for screening/testing purposes. This survey was not intended to be a comprehensive surface-by-surface inspection (i.e., HUD level inspection) of the Subject Property, nor is a survey of that type necessary or required. The inspection consisted of areas that were readily accessible.

For inspection purposes, each direction of the Subject Property was given a specific name as follows: wall A faces north, wall B faces east, wall C faces south, and wall D faces west.

3.1.1 Records Review

A records review consists of reviewing previous lead inspection reports, abatement records and/or site drawings, if available, associated with the facility.

3.1.2 XRF Instrumentation

Direct reading X-Ray Fluorescence (XRF) instrumentation was used to identify LBP. Specifically, the Niton Data Transfer instrument manufactured by Thermo Electron, Corp. was utilized for the limited survey. Surface coatings were considered LBP if the XRF result exceeds the State of Maryland definition of LBP of 0.7 milligrams of lead per square centimeter (> 0.7mg/cm²). An XRF performance characteristic sheet is included in Appendix F. The performance characteristic sheet specifies calibration tolerances, XRF indices for positive, negative, and inconclusive results, and modes of operation.

3.1.3 Paint Chip Analysis

Lead-based paint is also defined by the MDE as paint chips containing greater than 0.5% lead by weight, as determined through laboratory analysis (Method SW846-7420). Paint chip samples are typically collected and analyzed in the event that readings from
the XRF are reported as inconclusive. Paint chip samples are also collected in the event there is limited access to or irregularly-shaped surfaces of the substrate.

3.2 Results

3.2.1 Records Review

The following drawings (Appendix C) were made available by the Client for review.

- Sparks 5th Zone Pump Station, Drawing No. 72-1206, Last Revised 4/21/76
- Sparks 5th Zone Pump Station, Drawing No. 72-1207, Dated 9/24/73
- Sparks 5th Zone Pump Station, Drawing No. 72-1211, Last Revised 4/21/76
- Sparks 5th Zone Pump Station, Drawing No. 72-1212, Dated 9/24/73
- Sparks 5th Zone 1,000,000 Gal Elevated Tank, Drawing No. 72-1216, Dated 2/5/75

No LBP(s) were explicitly identified at the Subject Property on these drawings.

3.2.2 XRF Results

Lead-based paints were identified at the Subject Property by use of an XRF during the survey atop the following substrates:

**Pumping Station Building**

- Exterior
  - Door, Lintel, Metal, Brown
  - Wall, Hatch, Metal, Brown
- Interior
  - Wall, Support, Metal, Yellow
  - Floor, Riser, Metal, Black

Lead-containing paints (paints containing lead but at concentrations less than the threshold for lead-based paint) were also identified on various surfaces tested within the Subject Property and are identified in the XRF data included in Appendix G.

Representative photographs of the LBP are included in Appendix A. The XRF data from all tested surfaces is included in Appendix G.

3.2.3 Paint Chip Analysis

No paint chip samples were collected during the survey.

END OF SECTION
4.0 Liquid Polychlorinated Biphenyls

The on-site inspectors investigated the Subject Property for equipment containing liquid phase PCBs during the survey.

4.1 Inspection and Analytical Methodology

The Subject Property was inspected for equipment that may contain liquid phase PCBs. Such equipment commonly includes light ballasts located within fluorescent light fixtures, electrical transformers, and hydraulic equipment. No laboratory analysis was performed in association with the inspection for suspect PCB-containing equipment. Inspection for materials/items containing non-liquid PCBs was not included in this survey.

4.1.1 Records Review

A records review consists of reviewing previous PCB-containing equipment inspection reports, abatement records, and/or site drawings, if available, associated with the facility.

4.1.2 On-site Investigation

The on-site investigation involved a visual assessment of suspect equipment that may contain PCBs. If required, EBA performed limited dismantling of the equipment in order to visually confirm the presence or absence of oil suspected of containing PCBs. A representative number (approximately 10% of total) of fluorescent light fixtures were disassembled and the associated light ballasts were inspected for labels indicating PCB content.

4.1.3 Manufacturer and Utility Review

If the presence or absence of PCBs in suspect equipment could not be confirmed in the field, EBA conducted additional research by contacting the manufacturer and/or utility provider in order to obtain information on the suspect equipment. It should be noted that the manufacturer was not contacted for every piece of suspect equipment present at the Subject Property, as certain types of equipment were present in voluminous quantities (e.g., light ballasts).

4.2 Results

4.2.1 Records Review

The following drawings (Appendix C) were made available by the Client for review.

- Sparks 5th Zone Pump Station, Drawing No. 72-1206, Last Revised 4/21/76
- Sparks 5th Zone Pump Station, Drawing No. 72-1207, Dated 9/24/73
Sparks 5th Zone Pump Station, Drawing No. 72-1211, Last Revised 4/21/76
Sparks 5th Zone Pump Station, Drawing No. 72-1212, Dated 9/24/73
Sparks 5th Zone 1,000,000 Gal Elevated Tank, Drawing No. 72-1216, Dated 2/5/75

No equipment labeled as containing PCBs was explicitly identified at the Subject Property on these drawings.

4.2.2 On-site Investigation

EBA identified light ballasts suspected of containing liquid phase PCBs at the pumping station building. Ballasts lacking a "No PCB" stamp are presumed to contain liquid PCBs. An approximate number of ballasts observed within the Subject Property are listed in the Table as follows.

<table>
<thead>
<tr>
<th>Pumping Station Building</th>
<th>Lighting Ballast Quantity and Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturer</td>
<td>Cat. No.</td>
</tr>
<tr>
<td>Advance</td>
<td>RQM-2S40-3-TP</td>
</tr>
<tr>
<td>Universal</td>
<td>B234SR120M-A</td>
</tr>
<tr>
<td>Unknown</td>
<td>Unknown</td>
</tr>
</tbody>
</table>

During the survey, EBA identified additional equipment in the pumping station building that could potentially contain fluids and PCBs. However, based on the results of the inspection, the equipment was determined not to contain fluids and/or PCBs. This equipment included the following.

- One interior transformer manufactured by Sorgel was observed above the bathroom in the building. The unit was labeled as a dry-type transformer.

Representative photographs of the equipment determined to be suspect PCB-containing as a result of inspection and/or manufacturer’s review (refer to following section) are included in Appendix A.

4.2.3 Manufacturer Review

Suspect PCB-containing equipment was identified; however, contact with the manufacturer was not considered necessary.

4.2.4 Quantities for Liquid PCBs

Quantities for PCBs are listed by equipment type in the following Table.
5.0 Ozone-Depleting Compounds

The on-site inspectors investigated the Subject Property for equipment historically known to contain Ozone-Depleting Compounds (ODCs) during the survey. ODCs contain molecules of chlorine, fluorine, or bromine. Title VI of the United States Clean Air Act Amendments (CAA) of 1990 has defined ozone-depleting substances as belonging to Class I substances (most harmful) or Class II substances (less harmful).

5.1 Inspection and Analytical Methodology

The Subject Property was inspected for historically known types of equipment containing ODCs. Such equipment commonly includes chlorofluorocarbons (CFCs) within refrigerators, window air-conditioning units, water fountains, and chillers. No laboratory analysis was performed in association with the inspection for equipment suspected of containing ODCs.

5.1.1 Records Review

A records review consists of reviewing previous inspection reports, abatement records and/or site drawings, if available, associated with the facility.

5.1.2 On-site Investigation

The on-site investigation involved a visual assessment of suspect equipment that could contain ODCs. If considered necessary during the survey, EBA performed limited dismantling of equipment that was not currently in operation in an attempt to visually confirm the presence or absence of ODCs.

5.1.3 Manufacturer and Utility Review

If the presence or absence of ODCs in suspect equipment could not be confirmed in the field, EBA conducted additional research by contacting the manufacturer in order to obtain information on the suspect equipment.

5.2 Results

5.2.1 Records Review

The following drawings (Appendix C) were made available by the Client for review.

- Sparks 5th Zone Pump Station, Drawing No. 72-1206, Last Revised 4/21/76
- Sparks 5th Zone Pump Station, Drawing No. 72-1207, Dated 9/24/73
- Sparks 5th Zone Pump Station, Drawing No. 72-1211, Last Revised 4/21/76
- Sparks 5th Zone Pump Station, Drawing No. 72-1212, Dated 9/24/73
- Sparks 5th Zone 1,000,000 Gal Elevated Tank, Drawing No. 72-1216, Dated 2/5/75
No equipment labeled as containing ODCs was explicitly identified at the Subject Property on these drawings.

5.2.2 On-site Investigation

Equipment suspected of containing ODCs was not observed at the Subject Property.

5.2.3 Manufacturer Review

This type of review was unnecessary as equipment suspected of containing ODCs was not identified on-site.

5.2.4 Quantities for Ozone-Depleting Compounds

Equipment suspected of containing ODCs was not observed at the Subject Property.

END OF SECTION
6.0 Universal Wastes

The on-site inspectors investigated the Subject Property for items classified as Universal Wastes (UW) during the survey.

6.1 Inspection and Analytical Methodology

The Subject Property was inspected for equipment and items classified as UW. Such equipment commonly includes batteries, pesticides, mercury-containing equipment, and bulbs/lamps. No laboratory analysis was performed in association with the inspection for Universal Wastes.

6.1.1 Records Review

Records review consists of reviewing previous UW inspection reports, abatement records and/or site drawings, if available, associated with the facility.

6.1.2 On-site Investigation

The on-site investigation involved a visual assessment that focused on identifying UW at the Subject Property. EBA performed limited dismantling of suspect equipment to confirm the presence or absence of a UW.

6.1.3 Manufacturer Review

If the presence or absence of UW (e.g., the presence or absence of mercury in equipment) could not be confirmed in the field, EBA conducted additional research by contacting the manufacturer and attempting to obtain information on the suspect equipment.

6.2 Results

6.2.1 Records Review

The following drawings (Appendix C) were made available by the Client for review.

- Sparks 5th Zone Pump Station, Drawing No. 72-1206, Last Revised 4/21/76
- Sparks 5th Zone Pump Station, Drawing No. 72-1207, Dated 9/24/73
- Sparks 5th Zone Pump Station, Drawing No. 72-1211, Last Revised 4/21/76
- Sparks 5th Zone Pump Station, Drawing No. 72-1212, Dated 9/24/73
- Sparks 5th Zone 1,000,000 Gal Elevated Tank, Drawing No. 72-1216, Dated 2/5/75

No universal wastes were explicitly identified at the Subject Property on these drawings.
6.2.2 On-site Investigation

The results of the on-site investigation confirmed the presence of UW at the Pumping Station Building in the following forms:

- Light Bulbs and Tubes - 4-foot fluorescent tubes associated with light fixtures and high-intensity discharge (HID) bulbs
- Batteries – Batteries associated with emergency lighting

Representative photographs of UW are included in Appendix A.

6.2.3 Manufacturer Review

Universal Waste was identified at the Subject Property; however, contact with the manufacturer was not necessary.

6.2.4 Quantities for Universal Waste

Quantities for UW are listed by equipment type in the following Table.

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>Quantity</th>
<th>Unit of Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>HID Bulb</td>
<td>11</td>
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<tr>
<td>4’ Fluorescent Light Tube</td>
<td>56</td>
<td>Each</td>
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<tr>
<td>Battery</td>
<td>2</td>
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</table>

END OF SECTION
7.0 Miscellaneous Materials

The on-site inspectors investigated the Subject Property for other potentially hazardous or regulated items/materials classified as Miscellaneous Materials (MM) during the survey.

7.1 Inspection and Analytical Methodology

The Subject Property was inspected for items/materials that may be hazardous but do not necessarily fit into prior classifications, and for items/materials that may be non-hazardous but are regulated if the item/material is removed or becomes a waste. Such items/materials include aboveground and underground storage tanks, pressurized cylinders, and containers of paints, lubricants, degreasers and other potentially hazardous liquid/solid materials in quantities greater than 5-gallons. No laboratory analysis was performed in association with the identification and documentation of such items/materials.

7.1.1 Records Review

A records review consists of reviewing previous inspection reports, abatement records and/or site drawings, if available, associated with the facility.

7.1.2 On-site Investigation

The on-site investigation involved a visual assessment that focused on identifying items/materials of concern that do not necessarily fit into prior classifications described previously in this report.

7.1.3 Manufacturer Review

If the hazard classification of suspect items/materials could not be determined in the field, EBA conducted additional research by contacting the manufacturer in an attempt to obtain information on the suspect items/materials.

7.2 Results

7.2.1 Records Review

The following drawings (Appendix C) were made available by the Client for review.

- Sparks 5th Zone Pump Station, Drawing No. 72-1206, Last Revised 4/21/76
- Sparks 5th Zone Pump Station, Drawing No. 72-1207, Dated 9/24/73
- Sparks 5th Zone Pump Station, Drawing No. 72-1211, Last Revised 4/21/76
- Sparks 5th Zone Pump Station, Drawing No. 72-1212, Dated 9/24/73
- Sparks 5th Zone 1,000,000 Gal Elevated Tank, Drawing No. 72-1216, Dated 2/5/75

No other potentially hazardous or regulated items/materials were explicitly identified at the Subject Property on these drawings.

### 7.2.2 On-site Investigation

Other potentially hazardous or regulated items/materials were observed in the pumping station building and were present in the following forms:

- **Lead Component Materials:**
  - Water tight lead seals at interface between piping penetrations and exterior building wall

- **Pressurized Cylinders:**
  - Five (5) fire extinguishers

Representative photographs of other potentially hazardous or regulated items/materials observed during the survey are included in Appendix A.

### 7.2.3 Manufacturer Review

Items/materials exhibiting other hazardous or regulated characteristics were observed at the Subject Property; however, contact with the manufacturer was not considered necessary.

### 7.2.4 Quantities for Miscellaneous Materials

Quantities for MMs are listed by material type in the following Table.

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<tr>
<th>Equipment Type</th>
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<tr>
<td>Fire Extinguisher</td>
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<tr>
<td>Water Tight Lead Seal</td>
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END OF SECTION
8.0 Conclusions/Recommendations

The results of the survey have identified hazardous materials within the limits of the Subject Property. The presence of these hazardous materials will trigger Federal, State, and Local regulations when renovation activities occur.

8.1 Asbestos-Containing Building Materials

The results of the survey have identified asbestos-containing building materials (ACBM) in the following categories.

- Surfacing Materials – None
- Thermal System Insulation – None
- Miscellaneous Materials –
  - Friable - None
  - Non-Friable –
    - Category I – Valve Packings (Assumed), Gaskets (Assumed)
    - Category II – Fire Doors (Assumed)

Fire doors, gaskets, and valve packings were assumed to contain asbestos (rather than sampled/tested), as sampling posed safety risks and/or would have required significant disassembly/dismantling of equipment (by industry professionals) to access and collect samples of the suspected materials. It may be cost effective to have these assumed materials sampled and analyzed at an appropriate time to allow them to be definitively classified as asbestos-containing building materials. The most appropriate time to sample these materials is typically after the project has been turned over to the renovation contractor and dismantling has occurred.

The identified asbestos-containing materials were classified as non-friable at the time of the survey. EPA regulations do not apply to non-friable asbestos-containing materials, including RACM, unless they are disturbed and become friable during renovation/demolition activities. If the identified ACMs will be disturbed during planned renovation activities and the materials rendered friable, the EPA requires removal of such materials before renovation/demolition activities commence.

The OSHA “Asbestos in Construction Standard” 29 CFR 1926.1101 imposes restrictions on the disturbance of asbestos during demolition, remodeling, and renovation activities. Removal of any asbestos-containing building materials identified at the Subject Property is considered Class II asbestos work by OSHA regulations. Class II asbestos work must be performed by trained employees using work practices required by the OSHA standard.

8.2 Lead-Based Paints

Lead-based paints (LBP) were identified throughout the pumping station building atop exterior and interior building components. Specifically, LBP was identified on certain
metal substrates. LPB were not identified in the vault. In addition, lead-containing paints (i.e., paints containing lead but at concentrations less than the threshold for lead-based paint) were identified on various surfaces within the pumping station building and the vault. The presence of lead in paint in any concentration triggers OSHA regulatory standards (29 CFR 1926.62) and the presence of lead-based paint triggers EPA regulatory standards.

Demolition debris with LBP may be disposed of as non-hazardous provided the material is not classified as a hazardous waste in accordance with 40 CFR Part 261 and SW-846 (Test Methods for Evaluating Solid Waste Physical/Chemical). Metal objects coated with LBP can be recycled.

8.3 Liquid Polychlorinated Biphenyls

EBA identified at least one type/manufacturer of ballasts suspected of containing PCBs at the Subject Property. Further, since the inspection included only a portion of the ballasts present at the Subject Property, the uninspected ballasts are also considered to be suspect at this time.

Ballasts marked as “No PCBs” can be disposed of as non-hazardous waste. Ballasts lacking the “No PCBs” mark should be removed and disposed of in accordance with EPA’s Toxic Substances Control Act (TSCA) 40 CFR Part 761. If an unmarked ballast is not leaking, the associated lighting fixture does not require special handling or disposal. If an unmarked ballast is leaking, any material impacted by the leak should be treated as hazardous waste. Containers storing unmarked ballasts must be labeled in accordance with EPA labeling requirements specified in 40 CFR Part 262 Subpart C.

8.4 Ozone-Depleting Compounds

No sources of ozone-depleting compounds were identified at the Subject Property during the survey.

8.5 Universal Wastes

EBA identified universal wastes within the Subject Property in the form of mercury-containing fluorescent light tubes, high-intensity discharge (HID) bulbs, and batteries.

All universal waste is to be placed in a container that is structurally sound, will prevent damage to the contents, is compatible with its contents, and will be kept closed at all times (except when adding items to or removing items from the container). The container must be without damage, or evidence of spillage, that could lead to leakage of the waste contained inside. The disposal of hazardous waste is outlined in the EPA regulations in 40 CFR Part 260 and in Maryland regulations in COMAR Title 26, Subtitle 13.
8.6 Miscellaneous Materials

Other items/materials that are potentially hazardous or regulated were observed at the Subject Property. These items/materials and EBA’s conclusions and recommendations are provided as follows.

Fire extinguishers were observed at the Subject Property. If permanently removed from service, they should be disposed of in accordance with the publication titled "Guide to the Disposal of Condemned Fire Extinguishers" published by the Fire Extinguishing Trades Association, Fact File No. 108, dated February 2004.

Non-coated/non-painted water tight lead seals were observed at the interface of piping penetrations and the exterior wall of the Pumping Station Building. The disposal of these lead-containing items is regulated by the EPA in 40 CFR 261.

END OF SECTION
Appendix A – Photographs
Pumping Station Building
Photograph 1
Overview of Sparks Pumping Station, 14073 York Road, Sparks, Maryland (north wall)

Photograph 2
Overview of Sparks Pumping Station (south wall)
Limited Hazardous Materials Survey
Sparks Pumping Station

Photograph 3
Overview of Sparks Pumping Station (east wall)

Photograph 4
Overview of Sparks Pumping Station (west wall)
Limited Hazardous Materials Survey
Sparks Pumping Station

Photograph 5
Fire Doors, Assumed to contain Asbestos

Photograph 6
Gaskets, Assumed to contain Asbestos
Limited Hazardous Materials Survey
Sparks Pumping Station

Photograph 7
Gasket, Assumed to contain Asbestos

Photograph 8
Door, Lintel, Metal, Lead-Based Paint (LBP)
Limited Hazardous Materials Survey
Sparks Pumping Station

Photograph 9
Wall, Hatch, Metal, Lead-Based Paint (LBP)

Photograph 10
Wall, Support, Yellow, Lead-Based Paint (LBP)
Limited Hazardous Materials Survey
Sparks Pumping Station

Photograph 11
Floor, Riser, Metal, Lead-Based Paint (LBP)

Photograph 12
Advance Light Ballast, Suspect for Polychlorinated Biphenyls (PCBs)
Limited Hazardous Materials Survey
Sparks Pumping Station

Photograph 13
HID Bulbs, Universal Waste (UW)

Photograph 14
Photograph of 4' Fluorescent Light Tubes, Universal Waste (UW)
Photograph 15
Battery (inside), Universal Waste (UW)

Photograph 16
Fire Extinguisher, Miscellaneous Material (MM)
Limited Hazardous Materials Survey
Sparks Pumping Station

Photograph 17
Water Tight Lead Seal, Miscellaneous Material (MM)
Elevated Tank Vault
Photograph 1
Overview of Sparks Elevated Tank Valve Vault, 14073 York Road, Sparks, Maryland

Photograph 2
Overview of Sparks Elevated Tank Valve Vault
Limited Hazardous Materials Survey
Sparks Elevated Tank Valve Vault

Photograph 3
Packing on 4" Bypass Valve, Assumed to contain Asbestos

Photograph 4
Packing on 16" Valve, Assumed to contain Asbestos
Limited Hazardous Materials Survey
Sparks Elevated Tank Valve Vault

Photograph 5
Gaskets on 4" Bypass, Assumed to contain Asbestos

Photograph 6
Gaskets on 16" Piping, Assumed to contain Asbestos
Appendix B – Certificates of AHERA Inspectors
AEROSOL MONITORING & ANALYSIS, INC.

This is to certify that

SHERRI WALDRON

has met the attendance requirements and successfully completed

the course entitled

4-HOUR EPA AHERA INSPECTOR REFRESHER

For Accreditation Under TSCA Title II

04/16/2015
Course Date

04/16/2015
Exam Date

4/16/2016
Expiration Date

STEVE SIERACKI
Principal Instructor

AIR04162015-15
Certification No.

VAAIR04162015-15
Virginia Certification No.

E. Rush Barnett
Course Director

1331 Ashton Road
P.O.Box 646
Hanover, MD 21076
P: 410-684-3327
www.amatrainings.com

STATE OF MARYLAND

Asbestos License

Sherri Waldron
Name

15001851

Inspector Review
Course Title

MDE

Signature

Course Date: 04/16/2015

Expiring Date: 04/16/2016

Exam Date: 04/30/2015

Quality of Life

F Valenti

1632
AEROSOL MONITORING & ANALYSIS, INC.

This is to certify that

SYLVAN BONSIGNORE BURCH

has met the attendance requirements and successfully completed the course entitled

4-Hour EPA AHERA Inspector Refresher

For Accreditation Under TSCA Title II

Course Date Exam Date Expiration Date

STEVE SIERACKI
Principal Instructor

E. Rush Barnett
Course Director

AIR08292014-3 VAAIR08292014-3
Certification No. Virginia Certification No.

1331 Ashton Road P.O.Box 646 Hanover, MD 21076 P: 410-684-3327

www.amattraining.com

Sylvan Bonsignore Burch
Name:

Signature:

HAS ATTENDED AND PASSED THE EXAM IN AN ASSESSOR INSPECTION COURSE ENTITLED:

Inspector Review

Course Name:

FOR ACCREDITATION UNDER TSCA TITLE II.

8/29/14 8/29/15
Course Date(s) Expiration Date

NO. 128985
STATE OF MARYLAND

(STATE SEAL IS BLUE)

SEP 18 2014
Exam Date
Appendix C – Drawings Provided by Client
Appendix D – Asbestos Laboratory Results / Chain-of-Custody
# Certificate of Analysis

**Client:** EBA Engineering, Inc  
**Address:** 4813 Seton Drive  
**Baltimore, Maryland 21215**

**Job Name:** Sparks Pump Station and Elevated Tank Vault  
**Job Location:** 14073 York Road, Sparks Glencoe, MD 21152  
**Job Number:** 4232-00-000  
**P.O. Number:** Not Provided

**Attention:** Sylvan Burch  
**Chain Of Custody:** 527234  
**Date Analyzed:** 7/31/2015  
**Person Submitting:** Sylvan Burch

## Summary of Polarized Light Microscopy

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This report applies only to the sample, or samples, investigated and is not necessarily indicative of the quality or condition of apparently identical or similar products. As a mutual protection to clients, the public, and these Laboratories, this report is submitted and accepted for the exclusive use of the client to whom it is addressed and upon the condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written authorization from us. Sample types, locations, and collection protocols are based upon the information provided by the persons submitting them and, unless collected by personnel of these Laboratories, we expressly disclaim any knowledge and liability for the accuracy and completeness of this information. Residual sample material will be discarded in accordance with the appropriate regulatory guidelines, unless otherwise requested by the client. NVLAP accreditation applies only to polarized light microscopy of bulk samples and transmission electron microscopy of AHERA air samples. This report must not be used to claim, and does not imply product certification, approval, or endorsement by NVLAP or any agency of the Federal Government. All rights reserved. AMA Analytical Services, Inc.

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4475 Forbes Blvd. Lanham, MD, 20706 • (301) 459-2643 • Toll Free (800) 346-0961 • Fax (301) 459-2643

01000 – Appendix B – 57
# Certificate of Analysis

**Client:** EBA Engineering, Inc  
**Address:** 4813 Seton Drive  
**Attention:** Sylvan Burch  
**Job Name:** Sparks Pump Station and Elevated Tank Vault  
**Job Location:** 14073 York Road, Sparks Glencoe, MD 21152  
**Job Number:** 4232-00-000  
**P.O. Number:** Not Provided  
**Chain Of Custody:** 527234  
**Date Analyzed:** 7/31/2015  
**Person Submitting:** Sylvan Burch  
**Sample Type:** Homogeneity

## Summary of Polarized Light Microscopy

<table>
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<tr>
<th>AMA Sample Number</th>
<th>Client Sample #</th>
<th>Total Asbestos</th>
<th>Chrysotile Percent</th>
<th>Asbestos Percent</th>
<th>Crocidolite Percent</th>
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The following footnotes only apply to those samples which the total asbestos result is flagged with a note number.

1. **TEM RECOMMENDATION** - Please note, due to resolution limitations with optical microscopy and/or interference from matrix components of this sample, results which are reported via PLM as negative or trace (<1%) for asbestos may contain a significant quantity of asbestos. It is recommended that the additional analytical technique of TEM be used to check for asbestos fibers below the resolution limits of optical microscopy.

2. **MATRIX REDUCTION RECOMMENDATION** - Please note, due to interference from the matrix components of this sample, results which are reported via PLM as negative or trace (<1%) for asbestos may contain a significant quantity of asbestos which is obscured from view. It is recommended that the additional preparation technique of gravimetric reduction be performed on this sample to minimize the obscuring effects of matrix components, followed by reanalysis by PLM and/or TEM.

**Analysis Method** - EPA/600/R-93/116 dated July 1993

NAD = "No Asbestos Detected"  
TR = "Trace equals less than 1% of this component"

Uncertainty: For samples containing asbestos in range of 1-10% the CV is 0.43, 11-35% CV=0.55, >35 CV=0.23

All results are to be considered preliminary and subject to change unless signed by the Technical Director or Deputy.

**Technical Director:** Peerawut Chaikenne  
**Analyst(s):** Peerawut Chaikenne

This report applies only to the sample, or samples, investigated and is not necessarily indicative of the quality or condition of apparently identical or similar products. As a mutual protection to clients, the public, and these Laboratories, this report is submitted and accepted for the exclusive use of the client to whom it is addressed and upon the condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written authorization from us. Sample types, locations, and collection protocols are based upon the information provided by the persons submitting them and, unless collected by personnel of these Laboratories, we expressly disclaim any knowledge and liability for the accuracy and completeness of this information. Residual sample material will be discarded in accordance with the appropriate regulatory guidelines, unless otherwise requested by the client. NVLAP accreditation applies only to polarized light microscopy of bulk samples and transmission electron microscopy of AHERA air samples. This report must not be used to claim, and does not imply product certification, approval, or endorsement by NVLAP or any agency of the Federal Government. All rights reserved. AMA Analytical Services, Inc.

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**CHAIN OF CUSTODY**

**Submital Information:**
1. **Job Name:** Sparks Pump Station and Elevated Tank Vault
2. **Job Location:** 14073 York Road, Sparks Glenco, Maryland 21152
3. **Job #:** 4232-00-000  
   **F.O. #:**
4. **Contact Person:** Sylvan Burch  
   **@ phone #:** (410) 504-6115
5. **Submitted by:** Sylvan Burch  
   **Signature:**

**Reporting Information (Results will be provided as soon as technically feasible):**

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</tr>
<tr>
<td>2 Day</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Day +</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>After Hours (must be pre-scheduled)</th>
<th>Time Due</th>
<th>Results Required By Noon</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immediate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24 Hours</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Day</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Day +</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Day</td>
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**Asbestos Analysis**

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>QTY</th>
</tr>
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<tbody>
<tr>
<td>PCR Air</td>
<td>NIOSH 7400</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fiberglass</td>
<td></td>
</tr>
<tr>
<td>TEM Air</td>
<td>NIOSH 7402</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other (specify)</td>
<td></td>
</tr>
<tr>
<td>PLM Bulk</td>
<td>EPA 600</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NY State Friable 198.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other (specify)</td>
<td></td>
</tr>
<tr>
<td>MISC</td>
<td>Vermiculite</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Asbestos Soil</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(QTY)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(QTY)</td>
<td></td>
</tr>
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**TEM Bulk**

<table>
<thead>
<tr>
<th>Description</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>BLAP 198-4/Chatfield</td>
<td></td>
</tr>
<tr>
<td>NY State PLM/TEM</td>
<td></td>
</tr>
<tr>
<td>Residual Ash</td>
<td></td>
</tr>
</tbody>
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**TEM Dust**

<table>
<thead>
<tr>
<th>Description</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qual. (pres/abs) Vacuum/Dust</td>
<td></td>
</tr>
<tr>
<td>(QTY)</td>
<td></td>
</tr>
<tr>
<td>(QTY)</td>
<td></td>
</tr>
</tbody>
</table>

**TEM Water**

<table>
<thead>
<tr>
<th>Description</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qual. (pres/abs)</td>
<td></td>
</tr>
<tr>
<td>(QTY)</td>
<td></td>
</tr>
<tr>
<td>BLAP 198.2/EPA 100.2</td>
<td></td>
</tr>
<tr>
<td>EPA 100.1</td>
<td></td>
</tr>
</tbody>
</table>

**Metals Analysis**

<table>
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<tr>
<th>Description</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pb Paint Chip</td>
<td></td>
</tr>
<tr>
<td>Pb Dust Wipe (w/ type)</td>
<td></td>
</tr>
<tr>
<td>Pb Air</td>
<td></td>
</tr>
<tr>
<td>Pb Soil/Solid</td>
<td></td>
</tr>
<tr>
<td>Pb TCLP</td>
<td></td>
</tr>
<tr>
<td>Drinking Water</td>
<td></td>
</tr>
<tr>
<td>Waste Water</td>
<td></td>
</tr>
<tr>
<td>Pb Furnace (Media)</td>
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</tr>
</tbody>
</table>

**Fungal Analysis**

<table>
<thead>
<tr>
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<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collection Apparatus for Spores</td>
<td></td>
</tr>
<tr>
<td>Collection Media</td>
<td></td>
</tr>
<tr>
<td>Spore-Trap</td>
<td></td>
</tr>
<tr>
<td>Surface Vacuum Dust</td>
<td></td>
</tr>
<tr>
<td>Surface Swab (QTY)</td>
<td></td>
</tr>
<tr>
<td>Culturable ID Genus (Media)</td>
<td></td>
</tr>
<tr>
<td>Surface Tape (QTY)</td>
<td></td>
</tr>
<tr>
<td>Culturable ID Species (Media) (QTY)</td>
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**CLIENT ID NUMBER**

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<thead>
<tr>
<th>Client Information</th>
<th>Date</th>
<th>Volume</th>
<th>Area</th>
<th>Analysis</th>
<th>Matrix</th>
<th>Client Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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**LABORATORY STAFF ONLY (CUSTODY)**

<table>
<thead>
<tr>
<th>Date/Time RCVD</th>
<th>Date/Time Analyzed</th>
<th>Date/Time Reported</th>
<th>Comments</th>
</tr>
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<tbody>
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**LABORATORY STAFF ONLY (CUSTODY)**

<table>
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<th>Date/Time Analyzed</th>
<th>Date/Time Reported</th>
<th>Comments</th>
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<tbody>
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**LABORATORY STAFF ONLY (CUSTODY)**

<table>
<thead>
<tr>
<th>Date/Time RCVD</th>
<th>Date/Time Analyzed</th>
<th>Date/Time Reported</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>
## EBA Engineering Asbestos Sample Data Sheet

<table>
<thead>
<tr>
<th>Sample Number or ID</th>
<th>Material Description (Use FT-Floor Tile, CT-Ceiling Tile, PF-Pipe Fitting)</th>
<th>Color</th>
<th>Sample Location (Floor, Room)</th>
<th>ACBM Type (TSI or S or M)</th>
<th>Condition (G, F, or P)</th>
<th>Multiple Layers</th>
</tr>
</thead>
<tbody>
<tr>
<td>4232-00-07-23-01</td>
<td>24” Cover Gasket - OM3</td>
<td>Brown</td>
<td>Elevated Tank Vault</td>
<td>M</td>
<td>G</td>
<td>N</td>
</tr>
<tr>
<td>4232-00-07-23-02</td>
<td>16” Valve Gasket - OM4</td>
<td>Red</td>
<td>Elevated Tank Vault</td>
<td>M</td>
<td>G</td>
<td>N</td>
</tr>
<tr>
<td>4232-00-07-23-03</td>
<td>Caulk - OM7</td>
<td>White</td>
<td>Pump Station, Exterior</td>
<td>M</td>
<td>G</td>
<td>N</td>
</tr>
<tr>
<td>4232-00-07-23-04</td>
<td>Caulk - OM7</td>
<td>White</td>
<td>Pump Station, Exterior</td>
<td>M</td>
<td>G</td>
<td>N</td>
</tr>
<tr>
<td>4232-00-07-23-05</td>
<td>Pump Cover Gasket - OM16</td>
<td>Green</td>
<td>Pump Station, Room 3</td>
<td>M</td>
<td>G</td>
<td>N</td>
</tr>
<tr>
<td>4232-00-07-23-06</td>
<td>Pump Cover Gasket - OM16</td>
<td>Green</td>
<td>Pump Station, Room 3</td>
<td>M</td>
<td>G</td>
<td>N</td>
</tr>
</tbody>
</table>

### PLEASE ANALYZE ALL LAYERS OF EACH SAMPLE

**Homogeneous area = Suspect**

Materials of one type and color

Samples required for the following:

- **TSI**: 3 samples for each TSI material; 1 sample per area of patched insulation (<6 linear or squared feet); Sample in a manner sufficient per mechanical system not assumed to be ACBM where cement or plaster is used in fittings such as tees, elbows, or valves.
- **Surfacing**: 3 samples per area <1,000 ft²; 5 samples per area >1,000 ft²; 7 samples per area >5,000 ft².
- **Miscellaneous**: Sample in a manner sufficient to determine (Note: EBA’s Standard Operating Procedure is to collect at least 2 samples per homogenous area).

TSI = Thermal System Insulation
S = Surfacing Material
M = Any other building material or structural component
Appendix E – Certificate of LBP Inspector
THIS IS TO CERTIFY THAT

Sylvan Bonsignore Burch

HAS MET THE LEAD PAINT SERVICES ACCREDITATION REQUIREMENTS FOR

Risk Assessor

04 04 2016
EXPIRATION DATE

12 12 2013
COURSE DATE

STATE OF MARYLAND

14463
Certificate #

Application for reaccreditation shall be submitted to MDE 60 days prior to accreditation expiration indicated on this certificate.
Appendix F – XRF Performance Characteristic Sheet
Performance Characteristic Sheet

EFFECTIVE DATE: September 24, 2004

MANUFACTURER AND MODEL:
Make: Niton LLC
Tested Model: XLp 300
Source: $^{109}\text{Cd}$

Note: This PCS is also applicable to the equivalent model variations indicated below, for the Lead-in-Paint K+L variable reading time mode, in the XLI and XLp series:

- XLI 300A, XLI 301A, XLI 302A, and XLI 303A.
- XLp 300A, XLp 301A, XLp 302A, and XLp 303A.
- XLI 700A, XLI 701A, XLI 702A, and XLI 703A.

FIELD OPERATION GUIDANCE

OPERATING PARAMETERS:
Lead-in-Paint K+L variable reading time mode.

XRF CALIBRATION CHECK LIMITS:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0.8 to 1.2 mg/cm² (inclusive)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The calibration of the XRF instrument should be checked using the paint film nearest 1.0 mg/cm² in the NIST Standard Reference Material (SRM) used (e.g., for NIST SRM 2579, use the 1.02 mg/cm² film).

If readings are outside the acceptable calibration check range, follow the manufacturer's instructions to bring the instruments into control before XRF testing proceeds.

SUBSTRATE CORRECTION:

For XRF results using Lead-in-Paint K+L variable reading time mode, substrate correction is not needed for:

- Brick, Concrete, Drywall, Metal, Plaster, and Wood

INCONCLUSIVE RANGE OR THRESHOLD:

<table>
<thead>
<tr>
<th>K+L MODE READING DESCRIPTION</th>
<th>SUBSTRATE</th>
<th>THRESHOLD (mg/cm²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Results not corrected for substrate bias on any substrate</td>
<td>Brick</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>Concrete</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>Drywall</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>Metal</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>Plaster</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>Wood</td>
<td>1.0</td>
</tr>
</tbody>
</table>
BACKGROUND INFORMATION

EVALUATION DATA SOURCE AND DATE:
This sheet is supplemental information to be used in conjunction with Chapter 7 of the HUD Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing ("HUD Guidelines"). Performance parameters shown on this sheet are calculated from the EPA/HUD evaluation using archived building components. Testing was conducted in August 2004 on 133 testing combinations. The instruments that were used to perform the testing had new sources; one instrument’s was installed in November 2003 with 40 mCi initial strength, and the other’s was installed June 2004 with 40 mCi initial strength.

OPERATING PARAMETERS:
Performance parameters shown in this sheet are applicable only when properly operating the instrument using the manufacturer's instructions and procedures described in Chapter 7 of the HUD Guidelines.

SUBSTRATE CORRECTION VALUE COMPUTATION:
Substrate correction is not needed for brick, concrete, drywall, metal, plaster or wood when using Lead-in-Paint K+L variable reading time mode, the normal operating mode for these instruments. If substrate correction is desired, refer to Chapter 7 of the HUD Guidelines for guidance on correcting XRF results for substrate bias.

EVALUATING THE QUALITY OF XRF TESTING:
Randomly select ten testing combinations for retesting from each house or from two randomly selected units in multifamily housing. Use the K+L variable time mode readings. Conduct XRF retesting at the ten testing combinations selected for retesting. Determine if the XRF testing in the units or house passed or failed the test by applying the steps below.

Compute the Retest Tolerance Limit by the following steps:

Determine XRF results for the original and retest XRF readings. Do not correct the original or retest results for substrate bias. In single-family housing a result is defined as the average of three readings. In multifamily housing, a result is a single reading. Therefore, there will be ten original and ten retest XRF results for each house or for the two selected units.

Calculate the average of the original XRF result and retest XRF result for each testing combination.

Square the average for each testing combination.

Add the ten squared averages together. Call this quantity C.

Multiply the number C by 0.0072. Call this quantity D.

Add the number 0.032 to D. Call this quantity E.

Take the square root of E. Call this quantity F.

Multiply F by 1.645. The result is the Retest Tolerance Limit.

Compute the average of all ten original XRF results.

Compute the average of all ten re-test XRF results.

Find the absolute difference of the two averages.
If the difference is less than the Retest Tolerance Limit, the inspection has passed the retest. If the difference of the overall averages equals or exceeds the Retest Tolerance Limit, this procedure should be repeated with ten new testing combinations. If the difference of the overall averages is equal to or greater than the Retest Tolerance Limit a second time, then the inspection should be considered deficient.

Use of this procedure is estimated to produce a spurious result approximately 1% of the time. That is, results of this procedure will call for further examination when no examination is warranted in approximately 1 out of 100 dwelling units tested.

TESTING TIMES:

For the Lead-in-Paint K+L variable reading time mode, the instrument continues to read until it is moved away from the testing surface, terminated by the user, or the instrument software indicates the reading is complete. The following table provides testing time information for this testing mode. The times have been adjusted for source decay, normalized to the initial source strengths as noted above. Source strength and type of substrate will affect actual testing times. At the time of testing, the instruments had source strengths of 26.6 and 36.6 mCi.

<table>
<thead>
<tr>
<th>Testing Times Using K+L Reading Mode (Seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Substrate</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Wood</td>
</tr>
<tr>
<td>Drywall</td>
</tr>
<tr>
<td>Metal</td>
</tr>
</tbody>
</table>

CLASSIFICATION RESULTS:

XRF results are classified as positive if they are greater than or equal to the threshold, and negative if they are less than the threshold.

DOCUMENTATION:

A document titled *Methodology for XRF Performance Characteristic Sheets* provides an explanation of the statistical methodology used to construct the data in the sheets, and provides empirical results from using the recommended inconclusive ranges or thresholds for specific XRF instruments. For a copy of this document call the National Lead Information Center Clearinghouse at 1-800-424-LEAD.

This XRF Performance Characteristic Sheet was developed by the Midwest Research Institute (MRI) and QuanTech, Inc., under a contract between MRI and the XRF manufacturer. HUD has determined that the information provided here is acceptable when used as guidance in conjunction with Chapter 7, Lead-Based Paint Inspection, of HUD’s *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing*. 

Appendix G – XRF Lead-Based Paint Data Sheets
<table>
<thead>
<tr>
<th>READING No.</th>
<th>COMPONENT</th>
<th>MEMBER</th>
<th>SUBSTRATE</th>
<th>SIDE</th>
<th>COLOR</th>
<th>ROOM</th>
<th>LEVEL</th>
<th>CONDITION</th>
<th>SITE</th>
<th>INSPECTOR</th>
<th>RESULT</th>
<th>RESULT (mg/cm²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SHUTTER CAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SYLVAN BURCH</td>
<td></td>
<td>Positive 1</td>
</tr>
<tr>
<td>2</td>
<td>CAL STANDARD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td>SYLVAN BURCH</td>
<td>Positive</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>SYLVAN BURCH</td>
<td>Positive</td>
<td>1</td>
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<tr>
<td>5</td>
<td>VALVE 16&quot;</td>
<td>METAL</td>
<td>CTR</td>
<td>WHITE</td>
<td>INTERIOR</td>
<td>SUB LEVEL 1</td>
<td>INTACT</td>
<td></td>
<td>VAULT</td>
<td>SYLVAN BURCH</td>
<td>Negative</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>VALVE 16&quot;</td>
<td>METAL</td>
<td>CTR</td>
<td>WHITE</td>
<td>INTERIOR</td>
<td>SUB LEVEL 1</td>
<td>INTACT</td>
<td></td>
<td>VAULT</td>
<td>SYLVAN BURCH</td>
<td>Negative</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td>VALVE 16&quot;</td>
<td>METAL</td>
<td>CTR</td>
<td>WHITE</td>
<td>INTERIOR</td>
<td>SUB LEVEL 1</td>
<td>INTACT</td>
<td></td>
<td>VAULT</td>
<td>SYLVAN BURCH</td>
<td>Negative</td>
<td>0</td>
</tr>
<tr>
<td>8</td>
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<td>METAL</td>
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<td>SUB LEVEL 1</td>
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<td>VAULT</td>
<td>SYLVAN BURCH</td>
<td>Negative</td>
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</tr>
<tr>
<td>9</td>
<td>PIPING 16&quot;</td>
<td>METAL</td>
<td>CTR</td>
<td>WHITE</td>
<td>INTERIOR</td>
<td>SUB LEVEL 1</td>
<td>INTACT</td>
<td></td>
<td>VAULT</td>
<td>SYLVAN BURCH</td>
<td>Negative</td>
<td>0</td>
</tr>
<tr>
<td>10</td>
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<td>METAL</td>
<td>CTR</td>
<td>WHITE</td>
<td>INTERIOR</td>
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<td>INTACT</td>
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<td>VAULT</td>
<td>SYLVAN BURCH</td>
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<tr>
<td>11</td>
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<td>METAL</td>
<td>CTR</td>
<td>WHITE</td>
<td>INTERIOR</td>
<td>SUB LEVEL 1</td>
<td>INTACT</td>
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<td>VAULT</td>
<td>SYLVAN BURCH</td>
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<td>0</td>
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<td>12</td>
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<td>CTR</td>
<td>WHITE</td>
<td>INTERIOR</td>
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<td>INTACT</td>
<td></td>
<td>VAULT</td>
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</tr>
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<td>PIPING SUPPORT</td>
<td>CONCRETE</td>
<td>CTR</td>
<td>WHITE</td>
<td>INTERIOR</td>
<td>SUB LEVEL 1</td>
<td>INTACT</td>
<td></td>
<td>VAULT</td>
<td>SYLVAN BURCH</td>
<td>Negative</td>
<td>0.02</td>
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<td>14</td>
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<td>A</td>
<td>WHITE</td>
<td>INTERIOR</td>
<td>SUB LEVEL 1</td>
<td>INTACT</td>
<td></td>
<td>VAULT</td>
<td>SYLVAN BURCH</td>
<td>Negative</td>
<td>0</td>
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<tr>
<td>15</td>
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<td>CONCRETE</td>
<td>C</td>
<td>WHITE</td>
<td>INTERIOR</td>
<td>SUB LEVEL 1</td>
<td>INTACT</td>
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<td>VAULT</td>
<td>SYLVAN BURCH</td>
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</tr>
<tr>
<td>16</td>
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<td>CONCRETE</td>
<td>C</td>
<td>WHITE</td>
<td>INTERIOR</td>
<td>SUB LEVEL 1</td>
<td>NON-INTACT</td>
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<td></td>
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## Limited Hazardous Materials Survey
**Sparks Pump Station and Elevated Tank Vault**

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APPENDIX C

ELEVATED TANK REHABILITATION DETAILS
ANTENNA MOUNTING SUPPORT

2-1/2" Ø STEEL SOCKET WELDING CAP.

2 KNEE BRACES, 2-1/2" Ø PIPE SPACED 120° APART WELDED TO MOUNT AND TO NEW 6" Ø x 1/4" BASE PLATES WELDED TO ROOF

APPROX. 30°

3-1/2"
4" 3-1/2" 4"

BRACE DETAIL (TYPICAL) (ADJUST DIMENSIONS AS NECESSARY TO KEEP PIPE PLUMB.)

2-1/2" DIA., SCH. 80 PIPE, x 4' LONG. PIPE MUST BE PLUMB ± 1/8" PER 12"

4 BRACES (SEE DETAIL) SPACED 90° APART. ADJUST DIMENSIONS OF BRACES TO KEEP PIPE PLUMB.

12" DIA. x 1/4" BASE PLATE

NOTE: ADJUST BRACES AS NECESSARY TO KEEP PIPE PLUMB.

NOT TO SCALE

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1,000,000 GALLON STEEL ELEVATED TANK "SPARKS TANK" BALTIMORE COUNTY, MARYLAND 260

DWG. NO. AB 03/24/17 TIC 15.268.E518.020
CLOG-RESISTANT ALUMINUM ROOF VENT
24 INCH DIAMETER

FIGURE - 1

NOTE: INSTALL VENT ASSEMBLY PLUMB ± 1/8 IN. IN 12 IN.
24 IN. DIAMETER ALUMINUM VENT MATERIAL SPECIFICATION FOR FIG. 1

1 - Steel plate rolled to 24-1/2 in. O.D. X 6 in. high (min.) X 1/4 in. tk, must project 4 in. above roof (install plumb)

2 - Steel plate 34 in. O.D. X 1/4 in. X 24 in. I.D. (must be installed level)
   Bolt Circle: (8) 7/16 in. dia. holes @ 15-1/8 in. rad.

3 - Rubber gasket 34 in. O.D. X 3/8 in. X 24-1/4 in. I.D.
   Bolt Circle: (8) 7/16 in. dia. holes @ 15-1/8 in. rad.

4 - Aluminum plate 34 in. O.D. X 3/16 in. X 24 in. I.D.
   Bolt Circle: (8) 7/16 in. dia. holes @ 15-1/8 in. rad.

5 - (8) 304 S.S. bolts w/ H.H. nuts and (2) flat washers per bolt, 3/8 in. dia.
   X 1-1/2 in. long

6 - Aluminum plate rolled to 24 in. I.D. X 3/16 in. X 12-1/2 in. long (round one edge)

7 - Linear High Density Poly-Ethylene (HDPE) vacuum pallet 45 in. O.D. X 23 in. I.D.
   X 1/2 in. tk

8 - Aluminum plate rolled to 48 in. O.D. X 12-1/2 in. high X 1/8 in. tk

9 - Aluminum plate rolled to 54 in. O.D. X 12 in. high X 1/8 in. tk

10 - Pressure pallet, refer to Fig. 2

11 - Aluminum 2 in. X 2 in. X 3/16 in., angle rolled to 47-3/4 in. I.D. leg out w/ (4) evenly spaced 9/16 in. dia. holes (refer to Fig. 3)

12 - Aluminum cone roof plate 54 in. dia. X 1/8 in. tk (may substitute pressed plate or flanged and dished head)

13 - (6) Aluminum bar 2 in. X 3/16 in. X 8 in. long (refer to Fig. 5)

14 - (4) 304 S.S. bolts 1/2 in. dia. X 1-1/2 in. long, with (1) flat washer, (1) lock washer, and (1) nut per bolt (refer to Fig. 3). May substitute 1 in. Ø X 1/2 in. thick bar stock, drilled and tapped, and welded to angle for nut and lock washer.

15 - 3/4 in. X .125 in. flattened expanded aluminum (opening size .625 in. X 1.75 in.) formed to 48 in. I.D. X 11 in. high

16 - Aluminum angle 1 in. X 1 in. X 3/16 in. rolled to 45-3/4 in. I.D. leg out w/ (8) evenly spaced 3/16 in. dia. holes located midway on the horizontal leg

17 - (6) Aluminum bar 6 in. X 1-1/4 in. X 1/8 in.

18 - Aluminum angle 2 in. X 2 in. X 3/16 in. rolled to 43-3/4 in. I.D. leg out w/ (8) evenly spaced 3/16 in. dia. holes located midway on the horizontal leg

19 - (6) Aluminum angle 2 in. X 2 in. X 3/16 in. X 11-5/8 in. long, oriented leg–down

Operating Instructions:

1) Annually inspect and clean out the vent interior.

2) More frequent inspection and cleaning may be required if unusually severe dust conditions exist.

3) Severe icing could cause freezing of the pallets rendering the pallets inoperable. More frequent inspections are required during freezing conditions. The vents and pallets should be thawed if necessary.

4) The pallets and interior surfaces of the vent should not be painted. If the exterior surfaces are to be painted, TIC recommends these surfaces be hand–roughened with sand paper and solvent washed prior to coating. A primer acceptable for this type of surface should be used.

5) The vacuum and pressure–relief pallets should be removed during cleaning and painting of the tank to prevent them from clogging. The owner's representative should verify the proper re–installation of the pallets prior to placing the tank back into service.

Note:

All steel items to be made from A36, or A283 Grades A, B, or C steel unless otherwise specified.

All aluminum items to be made from Grade 3003–H14 or H16 formable, unless otherwise specified.

All dimensions to ± 1/8 in. tolerance except bolt hole diameters to ± 1/32 in. tolerance.
PRESSURE PALLET – 24 INCH DIAMETER VENT

10-1 – HDPE ring 47 in. O.D. X 43 in. I.D. X 1/2 in. tk
Bolt circle: (36) 1/4 in. dia. holes and evenly spaced @ rad. = 22–1/2 in.

10-2 – 16 X 16 316 stainless steel wire mesh 46 in. dia. (0.018 – 316 S.S. wire screen)
Bolt circle: (36) 1/4 in. dia. holes evenly spaced @ rad. = 22–1/2 in.

10-3 – (36) No. 12 pan head 316 S.S. machine screws w/ nuts and fender washers,
1–1/2 in. long

VENT COVER CONNECTION

9 – Aluminum plate rolled to 54 in. O.D. X 12 in. high X 1/8 in. tk

11 – Aluminum 2 in. X 2 in. X 3/16 in., angle rolled to 47–3/4 in. I.D. leg out w/ (4) evenly
spaced 9/16 in. dia. holes

12 – Aluminum cone roof plate 54 in. dia. X 1/8 in. tk (may substitute pressed plate or
flanged and dished head)

14 – (4) 304 S.S. bolts 1/2 in. dia. X 1–1/2 in. long, with (1) flat washer, (1) lock washer,
and (1) nut per bolt (refer to Fig. 3). May substitute 1 in. Ø X 1/2 in. thick bar stock,
drilled and topped, and welded to angle for nut and lock washer.

NOT TO SCALE

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Tank Industry Consultants
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1,000,000 GALLON STEEL ELEVATED TANK
“SPARKS TANK”
BALTIMORE COUNTY, MARYLAND 263

DWG. NO. CRV 03/24/17
TIC 15.268.E518.020
INTERIOR CONTAINER LADDER

Weld upper brackets to roof and side rails with 1/4" fillet weld - continuous

Upper Bracket

6"  3"  3"
1/2" P

Lower Bracket

6"  3"  3"
1/2" P
13/16" Slot

13/16" Dia. hole, bolt to brackets with 3/4" x 2" Silicon Bronze or Galv. Bolts w/nuts

Locate top of ladder accessible from roof manhole.
Ladder length shall be such that ladder shall have a positive slope to the manhole and roof.
Weld brackets to roof and tank bowl with 1/4" fillet weld - continuous

13/16 in. Dia. holes

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1,000,000 Gallon Steel Elevated Tank
"SPARKS TANK"
Baltimore County, Maryland 265

Dwg. No. LR
03/24/17
Tic 15.268.E518.020
30 INCH DIAMETER ROOF MANHOLE

5/8 IN. DIA. x 6 IN. x 3 IN. HANDLE

32 IN. DIAMETER

1/4 IN.

9/16 IN. DIA. HOLE FOR 1/2 IN. DIAMETER ROD WITH ENDS SEAL WELDED TO PREVENT REMOVAL

1/4 IN.

7/16 IN. DIA. HOLE FOR PADLOCK

5/8 IN. ± 1/8

3/4 IN. NOTCHED CORNER (TYP)

30 IN. I.D.

32 IN. DIA. PLATE x 3/16 IN. THICK

1/4 IN. x 6 IN. x 30 IN. I.D.

1/4 IN. x 2 IN. x 32 IN. DIA.

5/8 IN.

2 IN. x 2 IN. X 1/4 IN.

COVER MUST OPEN AT LEAST 45° PAST VERTICAL INSTALL BETWEEN ROOF STRUCTURE

NOT TO SCALE

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1,000,000 GALLON STEEL ELEVATED TANK
"SPARKS TANK"
BALTIMORE COUNTY, MARYLAND

DWG. NO. RM
03/24/17
TIC 15.268.E518.020
ROOF RIGGING OPENINGS

PHOENIX #132 FLAT WELDING FLANGE INVERTED—TAPPED FROM FLANGE SIDE WITH 1-1/2" GALVANIZED MALLEABLE IRON PLUG THREADS WRAPPED WITH TEFLOM TAPE

1/8
+ GAP

2-5/8" DIA. CUT-OUT IN ROOF

TANK ROOF

APPLY FLEXIBLE POLYURETHANE SEALANT TO INTERIOR JOINT AFTER COUPLING IS INSTALLED AND AFTER PAINT IS CURED. NO COUPLINGS SHALL BE INSTALLED BELOW THE TOP CAPACITY LEVEL. COUPLINGS TO BE INSTALLED TO AVOID ROOF STIFFENERS
APPENDIX D

BORING REPORT
February 29, 2016

Johnson, Mirmiran & Thompson, Inc.
72 Loveton Circle
Sparks, MD 21152

Attention: Mr. David Cox, P.E.
Senior Associate

Reference: Geotechnical Investigation Report
Sparks Pumping Station
Baltimore County, Maryland
E2CR Project No. 16506-04

Dear Mr. Cox:

E2CR, Inc. (E2CR) is pleased to submit this geotechnical investigation report for the referenced project. The geotechnical investigation was conducted for Johnson, Mirmiran & Thompson, Inc. (JMT) in general accordance with our proposal dated December 7, 2015. This letter report includes the field and laboratory tests and geotechnical recommendations.

SITE AND PROJECT DESCRIPTION

The project consists of the installation of an emergency generator at the Sparks Pumping Station. The site is located at 14073 York Road in the Sparks area of Baltimore County, Maryland. Figures 1 and 2 in the Appendix show the Site Vicinity Map and Aerial Photograph, respectively.

Our scope of services as directed by JMT was to perform one (1) soil test boring, conduct laboratory tests on representative soil samples, analyze the field and laboratory data, and provide recommendations for installation of concrete pad for the proposed emergency generator.

Based on information provided by JMT, the proposed generator weighs approximately 12.7 kips and will be supported on a 5.4 feet by 14.5 feet concrete pad.
FIELD INVESTIGATION AND LABORATORY TESTING

The subsurface conditions were explored by performing one (1) soil test boring (SB-1) at the proposed generator location. The boring was drilled to refusal at approximately 19 feet below the existing ground surface. The location of the soil test boring is shown on Figure 3, Boring Location Plan, in the Appendix. Standard Penetration Test (SPT) was conducted in the boring in accordance with ASTM D1586. A representative portion of each soil sample was placed in a glass jar, appropriately marked and transported to our laboratory for testing.

Groundwater levels were monitored in the boring during drilling and at the completion of drilling. The boring was backfilled with soil cuttings and bentonite grout upon completion.

Laboratory tests conducted on soil samples included natural moisture content, sieve analysis, and Atterberg limits tests. All tests were performed in general accordance with applicable ASTM procedures.

The results of the laboratory tests are summarized on a table which is included in the Appendix.

SUBSURFACE CONDITIONS

The edited Boring Log included in the Appendix contains data related to the subsurface conditions encountered at the boring location. The transitions between strata may be gradual and indistinct. The log indicates that the subsurface stratigraphy at the site consist of interlayered SILT and Silty SAND residual soils that were derived from the weathering of the parent rock. SPTs performed in the residual soils yielded N-values of 7 blows per foot (bpf) in the upper 5 feet and increased to more than 50 bpf in the bottom of the stratum.

Moisture content tests performed on samples from the boring resulted in moisture content values from 14.1 percent to 29.0 percent. Atterberg Limits tests performed on two (2) samples in the boring yielded Liquid Limit values of 34 and 37, with corresponding Plasticity Index values of 9 and 4, respectively. Based on the Atterberg Limits tests results, the soils can be considered as slightly to medium plastic and the Waterways Experiment Station (WES) classifies the soils as having low swell potential.

Groundwater was not encountered in the boring. Please note that perched groundwater conditions are common in the geology at the site. Fluctuation in precipitations, construction activity, surface runoff, and site specific factors could cause groundwater conditions to be different from those observed.
EVALUATION AND RECOMMENDATION

The recommendations presented herein are based on our understanding of the project, the engineering characteristics of the subsurface materials encountered in the soil test boring, and the anticipated behavior of the subsurface materials both during and after construction.

The proposed emergency generator can be supported on spread footings (pads). The minimum allowable footing depth is governed by the requirement for protection from frost effects. A minimum of 30 inches for frost protection should be provided for the generator pad.

The pad should be designed using an allowable bearing capacity of 2,000 psf. This bearing capacity is based on static conditions. Dynamic machine parameters were not available at the time this report was prepared. The anticipated service load of the emergency generator is approximately 12.7 kips, and will be supported on 5.4 feet by 14.5 feet concrete pad. Thus, the anticipated contact stress is approximately 165 psf. The available maximum soil bearing pressure of 2,000 psf should be adequate to support the proposed generator. Total and differential settlements are anticipated to be less than 1-inch and 0.5 inches, respectively. The slab should rest upon a minimum of 6 inches of free draining granular base such as AASHTO No. 57 stone. A waterproofing membrane shall be provided between the underside of the slab and the top of the granular base to limit moisture migration.

We appreciate the opportunity to provide our services to you on this project. If you have any questions or need additional information, please call us.

Very truly yours,

E2CR, Inc.

Alex Adu-Osei, Ph.D., P.E.
Project Manager

Siva Balu, P.E.
Chief Executive Officer
APPENDIX
APPENDIX

Figure 1: Site Vicinity Map
Figure 2: Aerial Photograph
Figure 3: Boring Location Plan

Boring Log
Laboratory Test Results
E2CR, INC.
Sparks Pumping Station
Baltimore County, Maryland
SITE VICINITY MAP

FIGURE: 1  DRAWN BY: AAO  CHECKED BY: SNG
DATE: February, 2016  JOB NO.: 16506-04  SCALE: NTS
<table>
<thead>
<tr>
<th>Depth</th>
<th>Strata Ele/Depth</th>
<th>Description</th>
<th>Sample No.</th>
<th>Sample Length</th>
<th>N-Value/RQD (%)</th>
<th>Sample Type and Diameter</th>
<th>Sample Recovery</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td>1 inch Topsoil</td>
<td>S-1</td>
<td>18</td>
<td>4-4-4</td>
<td>DS 14</td>
<td></td>
<td>.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Orange, brown, moist, medium stiff, Sandy SILT (ML)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.</td>
</tr>
<tr>
<td>461.5</td>
<td></td>
<td>Red, brown, moist, medium stiff, Silty SAND (SM)</td>
<td>S-2</td>
<td>18</td>
<td>2-3-4</td>
<td>DS 14</td>
<td></td>
<td>.</td>
</tr>
<tr>
<td>5</td>
<td>459.0</td>
<td>Tan, red, moist, loose, Silty SAND (SM)</td>
<td>S-3</td>
<td>18</td>
<td>8-5-5</td>
<td>DS 18</td>
<td></td>
<td>.</td>
</tr>
<tr>
<td>10</td>
<td>454.0</td>
<td>Tan, brown, slightly moist, medium stiff, SILT with Gravel, little Sand, Mica (ML)</td>
<td>S-4</td>
<td>18</td>
<td>5-5-5</td>
<td>DS 8</td>
<td></td>
<td>.</td>
</tr>
<tr>
<td>15</td>
<td>451.5</td>
<td>Tan, brown, slightly moist, very stiff, SILT with Gravel, little Sand, Mica (ML)</td>
<td>S-5</td>
<td>18</td>
<td>9-8-12</td>
<td>DS 13</td>
<td></td>
<td>2&quot; piece of Gravel Auger chatter at 2.5'</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>449.0</td>
<td>Tan, brown, slightly moist, very stiff, SILT with Gravel, little Sand, Mica (ML)</td>
<td>S-6</td>
<td>18</td>
<td>8-9-10</td>
<td>DS 16</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tan, brown, slightly moist, hard, SILT with Gravel, little Sand, Mica (ML)</td>
<td>S-7</td>
<td>18</td>
<td>15-20-18</td>
<td>DS 14</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-20</td>
<td></td>
<td>Boring terminated at 19.1'</td>
<td>S-8</td>
<td>4</td>
<td>50/4&quot;</td>
<td>DS 12</td>
<td></td>
<td>15'-19' shattered quartz in S-7, S-8, and S-9</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>S-9</td>
<td>1</td>
<td>50/1&quot;</td>
<td>DS 6</td>
<td></td>
<td></td>
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</table>
# TABLE 1. SUMMARY OF LABORATORY TEST RESULTS

SPARKS PUMPING STATION  
E2CR Project No. 16506-04

<table>
<thead>
<tr>
<th>Boring No.</th>
<th>Sample No.</th>
<th>Depth (feet)</th>
<th>Type</th>
<th>USCS</th>
<th>Moisture Content (%)</th>
<th>LL</th>
<th>PL</th>
<th>PI</th>
<th>GRAVEL (%)</th>
<th>SAND (%)</th>
<th>FINES (%)</th>
<th>Organic Content (%)</th>
<th>Stratum</th>
<th>Comment</th>
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</thead>
<tbody>
<tr>
<td>SB-1</td>
<td>S-1</td>
<td>1.0 - 2.5</td>
<td>Jar</td>
<td>ML</td>
<td>24.5</td>
<td>34</td>
<td>25</td>
<td>9</td>
<td>7.9</td>
<td>32.8</td>
<td>59.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>S-2</td>
<td>3.5 - 5.0</td>
<td>Jar</td>
<td>SM</td>
<td>29.0</td>
<td>37</td>
<td>33</td>
<td>4</td>
<td>9.7</td>
<td>43.7</td>
<td>46.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>S-3</td>
<td>6.0 - 7.5</td>
<td>Jar</td>
<td></td>
<td>14.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>S-4</td>
<td>8.5 - 10.0</td>
<td>Jar</td>
<td></td>
<td>15.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>S-5</td>
<td>11.0 - 12.5</td>
<td>Jar</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>S-6</td>
<td>13.5 - 15.0</td>
<td>Jar</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>S-7</td>
<td>16.0 - 17.5</td>
<td>Jar</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>S-8</td>
<td>18.5 - 20.0</td>
<td>Jar</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>
**LIQUID AND PLASTIC LIMITS TEST REPORT**

Dashed line indicates the approximate upper limit boundary for natural soils.

<table>
<thead>
<tr>
<th>MATERIAL DESCRIPTION</th>
<th>LL</th>
<th>PL</th>
<th>PI</th>
<th>%&lt;#40</th>
<th>%&lt;#200</th>
<th>USCS</th>
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</thead>
<tbody>
<tr>
<td>Orange, Brown, Sandy SILT</td>
<td>34</td>
<td>25</td>
<td>9</td>
<td>79.4</td>
<td>59.3</td>
<td>ML</td>
</tr>
<tr>
<td>Red, Brown, Silty SAND</td>
<td>37</td>
<td>33</td>
<td>4</td>
<td>76.4</td>
<td>46.6</td>
<td>SM</td>
</tr>
</tbody>
</table>

**Project No.** 16506-04  **Client:** JMT  **Remarks:**

**Project:** York Pumping Station

- **Source of Sample:** SB-1  **Depth:** 1.0’-2.5’  **Sample Number:** S-1
- **Source of Sample:** SB-1  **Depth:** 3.5’-5.0’  **Sample Number:** S-2

E2CR, Inc.  
Baltimore, MD
### Particle Size Distribution Report

**Material Description**
Orange, Brown, Sandy Silt

**Atterberg Limits**
- **PL** = 25
- **LL** = 34
- **Pl** = 9

**Coefficients**
- **D<sub>90</sub>** = 2.0442
- **D<sub>85</sub>** = 0.7964
- **D<sub>60</sub>** = 0.0828
- **D<sub>50</sub>** = 0.6039
- **D<sub>10</sub>** = 0.0673
- **Cu** = 4.6063
- **Cc** = 10.0963

**Classification**
- **USCS** = ML
- **AASHTO** = A-4(4)

**Remarks**
Natural Moisture: 24.5%

<table>
<thead>
<tr>
<th>Source of Sample: SB-1</th>
<th>Depth: 1.0'-2.5'</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample Number: S-1</td>
<td>Date: 1/28/2016</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SIEVE SIZE</th>
<th>PERCENT FINER</th>
<th>SPEC.* PERCENT</th>
<th>PASS? (X=NO)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td>2.5</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td>1.5</td>
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<td>1</td>
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<td></td>
</tr>
<tr>
<td>.75</td>
<td>95.8</td>
<td>95.8</td>
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<tr>
<td>.375</td>
<td>94.5</td>
<td>94.5</td>
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</tr>
<tr>
<td>#4</td>
<td>92.1</td>
<td>92.1</td>
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</tr>
<tr>
<td>#10</td>
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</tr>
<tr>
<td>#20</td>
<td>85.5</td>
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<tr>
<td>#40</td>
<td>79.4</td>
<td>79.4</td>
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</tr>
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<td>#60</td>
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<tr>
<td>#200</td>
<td>59.3</td>
<td>59.3</td>
<td></td>
</tr>
</tbody>
</table>

* (no specification provided)
Particle Size Distribution Report

**Material Description**
Red, Brown, Silty SAND

**Atterberg Limits**
- PL = 33
- LL = 37
- PI = 4

**Coefficients**
- D90 = 3.7443
- D85 = 1.0168
- D60 = 0.1680
- D50 = 0.0973
- D30 =
- D10 =
- Cu =
- Cc =

**Classification**
- USCS = SM
- AASHTO = A-4(0)

**Remarks**
Natural Moisture: 29.0%

---

**Source of Sample:** SB-1  
**Sample Number:** S-2  
**Depth:** 3.5'-5.0'

---

**E2CR, Inc.**  
**Baltimore, MD**  
**Client:** JMT  
**Project:** York Pumping Station  
**Project No:** 16506-04  
**Date:** 1/28/2016  

---

**SIEVE SIZE** | **PERCENT FINER** | **SPEC.* PERCENT (X=NO)** | **PASS? (X=NO)**
--- | --- | --- | ---
3 | 100.0 | |  
2.5 | 100.0 | |  
1.5 | 100.0 | |  
1 | 100.0 | |  
.75 | 100.0 | |  
.375 | 90.9 | |  
#4 | 90.3 | |  
#10 | 88.3 | |  
#20 | 83.7 | |  
#40 | 76.4 | |  
#60 | 68.0 | |  
#140 | 51.3 | |  
#200 | 46.6 | |  

*(no specification provided)*
APPENDIX E

ELEVATED TANK INSPECTION REPORT
INTERIOR EVALUATION OF THE
1,000,000 GALLON STEEL ELEVATED WATER TANK
"SPARKS TANK"
SPARKS, MARYLAND
FOR
BALTIMORE COUNTY
TOWSON, MARYLAND

December 5, 2015
15.268.E518.020
December 22, 2015

SUBJECT:

The subject of this report is the field evaluation of the interior of the 1,000,000 gallon steel elevated water tank at 14501 York Road in Sparks, Maryland. The tank was owned by Baltimore County and was known as the “Sparks Tank.” The field evaluation was performed on December 5, 2015 by Richard A. Racy and Cody W. Griffin of Tank Industry Consultants. The Owner's representative on the site at the time of the field evaluation was Michael Mazurek. Tank Industry Consultants had performed an exterior coating evaluation in 2010, the exterior was repainted in 2012, and Tank Industry Consultants performed a first anniversary evaluation of the exterior coating in 2014. The torus bottom tank was of welded steel construction. According to information on the tank nameplate, the tank was built in 1975 by Pittsburgh-Des Moines Steel Company under contract number 14094.

OBJECTIVE:

The purpose of this evaluation was to determine the condition of the tank interior. As the tank could not be drained for the field evaluation, the interior container was evaluated from the roof manhole and interior container ladder, and only the upper container and roof surfaces visible above the water level were observed. None of the bowl and riser interior could be viewed. The purpose of this report is to present the findings of the evaluation and to make recommendations for interior recoating, repairing, corrosion protection, and maintenance. Budget estimates for the work, anticipated life of the coating and the structure, and the replacement cost of the tank are also included.

AUTHORIZATION:

This evaluation and report were authorized in Delivery Order No. 00031905 dated October 28, 2015.

EXECUTIVE SUMMARY:

The interior coating system appeared to be in very poor condition and not providing adequate corrosion protection. Tank Industry Consultants recommends that the interior of this tank should be rehabilitated and recoated within a year.
ANSI/OSHA and Safety-Related Deficiencies: There were OSHA and safety-related deficiencies on this tank. These deficiencies included:

- up to 25% metal loss was noted on the top three rungs of the interior container ladder, and
- the head clearance on the interior container ladder at the roof manhole did not meet the required minimum (29 CFR 1910.27(c)(1)).

If the Owner wishes to fully comply with OSHA and safety-related standards, it is recommended that these deficiencies be rectified.

AWWA and Operational Deficiencies: There was a sanitary deficiency on this tank as well:

- the roof manhole cover overlap did not meet the required minimum (AWWA D100).

This deficiency should be corrected.

The safety-related, sanitary, and operating deficiencies listed above are not intended to be a complete list of deficiencies on this tank. The Owner should refer to the complete report text and accompanying photographs for a complete account of all observed deficiencies.

This evaluation and the reporting of the condition of this tank do not warrant the original structural condition of the tank or any of the original design for seismic loadings. Likewise, recommendations for this tank do not include modifications which may be required for compliance with present structural codes.

PHOTOGRAPHS:

Color photographs were taken of the visible portions of the tank interior and are included as a part of this report.

NOMENCLATURE:

Warning: Some appurtenances on this tank may be referred to as erection or rigging attachments, lugs, or brackets. This does not mean that they are safe for rigging. Each attachment for each tank should be evaluated on an individual basis by a structural engineer or an experienced rigger before being used. These devices may have been intended for only the original erectors and painters to use with specialized equipment.

ADHESION TESTS:

All adhesion tests performed during this evaluation were done in general accordance with ASTM D3359. The results are reported herein using the ASTM scale. The ASTM scale is a relative scale to rate adhesion from 0 to 5 with 5 being the best. A table of adhesion test results classification is included with this report.
HEAVY METALS TESTS:

A sample of the interior coating system was sent to a laboratory for inductively coupled plasma-atomic emission spectrometry analyses. The test results were as follows:

<table>
<thead>
<tr>
<th></th>
<th>Cadmium</th>
<th>Chromium</th>
<th>Lead</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mg/kg</td>
<td>mg/kg</td>
<td>mg/kg</td>
</tr>
<tr>
<td>Interior</td>
<td>&lt;25</td>
<td>96</td>
<td>510</td>
</tr>
<tr>
<td></td>
<td>&lt;0.0025%</td>
<td>0.0096%</td>
<td>0.051%</td>
</tr>
</tbody>
</table>

Tank Industry Consultants performs this test only to determine if there is lead, cadmium, or chromium present in the coating samples. To limit damage to the existing coating, only small areas were tested. The small number of samples taken and the difficulty of retrieving all primer from the steel profile may cause the tests performed to not accurately represent the total coating system. Variations in thickness, types of coatings applied, and the interim cleaning and painting operations will also affect the actual readings. The reliability of the results is also dependent on the amount of primer included in the sample. Additional testing to determine the amount of leachable contaminants present in the spent cleaning debris will need to be performed following cleaning operations at the time of repainting. Results from the laboratory analysis are included following the adhesion tables.

ULTRASONIC THICKNESS MEASUREMENTS:

Roof: (all readings were taken through coating)

Cap: 0.224 in. to 0.251 in.
Finger: 0.202 in. to 0.219 in.
Knuckle: 0.234 in. to 0.249 in.

OBSERVATIONS:

A. **Interior Surfaces**

PRIMARY ROOF MANHOLE:

Size: 24 in. diameter
Type: hinged
Curb: 5-1/2 in.
Overlap: 1-3/4 in.
Locked: yes
ROOF SUPPORT SYSTEM:
   Center Hub: approx. 6 in. x 6 in., angle
   Main Roof Stiffeners:
       Number: approx. 30
       Size: approx. 5 in. x 3 in. x 3/8 in., angle
   Circumferential Knuckle Stiffener: approx. 6 in. x 6 in. x 1/2 in., angle
   Roof Knuckle Stiffeners:
       Number: approx. 20
       Size: 3 in. x 2 in. x 1/4 in., angle

INTERIOR SHELL STIFFENING ANGLE:
   Size: approx. 6 in. x 4 in.
   Construction: intermittently welded to container

INTERIOR CONTAINER LADDER:
   Width: 16 in.
   Rung Size: 3/4 in. diameter
   Spacing: 12 in. on center
   Side Rails: 3-1/2 in. x 2-3/4 in. x 1/4 in., angle
   Toe Room: greater than 7 in.
   Head Clearance: 24 in. at roof manhole
   Top Brackets:
       Construction: welded to circumferential knuckle stiffener and bolted to ladder
       Size: 4 in. x 3/8 in., flat bar x 6 in. long
   Safe-Climbing Device: cable-type

1. **Interior Coating Condition**: The tank was not drained for the field evaluation. Due to the tank needing to remain in service and the limited visibility related to the black coal tar-type coating, the Owner elected to not have an interior evaluation performed by ROV. The coating on the interior roof surfaces of the tank appeared to be in very poor condition and was not providing adequate protection from corrosion to the steel. Coating was noted on the underside of roof stiffeners and on the visible shell below the fluctuation zone. The coating appeared to be a coal tar-type coating. Coal tar has a tendency to fill pits and hide areas of corrosion. Areas of corrosion may be hidden by the coal tar, and may not be detectable until abrasive cleaned to bare metal. Coal tar coatings have not been approved by NSF.

2. **Roof Manhole**: There was a sanitary and AWWA deficiency noted: the cover overlap of 1-3/4 in. did not meet the required minimum of 2 in. The roof was equipped with a manhole with a hinged and locked cover. The roof manhole was locked prior to and after this evaluation. Significant metal loss was observed on the interior of the roof manhole curb. (See photo 3)

3. **Roof Condition**: The coating on the roof plates appeared to be in very poor overall condition. Approximately 90% coating failure and corrosion were observed on the interior roof. The interior roof support structure consisted of intermittently welded radial roof stiffeners, roof knuckle...
stiffeners, and circumferential stiffeners. Up to 50% metal loss was noted on roof stiffeners and the circumferential stiffener at the top of the roof knuckle. Layered rust was observed on the circumferential stiffener at the top of the roof knuckle. Metal loss measurements taken on the roof during this evaluation indicated a typical pit depth of 3/32 in., and the deepest pit found measured less than 1/8 in. deep. Lugs were located on the roof stiffeners and roof knuckle stiffeners. The lugs should not be used for rigging or personnel access. (See photos 12-38)

4. Shell Condition: Coating appeared to be present on the visible shell below the fluctuation zone. An intermittently welded stiffening angle was located around the shell. Approximately 12 in. wide column post head stiffeners were observed on the interior container. It is the opinion of Tank Industry Consultants that the interior shell stiffening angle should not be used for rigging purposes. (See photos 39-40)

5. Interior Container Ladder: There were safety and ANSI/OSHA deficiencies noted: (1) up to 25% metal loss was noted on the top three rungs of the interior container ladder, and (2) the 24 in. head clearance on the interior container ladder at the roof manhole did not meet the required 30 in. minimum. Only the top 12 ft of the interior container ladder were visible at the time of the field evaluation. The top of the interior container ladder was bolted to brackets which were welded to the circumferential roof knuckle stiffener. The interior container ladder was equipped with a cable-type safe-climbing device. Due to metal loss, the interior container ladder should not be used for personnel access. (See photos 7-13)

RECOMMENDATIONS:

A. Interior Surfaces

Preface to Interior Recommendations: The interior surfaces below the top capacity level could not be completely evaluated due to the Owner not being able to drain the tank. Therefore, the following recommendations are based on the condition of the surfaces above the top capacity level. Prior to the preparation of specifications for interior rehabilitation work, the tank should be drained, washed out and thoroughly evaluated to more accurately determine the scope of work required. A complete evaluation of the interior and exterior would also reduce the number of potential change orders, and reduce the overall amount of the bids by eliminating uncertainty about the condition of the coating and steel.

1. Life of the Interior Coating: The interior coating system appeared to be in very poor condition and not providing adequate corrosion protection. Tank Industry Consultants recommends that the interior surfaces of this tank should be recoated within a year. It is recommended that when the interior is completely cleaned and repainted, an epoxy coating system should be used.

2. Coating Testing: Prior to preparation of specifications for the cleaning and coating of the interior of the tank, samples of the interior coating system should be subjected to laboratory analysis to test for ingredients which may at that time be subject to regulations concerning their handling and disposal.
3. **Recommended Interior Coating System:**

   a. **Epoxy Coating System:** The optimum long-life coating system presently available for the interior of water tanks is a two-component epoxy coating system. A three-coat epoxy system is recommended for the interior of this tank. This coating system should meet the certification criteria of ANSI/NSF 61 and state department of health regulations.

   b. **Coating Application:** When the interior is to be repainted, the entire tank interior should be cleaned to the equivalent of an SSPC-SP 10, Near-White Blast Cleaning and an epoxy coating system applied.

   c. **Service Life:** The typical life of a properly formulated and applied epoxy coating system is approximately 12 to 15 years in immersion service. Tank Industry Consultants defines the life of a coating as the expected service life before repainting becomes necessary due to coating failure and corrosion. The Owner could extend the service life of the coating by installing, properly maintaining and operating a cathodic protection system to help protect the steel surfaces in areas which have experienced coating failure.

4. **Cathodic Protection:** When the tank is rehabilitated the brackets and fittings should be installed for the future installation of a cathodic protection system.

   a. **Type:** When the cathodic protection system is installed, an ice-resistant cathodic protection system which features long-life anodes, automatic potential and current control, with an independently controlled circuit and anode for the riser should be specified.

   b. **Scheduling:** After the interior is completely cleaned and recoated, the cathodic protection system should not be energized until after the First Anniversary Inspection. The Owner should conduct washouts and evaluations approximately every 3 years to monitor the need for cathodic protection. As the interior coating begins to show signs of failure, the cathodic protection system should be energized to aid in minimizing corrosion below the top capacity level.

   c. **Maintenance:** Cathodic protection, if used and maintained properly, will control active corrosion below the water level and extend the useful life of a coating system. It should be noted that maintenance as recommended by the cathodic protection manufacturer is required for the cathodic protection system to work properly. Without proper monitoring, the cathodic protection system may operate too high and cause the coating to blister, or the system may operate too low and not adequately protect the exposed steel surfaces.

5. **Roof Support Structure:** After abrasive blast cleaning, the roof support structure should be carefully evaluated as metal loss repairs are likely to be necessary at areas where the metal loss was not previously visible.

6. **Pit Welding and Pit Filling:** After initial cleaning, all significant pitting which is found should be welded, and all pitting with rough edges that would make the pitting difficult to coat properly should be filled with a solventless epoxy seam sealer.

7. **Seam Sealing:** The existing roof manholes and existing roof vent intersections should be sealed with an epoxy seam sealer at the time of the interior recoating.
8. **Flexible Sealant**: The roof stiffener-to-roof interface and the unwelded lapped roof seams should be sealed with a flexible sealant at the time of the interior recoating.

9. **Seal Welding Roof Knuckle Stiffeners and Shell Stiffening Angle**: The shell stiffening angle should not be used for rigging or personnel access. Any intermittently welded stiffeners below the top capacity level should be seal welded.

10. **Rough Edges**: All unused brackets should be removed from the interior and exterior surfaces at the time of the next recoating. Any weld burrs, spatter, scars or rough edges in the steel should be ground smooth to provide a better surface for coating.

11. **Roof Manhole**: The existing roof manhole dimensions did not comply with current AWWA standards and significant corrosion was observed on the manhole. Therefore, the roof manhole should be replaced, and the new roof manhole should include a 2 in. overlapping cover. The roof manhole and cover should continue to be locked to improve water system security.

12. **Interior Ladder**: Interior ladders may be susceptible to ice damage and accelerated rates of corrosion. If the Owner decides to keep the interior ladder, the ladder should be replaced by a ladder which complies with current industry standards and should be equipped with a corrosion-resistant safe-climbing device.
ECONOMIC FACTORS:

Item | Cost | Life in Years
--- | --- | ---
Replacement of tank with a new one | $2,200,000\(^1\) | 75+ 

The following is a complete list of interior repairs and estimated costs for their respective recommendations found in the RECOMMENDATION section of this report.

<table>
<thead>
<tr>
<th>Item</th>
<th>Sanitary &amp; Safety</th>
<th>Scheduled Maintenance Repairs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean and Paint Interior:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP 10, 3-Coat Epoxy System</td>
<td></td>
<td>$360,000</td>
</tr>
<tr>
<td>Cathodic Protection System</td>
<td></td>
<td>15,000</td>
</tr>
<tr>
<td>Miscellaneous Chipping and Grinding</td>
<td></td>
<td>4,000</td>
</tr>
<tr>
<td>Seam Sealing</td>
<td></td>
<td>3,000</td>
</tr>
<tr>
<td>Pit Repair</td>
<td></td>
<td>5,000</td>
</tr>
<tr>
<td>Replacement of Roof Stiffeners</td>
<td></td>
<td>60,000</td>
</tr>
<tr>
<td>Replacement of Circumferential Roof Knuckle Stiffener</td>
<td></td>
<td>50,000</td>
</tr>
<tr>
<td>Replacement of Roof Knuckle Stiffeners</td>
<td></td>
<td>35,000</td>
</tr>
<tr>
<td>Seal Welding Roof Knuckle and Shell Stiffeners</td>
<td></td>
<td>15,000</td>
</tr>
<tr>
<td>Interior Container Ladder Removal</td>
<td></td>
<td>$2,000</td>
</tr>
<tr>
<td>Interior Container Ladder Replacement</td>
<td></td>
<td>6,000</td>
</tr>
<tr>
<td>Roof Manhole Replacement</td>
<td></td>
<td>5,000</td>
</tr>
<tr>
<td>Contingency Items</td>
<td></td>
<td>4,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6,000</td>
</tr>
</tbody>
</table>

Estimates are believed to be a high average of bids that would be received in 2016.

\(^1\) The replacement estimate includes costs associated with new tank fabrication and erection, foundation, painting, and engineering. The budget estimate given does not include costs associated with tank demolition, site acquisition, and distribution interruptions.
The following economic factors include only those work items which the Engineer believes to be the minimum to properly maintain this tank interior from an operational standpoint. Other items related to safety and risk management should be evaluated by the Owner.

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean and Paint Interior:</td>
<td></td>
</tr>
<tr>
<td>SP 10, 3-Coat Epoxy System</td>
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<td>Pit Repair</td>
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</tr>
<tr>
<td>Replacement of Roof Stiffeners</td>
<td>60,000</td>
</tr>
<tr>
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</tr>
<tr>
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<td>35,000</td>
</tr>
<tr>
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<td>15,000</td>
</tr>
<tr>
<td>Interior Container Ladder Removal</td>
<td>2,000</td>
</tr>
<tr>
<td>Roof Manhole Replacement</td>
<td>5,000</td>
</tr>
<tr>
<td>Contingency Items</td>
<td>10,000</td>
</tr>
</tbody>
</table>

**Total of Engineer's Recommendations** $564,000

Tank Industry Consultants has no control over the cost of labor, materials, or equipment, or over the contractors' methods of determining prices, or over competitive bidding, or the market conditions. Opinions of probable cost, as provided for herein, are to be made on the basis of our experience and qualifications and represent our best judgment as design professionals familiar with the design, maintenance, and construction of concrete and steel plate structures. However, Tank Industry Consultants cannot and does not guarantee that proposals, bids, or the construction cost will not vary from opinions of probable cost prepared for the Owner.

Due to the numerous potential scopes of work which exist, the Owner should obtain an updated budget estimate once the final scope of work has been determined. This would enable the Owner to accurately budget monies for additional mobilization costs and damaged coating rehabilitation costs.

Engineering and resident observation costs are not included in the Total of the Engineer's Recommendations because these fees are dependent upon the scope of work to be performed. Tank Industry Consultants performs all facets of the engineering services which would be required for this project. Estimated fees for engineering and resident observation will be furnished upon request.
CLOSURE:

Brief Summation: Baltimore County owns and operates a 1,000,000 gallon elevated water storage tank in Sparks, Maryland which is in need of interior rehabilitation and repainting. Proper maintenance after completing the recommendations herein would include periodic washouts and evaluations approximately every 3 to 5 years in accordance with AWWA recommendations, and the installation and proper maintenance of a new ice-resistant cathodic protection system with long-life anodes.

Contractor Selection: The work should be performed by a competent bonded contractor, chosen from competitive bids taken on complete and concise specifications. The coatings used should be furnished by an experienced water tank coating manufacturer, supplying the field service required for application of technical coatings.

Standards for Repairs and Coatings: All work done and coatings applied should be applied in accordance with NACE, ANSI/NSF Standard 61, the manufacturer’s recommendation, AWWA D100 and AWWA D102 (latest revisions), and the SSPC: The Society for Protective Coatings.

Observation of Work: Observation of the work in progress by experienced personnel will offer additional assurance of quality protective coating application. Observations can be performed on a continuous basis or spot (critical phase) basis. The actual cost of observation may be less using spot as opposed to full-time resident observation; however, with spot observation it is often necessary for work to be redone to comply with the specifications. This somewhat lowers the quality of the finished product, lengthens the job, and is frequently a cause of conflict between the contractor, Owner, and field technician. Resident full-time observation minimizes the amount of "rework" required.

Anniversary and Maintenance Evaluations: An anniversary evaluation should be conducted prior to the end of the one year bonded guarantee. Washouts and coating, structural, sanitary, safety, and corrosion evaluations should be conducted not less than every three years.

Time Frame: If the work is not performed within the next 12 months, the structure should be reevaluated prior to the preparation of specifications and solicitation of bids.

Specifications and Bidding Documents: The recommendations in this report are not intended to be specifications on which a contractor can bid. Complete bidding documents must include general and special conditions, detailed technical specifications, and other information necessary for the competitive bidding process. To properly protect the interests of the Owner, Contractor, and Engineer; the initial evaluation, the technical specifications, legal portions of the contract documents, and the observation should be performed by the same firm or with close coordination of all parties involved.

Limitations of Evaluation: It is believed that the conditions reported herein reflect the condition of the tank as observed on the date of the evaluation, using reasonable care in making the observations, and safety in gaining access to the tank. Should latent defects be discovered during the cleaning of the structure, they should be brought to the attention of the Owner and the Engineer.
Seismic and Wind Loadings: This tank is located in a region of low seismic activity. This evaluation and the reporting of the condition of this tank do not warrant the structural condition of the tank or any of the original design for seismic loadings. Likewise, recommendations for this tank do not include modifications that may be required for compliance with present structural codes. It is possible the tank was erected in compliance with pre-existing industry standards which have since been replaced by more restrictive standards.

Hazardous Materials in Coatings: It should be taken into consideration that Federal, State, and local environmental agencies have placed stricter controls on the removal of lead-based and other heavy-metal based coatings from steel structures by the use of conventional abrasive blasting techniques. The paint and blast residue may be considered to be hazardous waste depending on the concentration of lead or other particles in residue.

Please contact Tank Industry Consultants if you have any questions or comments.

Respectfully submitted,

Tank Industry Consultants

Patrick J. Brown, P.E.
Project Engineer

Gregory R. “Chip” Curtin
Managing Principal

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# Classification of Adhesion Test Results

**Method A – X Cut Tape Test**
Approx. 1.5 in. long cuts at 30 deg. to 45 deg. apart.

<table>
<thead>
<tr>
<th>Surface</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>No peeling or removal.</td>
<td>X</td>
</tr>
<tr>
<td>Trace peeling or removal along incisions.</td>
<td>X</td>
</tr>
<tr>
<td>Jagged removal along incisions up to 1/16 in. (1.6mm) on either side.</td>
<td>X</td>
</tr>
<tr>
<td>Jagged removal along most of incisions up to 1/8 in. (3.2mm) on either side.</td>
<td>X</td>
</tr>
<tr>
<td>Removal from most of the area of the X under the tape.</td>
<td>X</td>
</tr>
<tr>
<td>Removal beyond the area of the X.</td>
<td></td>
</tr>
</tbody>
</table>

**Method B – Lattice Cut Tape Test**
Six parallel cuts at 2mm apart.

<table>
<thead>
<tr>
<th>Surface</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>The edges of the cuts are completely smooth; none of the squares of the lattice are detached.</td>
<td>No Failure</td>
</tr>
<tr>
<td>Small flakes of the coating are detached at intersections; less than 5% of the lattice is affected.</td>
<td></td>
</tr>
<tr>
<td>Small flakes of the coating are detached along edges and at intersections of cuts. The area affected is 5% to 15% of the lattice.</td>
<td></td>
</tr>
<tr>
<td>The coating has flaked along the edges and on parts of the squares. The area affected is 15% to 35% of the lattice.</td>
<td></td>
</tr>
<tr>
<td>The coating has flaked along the edges of cuts in large ribbons and whole squares have detached. The area affected is 35% to 65% of the lattice.</td>
<td></td>
</tr>
<tr>
<td>Flaking and detachment worse than grade 1.</td>
<td></td>
</tr>
</tbody>
</table>

ASTM 3359 Standard Test Methods for Measuring Adhesion by Tape Test

**Tank Industry Consultants**

7740 West New York Street
Indianapolis, Indiana 46214

Telephone - 317/271-3100
FAX - 317/271-3300

298
REPORT OF ANALYSIS

Test Method: SOP SW846/3050B/7420M

Lab Sample # | Field Sample # | Sample Description | Result in mg/kg | Result in % by Weight | Reporting Limit mg/kg | % Weight
---|---|---|---|---|---|---
951961 | 1 | INTERIOR | 510 | 0.051 | 63 | 0.0063

Note: 1. EPA guidelines require identification of paint samples as "lead based paint" when concentrations are found to be greater than 0.5% by weight (5000 mg/kg); 2. Quality control results in this report are acceptable; 3. Results relate only to the items tested; Batta Laboratories, Inc. is not responsible for sample collection, nor interpretations made by others; 4. This report does not constitute endorsement by AIHA LAP, LLC., NVLAP and/or any other U.S. governmental agencies; and 5. Lab results/calculations are reported in 2 significant figures. Clients data/measurements are reported as they were submitted.

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Analyst: T Okavage
QA/QC By: N.C. Batta/R Shumate (QA/QC Officer)
# REPORT OF ANALYSIS

Test Method: SOP SW846/3050B/7420M

<table>
<thead>
<tr>
<th>Lab Sample #</th>
<th>Field Sample #</th>
<th>Sample Description</th>
<th>Result in mg/kg</th>
<th>Result In % by Weight</th>
<th>Reporting Limit mg/kg</th>
<th>% Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>051062</td>
<td>1</td>
<td>INTERIOR</td>
<td>98</td>
<td>0.0096</td>
<td>25</td>
<td>0.0025</td>
</tr>
</tbody>
</table>

**Note:** 1. EPA guidelines require identification of paint samples as "lead based paint" when concentrations are found to be greater than 0.5% by weight (5000 mg/kg); 2. Quality control results in this report are acceptable; 3. Results relate only to the items tested; Battla Laboratories, Inc. is not responsible for sample collection, nor interpretations made by others; 4. This report does not constitute endorsement by AIHA LAP, LLC., NVLAP and/or any other U.S. governmental agencies; and 5. Lab results/calculations are reported in 2 significant figures. Clients data/measurements are reported as they were submitted.

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**Analyst:** T Okavage  
**QA/QC By:**  
N.C. Batta/R Shumate (QA/QC Officer)
## REPORT OF ANALYSIS

**Test Method:** SOP SW846/3050B/7420M

<table>
<thead>
<tr>
<th>Lab Sample #</th>
<th>Field Sample #</th>
<th>Sample Description</th>
<th>Result in mg/kg</th>
<th>Result in % by Weight</th>
<th>Reporting Limit mg/kg</th>
<th>% Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>051963</td>
<td>1</td>
<td>INTERIOR</td>
<td>&lt; 25</td>
<td>&lt; 0.0025</td>
<td>25</td>
<td>0.0025</td>
</tr>
</tbody>
</table>

**Note:** 1. EPA guidelines require identification of paint samples as "lead based paint" when concentrations are found to be greater than 0.5% by weight (5000 mg/kg); 2. Quality control results in this report are acceptable; 3. Results relate only to the items tested; Battø Laboratories, Inc. is not responsible for sample collection, nor interpretations made by others; 4. This report does not constitute endorsement by AIHA LAP, LLC., NVLAP and/or any other U.S. governmental agencies; and 5. Lab results/calculations are reported in 2 significant figures. Clients data/measurements are reported as they were submitted.

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**Analyst:** T Okavage

**QA/QC By:** N.C. Batta/R Shumate (QA/QC Officer)
1. Tank.

2. Tank nameplate.
3. Corrosion on interior of roof manhole.

4. Sensor below roof.
5. Mounting bracket for sensor on interior roof.

6. Interior container ladder safe-climbing device.
7. Interior container ladder.

8. Corrosion and metal loss on interior container ladder rung.
9. Corrosion and metal loss on interior container ladder rung.

10. Interior container ladder bracket.
11. Interior container ladder bracket.

12. Corrosion on circumferential roof knuckle stiffener.
13. Corrosion on interior roof and stiffeners.

15. Corrosion and metal loss on circumferential roof knuckle stiffener.

17. Corrosion on roof stiffener.

18. Interior roof stiffeners.
19. Lug on interior roof stiffener.

20. Corrosion and metal loss on roof stiffener.

22. Corrosion on interior roof.
23. Corrosion on interior roof.

25. Corrosion on interior roof and roof stiffener.

27. Corrosion on circumferential roof knuckle stiffener.

28. Corrosion on circumferential roof knuckle stiffener.
29. Corrosion and metal loss on roof stiffeners.

30. Corrosion on roof stiffener.
31. Corrosion and metal loss on circumferential roof knuckle stiffener.

32. Corrosion and metal loss on roof stiffener.
33. Roof stiffeners.

34. Corrosion and metal loss on roof stiffeners.
35. Corrosion and metal loss on circumferential roof knuckle stiffener.

36. Roof knuckle stiffener.
37. Roof knuckle stiffener and interior shell stiffening angle.

38. Roof knuckle stiffener.
39. Roof knuckle stiffener, interior shell stiffening angle, and post head stiffener.

40. Interior shell stiffening angle and post head stiffener.
SECTION 01020

ALLOWANCES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Drawings, General Provisions, including general and supplementary conditions, and Special Provisions of the contract, apply to the work of this section.

B. Coordinate allowance work with related work to ensure that each section is completely integrated and interfaced with related work.

1.02 DESCRIPTION OF REQUIREMENTS

A. Definitions and Explanations: Certain requirements of the work related to each allowance are shown and specified in contract documents. The allowance has been established in lieu of additional requirements for that work and further requirements thereof will be issued by change order.

B. Types of allowances scheduled herein for the work including the following:

   1. Lump sum allowances.
   2. Unit price allowances.

C. Submit proposals and recommendations for purchase of products or systems of allowances in form specified for change orders.

D. Change Order Data: Where applicable, include in each change proposal both the quantities of products being purchased and unit costs along with total amount of purchases to be made. Where requested, furnish survey of requirements data to substantiate quantities. Indicate applicable taxes, delivery charges, and amounts of applicable trade discounts.

E. Prepare and submit substantiation of a change in the scope of work (if any) claimed in the change orders relate to unit-cost type allowances.

F. The County reserves the right to establish the actual quantity of work in place by an independent quantity survey, measure, or count.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Furnish materials required to accommodate the work requested by the Allowance.
2.02 CONTINGENT ALLOWANCE

A. Included in the Contract Proposal bid items fixed price contingent Bid Item 5 for a total quantity of 150 cubic yards of Contingent Class 3 Excavation and Selected Backfill in accordance with Section 301 and 302 of the Standard Specifications. The fixed price bid item shall only be used if the County and the Engineer review the proposed work and give prior approval.

B. Included in the items is a lump sum contingent allowance of $75,000 for Bid Item 6 to be included in the total cost for contract to provide:

1. Electrical/Instrumentation & Control related additions or changes determined to be necessary in the field during construction.

2. Additions, changes or enhancements to the pump control system including, but not necessarily limited to, hardware, software, conduit and wiring.

3. Additions, changes or enhancements to the SCADA system including, but not necessarily limited to, hardware, software, and integration at the pumping station, conduit and wiring, and any associated work at the City’s Telemetry Control Center at the Ashburton Facility.

4. Any additional electrical, instrumentation & control, pump control, or SCADA system adjusting, calibration, integration, testing, or training deemed to be necessary by the County during the contract period.

5. Note that this allowance does not include payment for programming. Miscellaneous System Integrator Programming is paid for separately and is described in Paragraph 2.02I of this section.

C. Included in the Contract Proposal bid items is unit price contingent Bid Item 7 for a total of 30 man-hours for Tank Rehabilitation Welding above and beyond the Elevated Tank work described in Specification 01000 for Bid Item 2. The unit price shall only be used if the County and the Engineer review the proposed work and give prior approval. Any hours above and beyond that specified herein shall be paid at the same unit cost. The labor and material cost for Tank Rehabilitation Welding shall be paid for at the unit price per man-hour as listed on the bidder’s proposal. Description of work is as follows:

After the initial abrasive blast cleaning, any pits defined for pit welding by the Engineer shall be repaired by welding. All areas of apparent seam deterioration shall be initially abrasive blast cleaned, and any seam corrosion or undercut defined by the Engineer shall be repaired by arc-gouging or grinding the deteriorated weld seem and welding. Any areas of extensive metal loss or holes in the roof or bowl identified by the Contractor and agreed to by the Engineer and Owner shall be repaired by welding a patch plate, the same thickness of the roof or bowl, over the area. Edges of the holes shall be ground smooth prior to installation of the patch plate. No patch plate shall be smaller than 6 in. in diameter. Edges of the patch plate shall lap no less than 2 in. from the edge of a hole. Corners on the patch plate shall be rounded to 2 in. radius minimum or the plates shall be circular. All exposed edges of the patch plates shall be ground to 1/16 in. radius minimum of 3 in from existing weld seams, or if an existing weld seam must be overlapped the patch plate shall be rectangular with radiused corners and extend a
minimum of 6 in. beyond the existing weld seam. The patch plates shall be welded all around with continuous fillet welds. All welds shall be multi-pass welds. Note the roof or bowl is likely to be thin in the areas of the patch plates, and as such, attachment welds and the weld procedures (e.g. electrode size and heat input) shall account for this likelihood. A detailed inspection summary and cost shall be provided for review prior to commencing work.

D. Included in the Contract Proposal bid items is unit price contingent Bid Item 8 for a total of 4 gallons of seam sealer for Pit Filling and Surfacing above and beyond the Elevated Tank work described in Specification 01000 for Bid Item 2. The unit price shall only be used if the County and the Engineer review the proposed work and give prior approval. Pit Filling and Surfacing shall be paid for at the unit price per gallon of seam sealer applied and accepted, as listed on the bidder’s proposal. Any volume of seam sealer for Pit Filling and Surfacing above and beyond that specified herein shall be paid at the same unit cost. Description of work is as follows:

After the specified surface preparation, all pits, rough areas or seams defined for pit filling or surfacing by the Engineer, and approved by the Owner, shall be filled with solventless polyamide epoxy seam sealer of the type recommended by the supplier of the interior paint system. Costs for all labor, equipment, supplies, rigging, and other associated costs for application of the solventless polyamide epoxy seam sealer shall be paid for at the unit price per gallon listed in the bidder’s proposal. A detailed inspection summary and cost shall be provided for review prior to commencing work.

E. Included in the Contract Proposal bid items is unit price contingent Bid Item 9 for a total of 80 man-hours for Interior Chipping and/or Grinding above and beyond the Elevated Tank work described in Specification 01000 for Bid Item 2. The unit price shall only be used if the County and the Engineer review the proposed work and give prior approval. Interior Chipping and/or Grinding shall be paid for at the unit price per man-hour as listed on the bidder’s proposal. Any hours above and beyond that specified herein shall be paid at the same unit cost. Description of work is as follows:

Any existing irregular surfaces which are not associated with the rehabilitation work described within the Contract Documents, including but not limited to surface protrusions, burrs, fitting scars, sharp edges or corners, weld spatter, weld overlap and rough weld beads, shall be removed from all interior surfaces of the tank in accordance with the Contract Specifications. A detailed inspection summary and cost shall be provided for review prior to commencing work.

F. Included in the Contract Proposal bid items is a lump sum contingent allowance of $15,000 for Bid Item 10 to be included in the total cost for contract to provide:

1. Replacement of damaged wood and/or roof substrate. The allowance shall only be used if the County and Engineer review the proposed work and give prior approval.

G. Included in the Contract Proposal bid items is a lump sum contingent allowance of $40,000 for Bid Item 11 to be included in the total cost for contract to provide:
1. Miscellaneous work required by BGE for unforeseen modifications to and/or relocation of existing electric service equipment and/or utility infrastructure deemed necessary by the County and Engineer to complete the construction of the project. The allowance shall only be used if the County and the Engineer review the proposed work and give prior approval. The allowance shall not be used for any BGE charges or work that is required by the Contractor for the installation of electric service as defined on the Contract Drawings. The allowance shall not be used for any work related to the Contractor’s installation of temporary service during construction.

H. Included in the Contract Proposal bid items is unit price contingent Bid Item 12 for a total of 60 man-hours for Miscellaneous Elevated Tank Rehabilitation work. This work shall be in excess of the elevated tank rehabilitation work described within the Contract Documents, including but not limited to, the work described in Specification 01000 for Bid Item 2. The unit price shall only be used if the County and the Engineer review the proposed work and give prior approval. The Contractor shall provide Miscellaneous Elevated Tank Rehabilitation services which shall be paid for at the unit price per man-hour as listed in the bidder’s proposal. Any hours above and beyond that specified herein shall be paid at the same unit cost.

I. Included in the Contract Proposal bid items is unit price contingent Bid Item 13 for a total of 120 man-hours to cover Miscellaneous System Integrator Programming for any one of, or combination of PLC devices, OIT devices, and HMI devices. Work shall be limited to PLC/OIT/HMI programming, program documentation, and related tasks not currently described by the Contract Documents for a fully functioning pumping station (including disinfection) and elevated tank system capable of both local operation and remote operation from Ashburton TCC. The 120 hours shall be used entirely at the discretion of the Owner. Work associated with this task shall only be performed with a written, detailed description of the service or task requested, the expected expenditure of hours, and written authorization from the Owner to utilize the referenced hours. The Contractor shall provide Miscellaneous System Integrator Programming services which shall be paid for at the unit price per man-hour as listed in the bidder’s proposal. The hourly rate for this additional programming task shall include all overhead, profit, subcontractor and Contractor markups, warranty, taxes (where applicable), mobilization, travel, and any and all other fees associated with the Contract. This work effort shall take place at the pumping station, elevated tank, Ashburton TCC, or elsewhere as directed and approved.

J. Included in the Contract Proposal bid items is a lump sum contingent allowance of $50,000 for Bid Item 14 to be included in the total cost for contract to provide:

1. Replacement and/or repair related to the vault drains resulting from the inspections performed in accordance with Specification 02661.

K. All contingent allowances and contingent bid items shall include material cost, receiving, handling, installation, and Contractor’s overhead and profit.

PART 3 – EXECUTION

(NOT USED)
SECTION 01040
ELEVATED TANK REHABILITATION COORDINATION

PART 1 - GENERAL

1.01 GENERAL

A. Coordination of the Project, and each portion of the Work on this Project shall be performed by the CONTRACTOR to achieve a quality product in an expedient manner in general accordance with this Section.

B. Refer to Specification 01300 for additional sequencing requirements.

1.02 PROJECT CONDITIONS

A. Schedule Submittal: Within two weeks after receipt of the Notice to Proceed and prior to starting the Work, the CONTRACTOR shall submit a bar chart or progress schedule indicating the anticipated schedule of the following functions:

1. Move onto site and rig tank, including containment
2. Repair Work (concrete and steel)
3. Cleaning and priming interior surfaces
4. Finish painting interior surfaces
5. Spot cleaning and spot priming exterior surfaces
6. Spot intermediate painting exterior surfaces
7. Spot finish painting exterior surfaces
8. Tank disinfection
9. Site clean-up.

Also indicated on the bar chart or progress schedule shall be the anticipated progress payment schedule of values. The bar chart and payment request schedule shall be updated monthly and submitted with the payment request. No separate payment shall be made for bonds, insurance, design, drawings, mobilization, containment of the cleaning and/or painting debris, or paint materials not incorporated into the Work.

B. Safety Analysis Forms and Meetings: The CONTRACTOR is required to thoroughly review all phases of the project and complete and submit the "Job Safety Analysis" and the "Construction Safety Checklist" prior to mobilizing to the site. Each subcontractor shall submit these forms for their work at the site as well. The CONTRACTOR shall update the forms as the project progresses or if there is a change
of personnel at the site. Once the site work begins, the CONTRACTOR’S COMPETENT PERSON shall complete the "Daily Site Safety Survey Report" and a "Contractor Daily Sign-in Form" to be presented to the FIELD OBSERVER at the end of each day. The CONTRACTOR shall hold daily safety meetings to discuss specific activities and events for the day and the safety ramifications. This shall be recorded each day, with a list of the attendees.

CONTRACTOR shall establish a safety program in accordance with applicable State and Federal laws. CONTRACTOR shall designate a specific individual as the Project Safety Officer and provide the necessary contact information to OWNER prior to the issuance of the Notice to Proceed.

The CONTRACTOR shall, at least 5 days prior to the start of construction, submit for OWNER's review the following information:

1. A Company Safety Plan. This plan shall include general safety information including but not limited to responsibilities, safety meetings, and reporting requirements.

2. A Site Specific Safety Plan. This plan shall identify specific safety requirements associated with all portions of the work.

3. A Job Safety Analysis (JSA). The JSA shall be submitted for major work activities including but not limited to traffic control, facilities demolition, handling of asbestos containing waste, explosive handling, priming of explosives, and detonation of explosives. The JSA shall list the activity, and for each activity, shall evaluate the safety hazard and develop the recommended safety solution in terms of field procedures.

4. The Contractor Safety Checklist is to be completed and signed prior to the start of work.

5. The Job Site Safety Survey is to be completed by the Project Safety Officer before work begins each day.

6. Once the required safety procedures are established, the CONTRACTOR shall brief staff including subcontractors staff, and implement and monitor the safety program throughout the period of construction.

C. Subcontracting: Cleaning and painting of the elevated tank shall only be performed by a Contractor or Subcontractor that is prequalified by Baltimore County to perform such work. If a SUBCONTRACTOR is used for other Work, the name and address of the proposed SUBCONTRACTOR shall be stated in the Bid Form.

D. Verification of Dimensions: CONTRACTOR shall verify all dimensions prior to fabrication or ordering any materials or parts needed or this Project. No additional compensation will be made to the CONTRACTOR for items that have to be modified, cut, or replaced because of inadequate dimensions used in ordering or fabricating items.
E. **Tank Empty for Painting:** The tank shall be drained during all cleaning, application, and curing of the coating. CONTRACTOR shall provide and administer into the tank enough dechlorinating chemical in accordance with AWWA C652 to neutralize the residual chlorine concentration and bring the chlorine residual inside the tank to 0.0 ppm.

F. **Protecting Equipment:** The antenna, telemetry, sensor, other electrical apparatus, and other equipment on the tank and on the site, including all wiring, shall be protected from all damage and dust or other deleterious material infiltration during the operations of the CONTRACTOR. The operation of the equipment shall be continued during the repair, cleaning, and painting operations. Any items damaged by the operations of the CONTRACTOR shall be replaced in kind or acceptably repaired by the CONTRACTOR at no cost to the OWNER.

G. **Fire Watch:** All equipment and wiring shall be protected from sparks, fire, weld spatter or other potential heat and/or ignition sources. CONTRACTOR shall have a trained employee equipped with proper fire suppression equipment stationed on the ground at all times that personnel are cutting, welding, or grinding on the tank or structure.

H. **Welding Repairs:** All welding repairs to the interior or exterior of the tank are to be made prior to all painting operations. Any resulting burrs, weld spatter, sharp edges, corners, or rough welds which would cause difficulty in applying a holiday-free coating shall be ground smooth. This grinding is considered incidental to the welding work and is to be included in the Base Bid. After grinding, these areas shall be cleaned to produce the profile recommended by the manufacturer of the coating system. (See Welding and Cutting Precautions paragraph in Section 01060 – Elevated Tank Rehabilitation Regulatory Requirements of these specifications for more requirements on welding.)

I. **Cleaning Areas of Welding and/or Grinding:** It shall be necessary to remove the coating prior to the welding of the new items to the tank. All areas that have been welded and/or ground smooth shall be cleaned prior to painting to provide proper profile for the coating system. Areas to be welded shall be welded prior to the final cleaning and painting of surfaces within the heat-affected zone. The heat-affected zone includes the opposite side of the plate or member being welded. Even if not specifically mentioned as a part of the Work under this Agreement, those areas of paint or coatings in the heat-affected zone of areas not specified to be painted shall be cleaned and painted in accordance with the requirements listed in these detailed technical specifications.

J. **Operation of Valves and Equipment:** All operations which would include closing valves, switching, starting, stopping, or removal from service of any equipment shall be done by the OWNER’s or Baltimore City’s personnel. If the CONTRACTOR desires the OWNER or Baltimore City to close valves, operate switches, start, stop, or remove any equipment from service, the CONTRACTOR shall submit a written request to the OWNER and Baltimore City, and if the OWNER or Baltimore City determines that such action will not adversely affect the operations of the OWNER to provide water, then the OWNER or Baltimore City’s may close valves, operate switches, start, stop, or remove the equipment from service. Such requests shall be
directed to the PROJECT REPRESENTATIVE so interruptions, if any, of the OWNER'S operations or systems will be no longer than necessary. The CONTRACTOR shall have a full complement of personnel working on a continuous basis until the Work causing the interruption is completed. All Work performed under this Agreement shall be performed in close cooperation with the OWNER.

K. Site Security: When not working on the tank or site (such as during the evening, weekends, holidays, or rain days), the CONTRACTOR shall secure all openings in the tank (greater than 8 in.), the exterior ladder, and access or rigging devices. Openings in the tank needed during ventilation of the tank shall be secured with bars, grating, or other means to allow sufficient air flow through the opening. The CONTRACTOR shall lock the site fence to prevent unauthorized personnel from gaining access to the site, the interior of the tank, and the CONTRACTOR'S equipment and supplies. The CONTRACTOR shall be solely responsible for the security of the site, tank, equipment, and supplies during both working and non-working hours.

L. Public Safety: CONTRACTOR shall protect the public from harm caused by the CONTRACTOR'S actions and performance of the work. Prior to start of work or mobilization on site, the CONTRACTOR shall submit a site-specific Public Safety Plan based on the CONTRACTOR'S selected work methods to the ENGINEER. The Public Safety Plan shall include necessary plans and procedures to protect the general public from harm. The Plan should include such items, but not be limited to, requirements for safety exclusion zones, warning sign type and placements, protective barriers, safety and warning devices, devices for daylight and nighttime protection, and all devices required by state and local requirements. CONTRACTOR shall include a site plan summarizing the requirements of the Public Safety Plan for the specific work on the tank. CONTRACTOR'S Plan shall include the name of the Competent Person responsible for enforcing the certified Public Safety Plan.

M. Traffic Control Plan: The CONTRACTOR shall permit traffic to pass around the Project site with the least possible inconvenience or delay. The CONTRACTOR shall maintain existing roads and streets within the Project limits, keeping them open, and in good, clean, and safe condition at all times. If any traffic lane closures are necessary, the CONTRACTOR shall provide all flaggers, signs, and other traffic control devices necessary to warn and protect the public at all times from injury or damage as a result of the CONTRACTOR'S operations that may occur on highways, roads, and streets. The CONTRACTOR shall submit a traffic control plan to the ENGINEER. If no disruption of traffic is anticipated, then the CONTRACTOR shall submit a statement indicating this.

N. OWNER Performed Work: The CONTRACTOR shall cooperate with the OWNER who may be conducting other operations on or near the tank. The CONTRACTOR shall clean and paint all areas added or disturbed by the OWNER on the tank and attached accessories.

O. Furnishing and Installation of Items: Any reference in these specifications to furnishing an item or installing an item shall mean the item shall be both furnished and installed by the CONTRACTOR, unless specifically stated otherwise. Replacement shall mean the removal and legal disposal of the existing items, and furnishing, and installation of the new items specified.
P. **Electrical Hazards:** The CONTRACTOR shall at a minimum take the following safety measure to prevent accidents due to electrical hazards:

1. **Electric Service Wiring:** The CONTRACTOR shall be aware of the electric service wiring attached to and located adjacent to the tank. The CONTRACTOR shall relocate, deactivate, or provide necessary electric shock hazard protective devices to prevent exposure of workers and/or equipment to electric shock hazards. The CONTRACTOR shall verify that there is sufficient electric shock hazard protection for the workers and equipment prior to and throughout each working period on the job. The verification of the electric shock hazard protection is the sole responsibility of the CONTRACTOR and shall be accomplished without supervision from the OWNER, ENGINEER, FIELD OBSERVER, or other direct or indirect agents of the OWNER.

**PART 2 -- PRODUCTS**

**NOT USED**

**PART 3 -- EXECUTION**

3.01 **QUALITY ASSURANCE**

A. **CONTRACTOR’S Personnel:** The CONTRACTOR shall have a full complement of personnel, for the proper coordination and expedition of the work, on a continuous basis until the work is completed.

B. **Notification:** The CONTRACTOR shall notify the OWNER and the ENGINEER at least seven (7) days before starting the Work at the site. The CONTRACTOR shall reconfirm the commencement of Work with the OWNER and ENGINEER twenty-four (24) hours prior to starting work at the site.

C. **Emergency Information:** The CONTRACTOR shall construct a plywood sign covered with a weatherproof, clear plastic cover and supported by wood posts. The CONTRACTOR shall post information on the plywood sign concerning emergency medical, fire, rescue and hazardous waste phone numbers from which personnel on the site can obtain information if needed. The CONTRACTOR shall also list the name and number of a representative of the CONTRACTOR who can be reached 24 hours a day in case of an emergency. The emergency information shall be in a central position, located so it is visible and accessible 24 hours a day. The emergency information shall be posted the entire length of time that the CONTRACTOR is performing Work at the tank site.

D. **Contractor Supervision:** The CONTRACTOR shall provide a competent superintendent, satisfactory to the OWNER, for the Work at all times during working hours with full authority to act for him/her. The on-site superintendent shall not be replaced without prior written notification and written approval of the ENGINEER. The CONTRACTOR shall also provide an adequate staff for the proper coordination and expedition of his work. Should, in the opinion of the OWNER, any language barrier exists between the on-site superintendent and the OWNER or FIELD OBSERVER, the CONTRACTOR shall employ a qualified full-time interpreter or provide a new on-site superintendent at no additional cost to the OWNER. The on-site superintendent shall be bi-lingual if any workers are not proficient in English.
E. **CONTRACTOR'S Accreditation:** The CONTRACTOR shall comply with the requirements of the Maryland Lead Paint Abatement Services Accreditation Program.

F. **Work Schedule:** The repairing, cleaning, and painting shall be accomplished in such a way as to minimize the length of time the tank is out of service and to minimize the number of days required for observing the repairing, cleaning, and painting operations. **The CONTRACTOR'S attention is directed to the OWNER' S Requirements concerning Contract Time.**

G. **Times for Work:** No repairing, cleaning or painting is to be done in the night period between sunset and sunrise. The times for Work shall also comply with local; state, and federal regulations and laws regarding days of week, noise, and interference with activities of surrounding property owners. The following exceptions may apply:

1. **Repair Work:** Should tank interior temperatures be excessive for personnel welfare during daylight hours or should other job conditions make nighttime Work beneficial to the CONTRACTOR and OWNER, written permission may be granted by the ENGINEER and OWNER to conduct repair Work at night. This permission shall only be granted if the CONTRACTOR provides the proper lighting and safety equipment and informs the neighboring occupants and property owners.

2. **Cleaning and Painting Work:** Should tank interior temperatures be excessive for paint application or personnel welfare during daylight hours or should other job conditions make nighttime Work beneficial to the CONTRACTOR and OWNER, written permission may be granted by the ENGINEER and OWNER to conduct Work at night. This permission shall only be granted if the necessary steel temperature, air temperature, humidity and dew point conditions are present and recorded during the application and initial drying or curing of the coatings. Also, the CONTRACTOR must provide the proper lighting and safety equipment and inform the neighboring occupants and property owners.

H. **Observation:** The OWNER plans to engage Tank Industry Consultants or another designated representative of the OWNER, to perform full-time observation of the repair Work, cleaning, and painting. However, the OWNER reserves the right to engage only intermittent observation services. The CONTRACTOR shall notify and make available to the FIELD OBSERVER for observation of the fit-up of any new and/or replacement parts prior to welding and following post-weld cleanup. The CONTRACTOR shall notify and make available to the FIELD OBSERVER for observation all surfaces to be coated.

I. **Accessibility for Observation:** All Work shall be made accessible to the FIELD OBSERVER using the CONTRACTOR'S rigging and equipment. If assistance is required for the FIELD OBSERVER to safely access the work, the CONTRACTOR shall furnish labor to assist the FIELD OBSERVER. The cost of this labor shall be included in the base contract amount.

J. **Attractive Nuisances and Cleanup:** The job site shall be kept in a clean and safe condition at all times. Hazards or attractive nuisances shall be protected at all times. Upon completion of the Work, the job site and all nearby sites impacted by the Work
activities shall be left clean of all debris or any other items resulting from the operations of the CONTRACTOR. The cost of any cleanup which must be done by the OWNER shall be deducted from funds due the CONTRACTOR. Impervious drip pans or double layers of plastic sheeting (each at least 6 mil thick) shall be placed under any compressors, generators, paint pumps, mixers, welding machines, etc. to prevent oils, solvents, organic compounds, or other contaminants from leaching into the soil. Fuel storage tanks, thinners, and other potentially hazardous materials shall be placed inside secondary containment structures to prevent contaminants from leaching into the soil. Any oils, solvents, organic compounds, or contaminants spilled on the site during the process of the Work shall be immediately removed and cleaned up by the CONTRACTOR. Any earth contaminated by a spill shall also be removed and replaced with new certified clean material to the satisfaction of the OWNER and the ENGINEER. If the OWNER has to remove the oils, solvents, organic compounds, contaminants, or earth, the OWNER may deduct the costs of removal and clean-up from the total contract amount owed the CONTRACTOR.

END OF SECTION
PART 1 - GENERAL

1.01 REGULATORY REQUIREMENTS

A. It is consistent with the intent of these Specifications to describe those performance standards, often broad and general in nature, required to provide a complete and operating system. It shall be the responsibility of the CONTRACTOR to familiarize himself fully regarding the detailed needs and requirements of any and all regulatory agencies having jurisdiction over this work. These detailed needs and requirements shall be accommodated, as part of the Work, in every manner just as if they were prescribed in these Contract Documents and Specifications.

B. Repair Standards: All design and repairs shall be in accordance with the local building code. All design and welding shall be done in accordance with AWWA D100-11 Standard for Welded Steel Tanks for Water Storage. Where tolerances, stresses, details, and modifications are not limited or provided by the AWWA Standard, the applicable sections of the following American Petroleum Institute (API) Standards shall apply. Unless otherwise specified, all steel structural and bar components shall be fabricated from new ASTM A-36 material, all steel plate components shall be fabricated from new ASTM A-36, and all steel pipe shall be fabricated from new ASTM A-53 material.


C. Painting Standards: All Work shall be done in accordance with the following requirements. The SSPC-Vis 1-02, the SSPC-Vis 3-04, and the SSPC-Vis 4-01 shall also be used taking into account staining from prior paint applications. The SSPC Standards SSPC-SP 6, Commercial Blast Cleaning and SSPC-SP 10, Near-White Blast Cleaning shall be modified to apply to each square inch instead of the approximately 9 square inch area indicated in paragraph 2.6 of each of these standards and shall be referred to hereinafter as SSPC-SP 6, Commercial Blast Cleaning (modified) and SSPC-SP 10, Near-White Blast Cleaning (modified). Where the foregoing standards, recommendations, and specifications are conflicting, said conflicts shall be brought to the attention of the ENGINEER. Manufacturer’s published product data shall be adhered to unless changed in writing by the home office of the manufacturer.

1. SSPC: The Society for Protective Coatings (SSPC)

b. SSPC-AB 1 "Mineral and Slag Abrasives"

c. SSPC-AB 2 "Specification for Cleanliness of Recycled Ferrous Metallic Abrasives"

d. SSPC-AB 3 "Newly Manufactured or Re-Manufactured Steel Abrasives"

e. SSPC-VIS 1-02 "Visual Standard for Abrasive Blast Cleaned Steel"

f. SSPC-VIS 3-04 "Visual Standard for Power- and Hand-Tool Cleaned Steel"

g. SSPC-VIS 4-01 "Guide and Reference Photographs for Steel Surfaces Prepared by Water jetting"

h. SSPC-VIS 5-01 "Guide and Reference Photographs for Steel Surfaces Prepared by Wet Abrasive Blast Cleaning"

i. SSPC-Guide 6 (CON) "Guide for Containing Debris Generated During Paint Removal Operations"

j. SSPC-PA 2 "Measurement of Dry Paint Thickness with Magnetic Gages"

k. SSPC-PA Guide 10 "Guide to Safety and Health Requirements for Industrial Painting Projects"

l. SSPC-SP 12, Surface Preparation and Cleaning of Steel and Other Hard Materials by High- and Ultrahigh-Pressure Water Jetting Prior to Recoating

m. SSPC-SP 13, Surface Preparation of Concrete

n. SSPC-SP 14, Industrial Blast Cleaning

2. American Water Works Association Standards

a. AWWA D 100-11, Standard for Welded Steel Tanks for Water Storage

b. AWWA D102-14, Standard for Painting Steel Water-Storage Tanks

c. AWWA C652-11, Disinfection of Water-Storage Facilities

3. NSF International (NSF)

a. ANSI/NSF Standard 61 "Drinking Water System Components - Health Effects"

4. The paint manufacturer's published product data

5. These Detailed Technical Specifications
D. **Confined Space Entry:** The CONTRACTOR shall comply with and have documented Confined Space Entry Procedures available at the tank site at all times as required by OSHA 29 CFR 1926 Subpart AA. The CONTRACTOR shall also comply with any State and/or local requirements which are more restrictive than the Federal requirements.

E. **Compliance with Environmental Regulations:** Compliance with local, state and federal regulations concerning emissions or disposal of solid, particulate, liquid, or gaseous matter as a result of the cleaning, painting, or other operations under this Agreement shall be the responsibility of the CONTRACTOR. This compliance shall be accomplished without supervision from the OWNER, ENGINEER, FIELD OBSERVER, or other direct or indirect agents of the OWNER. No additional compensations for changes in the laws, regulations, or the interpretation thereof shall be granted by the OWNER. No burning of trash (including abrasive bags or other: paper or wood products) on the site shall be permitted. All shielding, abrasive retrieval, or other methods of using precautions required by the regulating agencies shall also be accomplished at no additional cost to the OWNER unless otherwise provided herein. **Any fines imposed on the OWNER, ENGINEER, or FIELD OBSERVER by any regulatory agency as a result of the CONTRACTOR'S noncompliance with environmental regulations shall be paid or reimbursed by the CONTRACTOR.**

F. **Safety and Health:** The CONTRACTOR shall comply with safe working practices for abrasive blasting, cleaning, burning, welding, and handling lead-based and nonlead-based coated steel, and all health and safety regulations and requirements of Federal OSHA (specifically OSHA Standard for Construction Industry, 29 CFR 1926.62, entitled "Lead Exposure in Construction, with Maryland Amendments; Interim Final Rule," regarding occupational exposure to lead), state and local health regulatory agencies, Material Safety Data Sheets (MSDS), SSPC-PA Guide 3, and the paint and abrasive manufacturers. This compliance shall be accomplished without supervision from the OWNER, ENGINEER, FIELD OBSERVER, or other direct or indirect agents of the OWNER. Should vents, holes, rigging attachments, or any other modification, cutting, or welding be required to meet safety standards or otherwise accomplish the Work, they may be accomplished at the expense of the CONTRACTOR upon submitting of details in writing to, and with subsequent permission by the ENGINEER.

G. **Rigging Attachments:** All rigging attachments present on the tank shall be carefully evaluated by the CONTRACTOR immediately prior to use for the type and magnitude of loads which CONTRACTOR intends to impose on them. Any rigging attachments installed on the tank by the CONTRACTOR shall be removed at the completion of the Work and areas damaged by the removal of these attachments shall be cleaned and painted in accordance with these specifications. The CONTRACTOR assumes all responsibility for use of any existing or added attachments.

H. **Welder's Certification:** All welders and welding operators shall be certified in accordance with ASME, Section IX or AWS D1.1-96 (tests as described in AWS B2.1) to the procedures and processes required to accomplish the Work. Welder's certification papers shall be furnished to the FIELD OBSERVER for review prior to the commencement of welding on the tank.
I. **Welding and Cutting Precautions:** No welding or flame cutting through the existing coating system shall be permitted, unless adequate worker protection is provided in accordance with the instructions in ANSI Z49.1, “Safety in Welding and Cutting” and OSHA Standard for Construction Industry, 29 CFR 1926.62 entitled "Lead Exposure in Construction; Interim Final Rule, with Maryland Amendments."

J. **Authority of CONTRACTOR’S COMPETENT PERSON(S):** The CONTRACTOR’S COMPETENT PERSON(S) shall have the complete support of top management and written authority to ensure these operations are carried out in accordance with compliance plans and governmental regulations, independent of production pressures. To ensure independence, CONTRACTOR’S COMPETENT PERSON(S) shall report directly to the headquarters office and not to the site foreman. The CONTRACTOR’S COMPETENT PERSON(S) may have additional responsibilities and carry out other work assignments but shall not routinely be a member of the crew that actually performs surface preparation work.

K. **Responsibility of CONTRACTOR’S COMPETENT PERSON(S):** The CONTRACTOR’S COMPETENT PERSON(S) shall be responsible for overseeing surface preparation operations without supervision of the OWNER, ENGINEER, and/or FIELD OBSERVER. Responsibilities shall include:

1. Monitoring effectiveness and ensuring the continued integrity of environmental controls.

2. Supervising worker exposure monitoring.

3. Ensuring that a hazard communication program has been conducted for the CONTRACTOR’S personnel on site.

4. Ensuring that the Confined Space Entry Procedures are followed.

5. Ensuring that employees are wearing personal protective equipment and are trained in the use of such equipment and in the use of exposure control methods, personal hygiene facilities, respiratory protection, and decontamination practices.

6. Ensuring that employees are utilizing fall protection and are trained in accordance with all OSHA regulations.

7. Daily inspection and approval of the rigging equipment and scaffolding utilized.

8. Ensuring that the engineering controls in use are in operating condition and functioning properly.

9. Ensuring that fugitive emissions to air, water, or soil are minimized and that handling of all waste streams is in compliance with applicable regulations and contract specifications.

10. Controlling access to the work site and ensuring that contaminated control boundaries are marked off.
11. Maintaining project documentation.

L. **Medical Surveillance**: The CONTRACTOR shall institute a medical surveillance program in complete accordance with "OSHA Standard for Construction Industry, 29 CFR 1926.62 entitled "Lead Exposure in Construction; Interim Final Rule, with Maryland Amendments" or more restrictive regulations. As part of the program, the CONTRACTOR shall make available biological monitoring in the form of blood sampling and analysis for lead. The CONTRACTOR shall furnish certification with the **prior to Notice-to-Proceed** to the ENGINEER and OWNER to document the CONTRACTOR'S compliance with the medical surveillance program requirement. The costs of biological monitoring shall be paid for by the CONTRACTOR. The CONTRACTOR'S medical surveillance program shall be submitted to the ENGINEER and OWNER **prior to Notice-to-Proceed** of the Contract and shall be submitted to the FIELD OBSERVER in the field during the Work.

M. **Compliance with Requirements**: The CONTRACTOR shall comply with all applicable requirements of The Occupational Safety and Health Act of 1970 (Public Law 91-596) and will hold the OWNER and ENGINEER harmless from any civil or criminal penalties imposed as a result of the CONTRACTOR'S noncompliance with such requirements. No additional compensations for changes in the laws, regulations, or the interpretation thereof shall be granted by the OWNER. The CONTRACTOR shall be responsible for complying with all laws and regulations, even if not specifically listed in these Specifications.

N. **Removal and Disposal of Cleaning Residue**: The interior cleaning debris shall be kept separate from the exterior cleaning debris. All cleaning debris shall be cleaned up and stored daily in leak-proof covered dumpsters/containers lined with polyethylene. Each cover shall be designed and installed to keep all rainwater from entering the dumpster/container or the contents. All operations associated with this project shall be in conformance with the Occupational Safety and Health Act (OSHA) of 1970 and all regulations and standards promulgated under this Act, as well as all applicable state and local standards and regulations governing worker safety and health.

1. The material shall be legally disposed of by the CONTRACTOR in accordance with local, state, and federal laws. The CONTRACTOR shall be responsible for removing and properly transporting all the material from the project site. The material shall be transported in containers approved by the United States Environmental Protection Agency (USEPA) and local, state, and federal regulations. Bidders should prepare their Base Bid to include the cost of the transporting of the combined paint and spent cleaning material to a landfill and any disposal costs at that facility. All testing required by regulations or by the selected waste hauler or landfill, including any follow-up testing and the collection of the samples, shall be done at the CONTRACTOR'S expense. Copies of all manifests, testing results and treatment procedure documents shall be sent to the ENGINEER and OWNER.

2. All dumpsters/containers and labeling of the dumpsters/containers shall adhere to the US Department of Transportation's regulations (49 CFR Part 172) and the HMTA.
O. **Material Safety Data Sheets:** Material Safety Data Sheets (MSDS) shall be posted at the job site for each chemical product on the job site, including but not limited to coatings, thinners, other solvents, disinfecting agents, abrasives, welding materials, and flexible sealant material.

1.02 REQUIREMENTS

A. Provide required personnel, equipment, and materials, to construct project according to applicable codes and standards.

1.03 APPLICABLE CODES AND STANDARDS

A. As a minimum standard of quality and workmanship, construction Work is to comply with the latest edition of the following codes and standards insofar as they are applicable:

1. American Water Works Association (AWWA) Standards
2. American Welding Society (AWS) Standards
3. American Petroleum Institute (API) Standards
4. American Institute of Steel Construction (SC)
5. American Society for Testing and Materials (ASTM) Standards
6. American Concrete Institute (ACI) Standards
7. Concrete Reinforcing Steel Institute (CRSI) Standards
8. SSPC: The Society for Protective Coatings (SSPC) Standards \{formerly Steel Structures Painting Council\}
9. Occupational Safety and Health Administration (OSHA) Standards
10. American National Standards Institute (ANSI) Standards
11. United States Environmental Protection Agency (USEPA)
14. NSF International (NSF) \{formerly National Sanitation Foundation\}
15. Underwriter's Laboratories (UL)
16. Maryland Department of Health and Mental Hygiene, Maryland Waste Management Administration (MD DOH&MH)
17. International Building Code (IBC)
18. NACE International (NACE) Standards *(formerly National Association of Corrosion Engineers)*

19. American Society of Civil Engineers (ASCE)

B. The above codes and standards are hereinafter referred to as “Reference Specifications.”

PART 2 - PRODUCTS

(NOT USED)

PART 3 - EXECUTION

3.01 PROCEDURES

A. CONTRACTOR shall comply with all regulations and requirements listed or inferred by this Section. CONTRACTOR shall pay all fees, obtain necessary permits as may be required for the prosecution of his work.

END OF SECTION
PART 1 - GENERAL

1.01 COORDINATION WITH PUMP STATION OPERATIONS AND SHUTDOWNS

A. General:

1. Construction work under this Contract shall interfere to the least extent possible with the operations of both the water pumping station and elevated storage tank. The water pumping operations must be maintained in continuous operation at all times during the course of the work under this Contract.

2. All operations of existing valves, gates and equipment required to perform the work shall be coordinated with the City. Contractor shall provide a minimum 7-day notice of the need to operate existing equipment that could affect station operations.

3. Insofar as possible, equipment and facilities shall be tested and in operating condition before the final tie-ins are made which connect new equipment and facilities to existing equipment and facilities.

4. The Contractor shall coordinate his work to minimize impact to the operation of the existing suction and discharge pressure system, including the suction and discharge pressure manifolds. Where replacement is shown on the contract drawings, the Contractor shall coordinate with the City for shutdown to cut the pipe manifold and immediately cap the affected section so the pressure system can be put back in operation as soon as possible.

B. Facility Shutdowns:

1. Shutdown durations shall be mutually agreed upon by the City and the Contractor, with the Engineer's approval.

2. Shutdown will only be allowed for those operations listed below. Specifically, shutdown of pump station process controllers, and communications are not allowed. Short electrical shutdowns of two (2) hours or less may be considered by the Owner on a case by case basis.

3. Allowable shutdown durations for certain operation are limited as follows:

<table>
<thead>
<tr>
<th>Operation</th>
<th>Shutdown Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump</td>
<td>2 months (one at a time)(^a)</td>
</tr>
<tr>
<td>Suction and Discharge Manifolds</td>
<td>2 hours</td>
</tr>
<tr>
<td>Chlorine Room Power</td>
<td>2-hours(^b)</td>
</tr>
<tr>
<td>Elevated Storage Tank and Vault</td>
<td>6 months</td>
</tr>
</tbody>
</table>
Permissible pump offline duration when bypass pumping is not in place.

Chlorine dosing shall be available at all times during Construction. The Contractor shall include as part of the base bid, provision of a temporary sodium hypochlorite dosing system to ensure the City has capabilities of meeting water quality requirements. The temporary dosing system is considered means and methods of the Contractor; however, the solution strength and pump types provided shall be similar to that as described within these specifications and all dosing shall be metered and recorded as required by the City’s requirements.

4. In order to reduce each shutdown period to a minimum, the Contractor shall, prior to each shutdown request, expedite completion of the work to the fullest extent.
   a. The Contractor shall have completed all necessary preparatory work including testing and shall have adequate personnel available to keep each shutdown period to a minimum.
   b. All equipment and materials required to complete the work during a shutdown period shall be on the job site before the shutdown is commenced.

5. The Contractor shall carefully coordinate all work and schedules and shall provide the County, City and Engineer with 21 calendar days’ minimum written notice prior to each shutdown period, unless otherwise approved. The County and City reserves the right to deny any changes to the operating procedures based on certain circumstances, as deemed necessary for operations. The Contractor is not entitled to any additional payment or delay claims stemming from the denial of the shutdown.

6. Submittal: Prior to each shutdown period, the Contractor shall submit to the Engineer, in writing, the following information:
   a. Detailed descriptions and schedules of the proposed construction procedures during the shutdown period.
   b. Information submitted to the Engineer shall include a complete inventory of materials and equipment needed to perform the work.
   c. No shutdown of a facility or operation will be permitted until the Engineer has reviewed and approved, in writing, the proposed construction plans and procedures.

7. During shutdown periods, the City will temporarily discontinue the use of affected facilities as deemed necessary by the Engineer in coordination with Pump station forces to facilitate the work of the Contractor.

8. If work during any shutdown period is not done satisfactorily, or as planned, or within the maximum time allocated, the City and County may:
a. Order the Contractor to place the facility or operation back in service and reschedule the work.

b. Order the work required to place the facility or operation back in service done with other forces at the Contractor's expense.

c. The Contractor may be required to work around the clock to put a facility or operation back in service, if so directed by the Engineer.

9. No extra payment will be made for any labor, materials, tools, equipment or temporary facilities required during the shutdown periods. All costs therefore shall be considered to have been included in the prices bid for the Contract.

10. Refer to Specification 01040 for additional coordination requirements for work associated with the Elevated Tank Improvements.

1.02 CONSTRUCTION SEQUENCING

A. Work Schedule: The Contractor shall submit and follow a construction schedule. The work schedule shall outline in detail the planned equipment shutdown and the anticipated shutdown durations.

B. Contractor is responsible for coordinating parallel work items with the Engineer so as to expedite construction progress while minimizing interference with the station operations.

C. Sequence of Work: There are certain areas where construction must be sequenced in a particular manner in order to eliminate pumping operation shutdowns and to minimize disruption. The following sequence of work shall be generally followed. This sequence is not intended to identify all required components of the work, but highlight the major items. The Contractor shall submit a detailed sequence of construction for review and approval prior to beginning any work activities. Installation of electrical, instrumentation and controls may require a temporary shutdown of the operation, which if required, shall be coordinated with and approved by the County and City.

1. PHASE 1 – Elevated Tank Rehabilitation

a. Coordinate with the City at least 7 days before start of demolition activities for City to tag items to be salvaged.

b. Install soil erosion and sediment control devices per design drawings and as directed by Baltimore County.

c. Install temporary hydro pneumatic tanks and all related controls at the Elevated Tank to maintain system pressure throughout tank and vault rehabilitation.

d. Test hydro pneumatic tank system in accordance with the Contract Specifications. Upon testing approval, begin use of hydro pneumatic tank system and prepare for demolition within the altitude valve vault.
e. Demolish existing isolation gate valves, altitude valve, and check valve within the altitude vault.

f. Install new isolation gate valves, altitude valve, altitude valve, and check valve within the altitude vault, and test line pressure.

g. Repair tank and clean in accordance with the Contract Documents.

h. Place tank and line in service and test for no less than 72 hours. The hydro pneumatic tanks shall remain on site and connected until the testing has been completed and approved. Upon testing approval, remove hydro pneumatic tank system.

2. PHASE 2 – Sparks Water PS Improvements

a. Work in this phase shall only start after Contractor has received completion approval of all Phase 1 work.

b. Coordinate with the City at least 7 days before start of demolition activities for City to tag items to be salvaged. Provide at least 30 days coordination for the City to remove items from the Chlorine Room.

c. Install soil erosion and sediment control devices per design drawings and as directed by Baltimore County.

d. Install and test bypass pumping system in accordance with the Contract Specifications. Upon testing approval, begin use of the bypass pumping system.

e. Install temporary telemetry to allow status communication to the Ashburton Telemetry Control Center (TCC). Temporary services, including connections for all instrumentation and power wiring in the existing 480 V panel shall be installed, tested, and approved by the City prior to demolishing the existing panel. Similarly, prior to removal of temporary services, all new permanent connections for all instrumentation and power wiring in the existing 480 V panel shall be installed, tested, and approved by the City prior to removing the temporary panel.

f. Coordinate with City and County to close suction isolation valve(s) located outside of Pump station to isolate flow from the main water distribution to pumps A through C suction side.

g. With bypass system in operation, demolish and replace all pumps, valves, piping, suction/discharge piping and appurtenances, motor control center, sodium hypochlorite chlorination system, instrumentation and station control system, and associated ancillary system.

h. Once work is completed, coordinate with the City and County, at least 7 days in advance, to perform a 7-day start-up of all pumps, the sodium hypochlorite system, all new electrical equipment, and instrumentation.
PART 2 - PRODUCTS

(NOT USED)

PART 3 - EXECUTION

(NOT USED)

END OF SECTION
SECTION 01310

TELEPHONE SYSTEM COORDINATION

PART 1 - GENERAL

1.01 COORDINATION WITH WATER DISTRIBUTION OPERATIONS AND SHUTDOWN

A. General:

1. Telephone system work under this Contract shall interfere to the least extent possible with the operations of all associated water distribution facilities. The water pumping and distribution operations must be maintained in continuous operation at all times during the course of the work under this Contract.

2. Insofar as possible, new telephony equipment shall be tested and in operating condition before the final tie-ins are made allowing use of the new terminal panels and equipment for communication across the circuits detailed below.

3. The Contractor shall coordinate his work to minimize downtime of communication circuits between the facilities listed below. Switchover from the existing terminal panel and equipment to the new terminal panel and equipment shall be the sole responsibility of the Contractor and shall be performed in coordination with the City Municipal Telephone Exchange and with Verizon. Each line shall be switched over individually and operation of associated short-haul modems shall be confirmed prior to proceeding to the next circuit.

B. Communication Downtime:

1. Communication link downtime schedule and durations shall be mutually agreed upon by the City, the County, the Baltimore City Department of Public Works - Office of Information and Technology (DPW-IT), The City of Baltimore Municipal Telephone Exchange (MTE), City Security Contractor, Verizon’s Business, Engineering, and Field Departments, the Contractor, and the Engineer.

2. Any work related to the telephone lines and security systems shall be coordinated with William Dove, Water Pumping Manage, Baltimore City DPW, prior to any outages. Contractor shall inform and coordinate with William Dove in writing to ensure all required provisions are made, all necessary personnel are informed of any system outages, and everything is provided to ensure a complete installation. William Dove is available at (410) 396-0360.

3. Once switchover from the old termination panel to the new termination panel has begun the Contractor shall continue efforts until all circuits have been moved over to the new equipment. If required, work efforts shall continue 24 hours a day – 7 days a week, the Contractor shall not be entitled to any addition time or money resulting from extended work hours required for communications switchover. Furthermore, the City reserves the right to back-charge the Contractor for any overtime required for City Employed or Contracted Personal resulting from negligence and incomplete or incorrect work on the part of the Contractor.
4. Communication between facilities will only be allowed to be interrupted for those operations listed below. Specifically, downtime of more than 8-hours is not allowed.

5. Allowable shutdown durations for certain operations are limited as follows:

<table>
<thead>
<tr>
<th>Operation</th>
<th>Shutdown Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switching voice phone lines for desk and alarm phone circuits.</td>
<td>Continuous unless prior written approval is provided from the City</td>
</tr>
<tr>
<td>Switching Individual Data / SS7 4-wired Telephony Circuits,</td>
<td>4 hours (one line at a time)</td>
</tr>
<tr>
<td>Switching All Telephony Circuits (If all circuits must be switched over concurrently downtime shall not exceed)</td>
<td>8 hours</td>
</tr>
</tbody>
</table>

6. In order to reduce each shutdown period to a minimum, the Contractor shall, prior to each communication switchover request, expedite completion of the work to the fullest extent.

   a. This shall include configuration and installation of all required short-haul/long-haul modems and associated equipment required to allow for interfacing between the PLC and Modems and the Modems and provided Telephony Equipment.

   b. Installation of all junction boxes, conduit, enclosures, plywood backer board, and power circuits as required for the new terminal panel and associated Data Station Termination Modules (DST/DSMTs) or “smart jacks” shall be completed prior to Verizon Installation effort and commencement of switchover activities.

   c. Conduit from the exterior of the building to the new interior terminal panel location on the ground floor shall be installed to allow for Verizon to install the required multi-pair cable from the exterior splice/tap point to the new terminal panel.

   d. Conduit and wiring from existing PLC control panel to new telephony equipment installation location shall be installed to within the panel where new Verizon Equipment will be installed.

   e. All equipment and materials required to complete the work during a shutdown period shall be on the job site before the shutdown is commenced.

   f. Conduit and control wiring from the existing and new modems installed within in the Facility PLC control panel shall be run into the new enclosure provided for installation of Verizon’s telephony equipment / “smart jack” installation location to allow for timely installation once circuits are available for termination at the new equipment.
7. The Contractor shall carefully coordinate all work and schedules and shall provide the County, City and Engineer with 21 calendar days minimum written notice prior to the communication downtime period, unless otherwise approved. The County and City reserves the right to deny any changes to the operating procedures based on certain circumstances, as deemed necessary for operations. The Contractor is not entitled to any additional payment or delay claims stemming from the denial of the shutdown.

8. Submittal: Prior to each shutdown period, the Contractor shall submit to the Engineer, in writing, the following information:
   a. Detailed descriptions and schedules of the proposed construction procedures during the shutdown period.
   b. Information submitted to the Engineer shall include a complete inventory of materials and equipment needed to perform the work.
   c. No shutdown of a facility or operation will be permitted until the Engineer has reviewed and approved, in writing, the proposed construction plans and procedures.

9. During communication interruption and switchover periods, the City will temporarily discontinue the use of the associated communication link for the time allowed above to facilitate the work of the Contractor. If the Contractor requires downtime in excess of that allowed herein they shall provide and configure temporary wireless connectivity between the impacted facilities prior to and for the entire duration of the required communication link switchover.

10. If work during any shutdown period is not done satisfactorily, as planned, or within the maximum time allocated, the Contractor shall be required to work around the clock to put the communication links back in service. No additional time or cost shall be provided for these efforts.

11. No extra payment will be made for any labor, materials, tools, equipment or temporary facilities required during the shutdown periods. All costs therefore shall be considered to have been included in the prices bid for the Contract.

1.02 CONSTRUCTION RESPONSIBILITIES AND SEQUENCING

A. Telephone system work provided under this Contract includes the following:

1. Work Performed by Verizon:
   a. To maintain the existing telephone service, Verizon shall be contracted through DPW-IT and MTE to provide a new terminal cabinet on the ground floor of the station. The existing exterior multi-pair cable shall be live-tapped by Verizon to ensure that existing communication from the Sparks Pumping Station to offsite facilities are not interrupted during installation of new Verizon telephony equipment.
   b. Verizon shall provide new terminal cabinet, new “smart jacks,” and associated mounting rack / backplane.
c. Verizon shall provide services, when required and confirmed ready by the Contractor, to switch over terminal locations and “smart jack” equipment from the existing equipment located within the facility basement to the new equipment located on the facility ground floor. This shall include coordination efforts with the Verizon Business Department to allow for configuration of new “smart jack” equipment for use with the existing circuits detailed below.

d. Following communications switchover from old equipment to new equipment and confirmation by the Contractor and Verizon that the equipment within the basement is no longer required for any intra-station or inter-station communications Verizon shall demolish all of the existing telephony equipment located within the basement and shall demolish the existing multi-pair cable from the basement to the new tie-in location on the west exterior side of the building.

2. Work Performed by the Contractor:

a. The Contractor shall provide new exterior stainless steel junction box minimum 2’ x 2’ x 1’ and rated NEMA 4X. Exact junction box location, size, accessories, penetration locations, and all other requirements shall be coordinated with Verizon prior to installation. Junction box and associated conduit detailed below shall be installed prior to Verizon’s performance of required live-tap to be performed therein.

b. Contractor shall install two new 4-inch thick PVC / Vinyl coated ridged galvanized steel conduits from the exterior live-tap junction box, through the exterior wall of the station and to the location of the new terminal panel to allow for routing of the new multi-pair cable(s). Exact location of conduit ends and routing shall be coordinated with Verizon.

c. Contractor shall provide new wall mounted NEMA 4X stainless steel enclosure 24” high by 24” wide by minimum 12” deep for installation of new Verizon DSTM or “smart jack” equipment and associated breakout terminal blocks. Enclosure size shall be coordinated with the Verizon telephony equipment to be installed therein. Contractor shall be responsible for the coordination and installation of the associated conduit and communication lines from the modems in the PLC control cabinet to the new terminal blocks provided by Verizon. Wiring shall be installed prior to Verizon’s installation of DSTM / “smart jack” equipment.

d. Contractor shall provide new wall or pole mounted NEMA 4X stainless steel enclosure 24” high by 24” wide by minimum 12” deep for installation of new Verizon cellular router and ancillary devices at both the Sparks pumping station and Elevated Storage Tank sites. Enclosure size shall be coordinated with the Verizon telephony equipment to be installed therein. Contractor shall be responsible for the coordination and installation of the associated conduit and communication lines from the modems in the PLC control cabinet to the new terminal blocks provided by Verizon.
3. Voice Telephone Circuits: The two voice phone lines currently served via the existing Verizon Terminal Panel shall be relocated and terminated to be served via the new terminal panel. The service and best available associated phone number are provided below. Contractor shall confirm the associated numbers with Verizon prior to switchover. As DSTM / “smart jack” equipment is not required service shall be continuously provided via use of a live-tap and connection of the new phone lines to the existing equipment / jacks prior to demolition of existing wiring:

   a. Alarm / Key Card Phone Line: (410) 484-1463
   b. Desk Phone Line: (410) 486-3580

B. Telecommunications Work Schedule: The Contractor shall submit and follow a construction schedule. The work schedule shall outline in detail the planned communication equipment switchover and the anticipated communication interruption durations. At a minimum it shall include all activities detailed above and all activities required to relocate the termination panel for the listed services.

PART 2 - PRODUCTS

(NOT USED)

PART 3 - EXECUTION

(NOT USED)

END OF SECTION
PART 1 - GENERAL

1.01 SCOPE

A. Provide the services of a factory trained specialist to instruct the City’s personnel in the operation and maintenance of identified equipment and system components. Upon request, the City will provide various A/V equipment as needed, if available.

B. Coordinate training services with the County and City, with a minimum of 30 days prior notice.

C. Hands-on training for will include proper start-up, shutdown, normal and alternative operating strategies, emergency procedures, and monitoring and troubleshooting checklist review. Each trainee will demonstrate skill acquisition to the satisfaction of the instructor. Emphasize demonstration of skills to be mastered by all audiences.

D. Conduct training at the Station. Target training at journeyman level. Each class size shall be limited to 15 trainees.

E. Training sessions shall be no more than four (4) hours in length.

F. Two sessions in the morning (Training shall occur between the City working hours of 7:00am to 3:00pm), on two consecutive days, shall be provided to accommodate City personnel.

G. Periods of instruction shall not coincide with the supervision of installation or initial operation of equipment by the manufacturer’s representatives nor will any of the time spent therewith be credited against the instructional periods specified.

H. The cost associated with the training described herein shall be included as part of the lump sum cost of the Contract.

I. Timetable for required training:

1. Attached, as Appendix A to this section is a list of the specification sections that require training, and a schedule for the training sessions.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Compliance with this section is required whenever any section of Divisions 2 through 17 of the Project Manual specifications includes a training requirement, whether noted in Appendix A or not.

B. Additional training requirements may be listed by individual equipment section.
1.03 SUBMITTALS

A. Submit for approval instructor qualifications for the training instructor. This submittal shall include documentation that details the instructor’s general knowledge of the material he will teach, specific knowledge of the application of this equipment and qualifications and history as an adult vocational instructor. Instructor qualifications shall be approved prior to the contractor issuing the 30 day notice for training.

B. Submit for approval five copies of a preliminary lesson plan in accordance with these specifications. The lesson plan shall be approved prior to contractor issuing the 30 day notice for training. Include copies of all audio/visual and other training aids as well as a student handout, to be used during course of instruction.

C. Submit a request to schedule training to the engineer at least 30 days prior to the training sessions.

D. For each training class, provide student handouts material for at least fifteen (15) attendees.

E. Within 30 calendar days of the completion of each training event, submit 5 copies of the final lesson plan and student handouts, plus two copies of all other audio-visual training aids utilized during each training course; along with 2 copies of the attendance rosters. This material shall be submitted as a final transmittal for record.

1.04 INSTRUCTION LESSON PLAN

A. Contractors proposed Lesson plans shall be submitted as outlined in this specification. The Lesson Plan shall be based on the elements presented in the “OUTLINE OF UTILITIES PERSONNEL INSTRUCTION LESSON PLAN” below. Specified components and procedures shall be identified in the proposed Lesson plans.

B. Contractor’s proposed Lesson plans shall detail specific instruction topics. “Hands-on” demonstrations planned for the instructions shall be described in the Lesson plans. Training aids to be utilized in the instructions shall be cross-referenced in the proposed Lesson plans. Training strategies such as planned blackboard work, instructor questions and discussion points or other planned classroom or field strategies shall be detailed in the lesson plan document.

C. Handouts for training shall be attached to the lesson plans and cross-referenced by section or topic in the lesson plan.

D. Indicate the duration of each segment in the following outlines.

1.05 OUTLINE OF UTILITIES PERSONNEL INSTRUCTION LESSON PLAN:

A. Equipment Operation:

1. Describe equipment’s operating (process) function and system theory.

2. List equipment’s fundamental operating principles and dynamics.
3. Identify equipment’s mechanical, electrical and electronic components and features.

4. Identify all support equipment associated with the operation of subject equipment.

5. Detail the relationship of each piece of equipment or component to the sub-systems, systems and processes related to this project.

6. Cite all hazards associated with the operation; or exposure to chemicals associated with the component; or the waste stream handled by the component.

7. Specify the appropriate safety precautions, equipment, and procedures to eliminate, reduce or overcome these hazards.

B. Detailed Component Description:

1. Identify and describe in detail each component’s function.

2. Where applicable, group related components into subsystems.

3. Identify and describe in detail equipment safety features, permissive and controls interlocks.

C. Equipment Preventive Maintenance (PM):

1. List PM inspection procedures required to:
   a. Perform an inspection of the equipment in operation.
   b. Perform pre-startup inspection.
   c. Spot potential trouble symptoms (anticipate breakdowns).
   d. Forecast maintenance requirements (predictive maintenance).

2. Describe pre-startup lubrication requirements.

3. Identify and demonstrate all daily and weekly preventive maintenance.

D. Equipment Troubleshooting:

1. Define recommended systematic troubleshooting procedures for operations personnel.

2. Provide component specific troubleshooting checklists.

3. Describe applicable equipment testing and diagnostic procedures to facilitate troubleshooting.
E. Equipment Corrective Maintenance (CM):

1. Define recommended systematic troubleshooting procedures as they relate to mechanical problems.

2. Identify and describe the use of any special tools required for maintenance of the equipment.

3. Demonstrate/describe component removal/installation and disassembly/assembly procedures.

4. Perform at least two “hands-on” demonstrations of common corrective maintenance repairs. Additional demonstrations may be required by the Engineer.

5. Describe recommended measuring instruments and procedures, and provide instruction on interpreting alignment measurements, as appropriate.

6. Define recommended torquing, mounting, calibration and/or alignment procedures and settings, as appropriate.

7. Demonstrate recommended procedures to check/test equipment following a corrective maintenance repair.

F. Startup Procedures:

1. Specify the order of start up for upstream and downstream component and/or other systems.

2. Perform pre-start up inspections and lubrication requirements.

3. Properly start up the component in both a normal and alternative mode.

4. Determine the startup has been successful.

G. Operation of component:

1. Cite parameters that indicate component is operating nominally when in normal mode.

2. Cite values that would indicate continued operation if normal mode should cease.

3. Demonstrate proper procedure for placing component into an alternative mode.

4. Cite parameters that would indicate return to normal mode is justified.

5. Demonstrate proper procedure for returning component to normal mode.

6. Properly fill out monitoring forms.
H. Shut down Procedures:

1. Specify the order of shutdown for upstream and downstream component and/or other systems.

2. Properly shut down the component in both a normal and alternative mode.

3. Determine that shutdown has been successful.

4. Perform shutdown inspections and lubrication requirements, if any.

I. Submit, for approval, the following information for Electrical Equipment training:

1. Potential arc flash hazard recognition and labeling definitions.

2. Actual in-place conduit and cable layouts accurately showing the location, elevation and size of all conduits, boxes and other electrical equipment and the number, identification number size and use of conductors.

3. Layouts of the grounding system and lighting arrangements.

4. Control wiring diagrams with terminal numbers, wire numbers and all control devices identified.

5. A complete integrated control wiring diagram with terminal numbers and all control devices identified.

6. Conduit and wire schedules with each conduit and circuit identified and described.

7. Panel schedules with each circuit associated load identified described.

1.06 TRAINING AIDS

A. The course instructor shall incorporate training aids as appropriate to assist in the instruction. Training aids shall include text and figure handouts. The vendor is encouraged to make use of other audio/visual medium, such as:

1. Audio-visual aids (e.g., films, slides, videotapes, posters, blueprints and diagrams).

2. Equipment Cutaways, equipment models, and samples (e.g., spare parts, damaged equipment).

3. The course instructor shall utilize descriptive student handouts during the instruction. Photocopied student handouts shall be good quality reproductions. Student handouts should accompany the training instruction, with frequent reference made to them. Customized handouts developed especially for the instruction are encouraged.
1.07 INSTRUCTION SESSIONS

A. Different sessions shall be scheduled for each audience for each type of equipment listed in Appendix A.

B. Course instructor shall present “hands-on” demonstrations of common corrective maintenance repairs for each scheduled group. The manufacturer shall provide the tools and equipment to conduct the demonstrations. Requests for supplemental assistance and facilities should be submitted with Contractor’s proposed Lesson plans. Each trainee will demonstrate skill acquisition to the satisfaction of the instructor.

C. Hands-on training will cover proper start-up, shutdown, normal and alternative operating strategies. Each trainee shall demonstrate skill acquisition to the satisfaction of the instructor.

D. For those training situations where personnel will participate in disassembly or assembly of equipment, the Contractor shall be responsible for such disassembly or assembly and, on completion of all hands-on training shall provide written certification of proper equipment operation to Engineer.

PART 2 - PRODUCTS
(NO TUsed)

PART 3 - EXECUTION
(NO TUsed)

PART 4 - APPENDIX A

EQUIPMENT INSTRUCTION SESSIONS

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<td>17400</td>
<td>Programmable Controller System</td>
<td>During 30-Day Demonstration Period</td>
</tr>
</tbody>
</table>

END OF SECTION
SECTION 01736

FACILITY ONLINE TRAINING

PART 1 - GENERAL

1.01 DESCRIPTION

A. In addition to the training requirements described in other specification sections, the Contractor shall engage an online learning modules provider to develop online learning modules, quizzes and tests.

B. Contractor is responsible for coordinating with equipment manufacturers to provide necessary information to the online learning modules provider. Supplied material shall include, as a minimum, the following operation and maintenance manual components:

1. Brochures,
2. Start-up and shut down procedures,
3. Operation and maintenance material required to operate and maintain the equipment, Troubleshooting guide, and
4. Safety
5. Any additional material the equipment manufacturer has, which would assist the Owner to properly operate and maintain the equipment

C. Course work, hosting services and programming shall be provided by 360water, Inc. or approved equal.

1.02 EQUIPMENT AND SYSTEMS TRAINING MODULES

Training modules shall be furnished for the following equipment and systems.

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<thead>
<tr>
<th>Specification Section</th>
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<td>CENTRIFUGAL WATER PUMPS, INCLUDING MOTORS AND RTDS</td>
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</tr>
<tr>
<td>16700</td>
<td>STANDBY POWER GENERATOR SYSTEM</td>
</tr>
</tbody>
</table>
1.03 QUALIFICATIONS

A. The online learning modules provider shall have provided the platform to a minimum of ten municipal wastewater clients and shall have been in business for a minimum of seven years. The Contractor shall provide a list, with contact phone numbers, of ten municipal wastewater treatment facility installations which the online learning modules provider has completed technical training similar to this project.

1.04 SUBMITTALS AND NOTICES

A. Submit for approval online learning modules provider qualifications in developing learning modules.

B. Submit for approval preliminary learning module plan in accordance with these specifications.

PART 2 - MATERIALS AND EQUIPMENT

2.01 FACILITY ONLINE TRAINING

A. The Modules shall be able to evaluate and test the operators on:

1. Start-up /Shut down of equipment,

2. Basic operations, maintenance and safety, and

3. Trouble shooting techniques.

B. The Online Education Program shall include the following functions for each module.

1. Intermittent quizzes and test questions.

2. Wrong answer notification.

3. Generation of a certificate of completion. 100% proficiency shall be required before a certificate of completion is generated.

4. A real time clock on screen that verifies the time spent on the course material.

5. The software program shall automatically bookmark when the operator leaves a course (in case of power outage or an emergency in the facility).
6. The online learning modules provider shall submit all training modules for the online education program to the Maryland Department of the Environment for wastewater operators continuing education credit and obtain MDE accreditation. This is in the event of the facility choosing to apply for CH/CEU credits for their training program.

7. The platform shall be browser independent.

C. The hosting of this service shall last a minimum of five years. A hard copy and an electronic version of all training modules shall be provided to the City to use for other non-online training programs. The City, at the end of the 5 year period, can continue with the program, by negotiation with the online learning modules provider, or, upon the City’s request, the online learning modules provider shall load the operating system and courseware onto a City-owned server and run on the City’s intranet. The cost of this hosting shall be included in the Contractor’s lump sum base bid.

2.02 REVIEW OF ONLINE TRAINING:

A. The Contractor’s equipment manufacturers shall review the courseware written for equipment they are supplying. Comments and corrections will be required within a schedule determined by the Contractor.

B. Following completion of revisions to the courseware to reflect the equipment manufacturers’ comments, the Contractor shall submit the draft courseware to the Engineer for review and comments. Upon receipt of the Engineer’s comments revisions shall be made to the courseware to reflect the Engineer’s review comments.

2.03 DATA CAPTURE:

A. The online learning modules provider shall provide staff for a minimum of seven (7) working days to capture digital images and video of equipment manufacturer-furnished operation and maintenance training, for the courseware. During one of the trips the online learning modules provider shall review some of the courseware with the ENGINEER, an operations supervisor, and a maintenance supervisor to demonstrate the review process that will be conducted in house by the City.

2.04 HUMAN MACHINE INTERFACE (HMI) TRAINING:

HMI simulation training modules shall be furnished. The training shall have the capability to simulate the use of the HMI to run basic functions of specified systems.

A. Pumping System

B. Chemical Feed System

2.05 PROCESS COURSEWARE:

A. The Contractor shall furnish to the online learning modules provider electronic files of all the Operation and Maintenance manuals for use by the online learning modules provider in preparing general course training modules. The online learning modules provider shall furnish courses based on the facility operation and maintenance manual prior to substantial completion.
B. The online learning modules provider shall develop courses as specified in paragraph 1.2 based on the Operation and Maintenance manual material. The online learning modules provider shall be responsible for taking the content and programming the materials into the online system and making graphics web-ready.

C. Regarding test questions, the Engineer will highlight any information in the Operation and Maintenance Manual that is mandatory for the student to know, and the online learning modules provider shall base his questions on that material. The Engineer will review the questions prior to programming.

2.06 FACE TO FACE TRAINING REVIEW

A. Online learning modules provider personnel involved in the writing of the courseware shall attend training sessions provided by the equipment manufacturer. The purpose is to document any additional information stated but not captured in the operation and maintenance manual as well as to note any discrepancies or contradictions with the materials. Provide revisions to the online training modules as necessary at no additional cost.

B. Comments and Notes shall be provided by the online learning modules provider to the Contractor to submit to the Engineer. The Engineer will decide if the contradictions or discrepancies warrant a return visit from manufacturer’s representative to clarify comments and/or for correction of equipment manufacturer-furnished operation and maintenance data. Return visits from manufacturer’s representative to clarify comments and/or for correction of equipment manufacturer-furnished operation and maintenance data, if required by the Engineer, shall be at the Contractor’s expense.

PART 3 - EXECUTION

(NOT USED)

END OF SECTION
SECTION 01780
CERTIFICATION OF MATERIALS AND INSTALLATIONS

PART 1 - GENERAL
1.01 DESCRIPTION

A. The Contractor shall furnish certification from each manufacturer, or from an approved testing laboratory, that all material used in the work is in accordance with these and all referenced specifications.

B. Upon completion of the work, and before acceptance by the County, the Contractor shall furnish the County with a certificate from each of the manufacturers that the equipment and material furnished by him has been erected and installed in a satisfactory manner and is ready for continuous service and operation.

C. Machinery and equipment for which manufacturer certification is specified will not be accepted, nor payment made therefore, without such certification. The Engineer reserves the right, however, to reject such certification when in his judgment, equipment and materials have been improperly installed or show evidence of unsatisfactory operation.

D. Certification shall be provided on the manufacturer’s letterhead.

PART 2 - PRODUCTS

(NOT USED)

PART 3 - EXECUTION

(NOT USED)

END OF SECTION
(SEE ATTACHMENTS THAT FOLLOW)
EQUIPMENT CERTIFICATION FORM

Baltimore County
Sparks Water Pumping Station & Elevated Tank Improvements

Reference:
The undersigned hereby attests that he has examined all the referenced project drawings and specifications and hereby warrants and certifies that the equipment, component, or system he proposes to furnish and deliver meets or exceeds contract specifications, is suitable for its intended purpose and installation, and will provide satisfactory performance at the design criteria specified. This warranty shall be in addition to and not in lieu of all other warranties, express or implied.

Equipment:__________________________________________

Manufacturer:________________________________________

Name:________________________________________________

Address:______________________________________________

By:____________________________________________________

(Typed Name and Title) (SEAL)

(Signature) (Date)

NOTE: Equipment Warranty and Certification must be signed by a Principal Person (President, Vice President, etc.) of the equipment manufacturer. In the event that the manufacturer is not the Supplier, then a Principal Person of the Supplier must also sign this form.

Supplier:

Name:________________________________________________

Address:______________________________________________

By:____________________________________________________

(Typed Name and Title) (SEAL)

(Signature) (Date)
EQUIPMENT OPERATION WARRANTY

BALTIMORE COUNTY
SPARKS WATER PUMPING STATION & ELEVATED TANK IMPROVEMENTS

THE UNDERSIGNED HEREBY ATTESTED THAT AT THE CONCLUSION OF THE RUNNING-IN PERIOD, HE WARRANTS AND CERTIFIES THAT THE EQUIPMENT, COMPONENTS OR SYSTEM HE FURNISHED HAS BEEN PROPERLY INSTALLED AND LUBRICATED UNDER EITHER THE CONTINUOUS OR PERIODIC SUPERVISION OF THE MANUFACTURER’S FIELD REPRESENTATIVE, IS IN ACCURATE ALIGNMENT; IS FREE FROM UNDUE STRESS IMPOSED BY CONNECTING PIPING OR ANCHOR BOLTS; HAS BEEN ADJUSTED AND INITIALLY OPERATED UNDER FULL LOAD CONDITIONS IN THE PRESENCE OF THE MANUFACTURER’S FIELD REPRESENTATIVE AND THAT IT OPERATED SATISFACTORILY IN ACCORDANCE WITH THE CONTRACT DRAWINGS AND SPECIFICATIONS, APPROVED SHOP DRAWINGS AND PRODUCT DATA INCLUDING ANY NOTATIONS, REMARKS OR REVISIONS BY THE ENGINEER, TO THE MANUFACTURER’S SATISFACTION. THIS WARRANTY SHALL BE IN ADDITION TO AND NOT IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED. A COPY OF THIS CERTIFICATION SHALL BE PROVIDED TO THE RESIDENT ENGINEER PRIOR TO ANY OPERATION OF SAID EQUIPMENT.

EQUIPMENT:

MANUFACTURER Name: ________________________________
Address: ____________________________________________

By: _________________________________________________
(Typed Name and Title) (SEAL)

____________________________________________________
(Signature) (Date)

Equipment Warranty and certification must be signed by Principal Person (President, Vice President, etc.) of the equipment manufacturer. In the event the manufacturer is not the Supplier, then a Principal Person for the Supplier must also sign this form.

SUPPLIER Name: ________________________________
Address: ____________________________________________

By: _________________________________________________
(Typed Name and Title) (SEAL)

____________________________________________________
(Signature) (Date)
SECTION 02240
DEWATERING

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Contractor shall furnish labor, materials, equipment and services necessary for and incidental to the execution and completion of dewatering, as specified herein. Work consists of maintaining all excavations free from water at all times during construction.

1.02 SUBMITTALS

A. Submit to the Engineer a detailed plan providing a description of proposed materials and methods of installation, maintenance and procedures of dewatering operations. The plan shall be prepared, sealed, and signed by a qualified Professional Engineer registered in the State of Maryland. The plan shall include, as a minimum:

1. Control procedures to be adopted if dewatering problems arise.

2. Record drawings identifying and locating any capped utilities and other subsurface conditions performed during dewatering, including locations and capping depth of wells and well points.

3. Field Test Reports: Before starting excavation, submit test results and computations demonstrating that the dewatering system is capable of meeting performance requirements.

PART 2 - PRODUCTS

2.01 MATERIALS AND TECHNIQUES

A. Method, materials and equipment used for dewatering shall be selected at the Contractor’s option.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Methods and Requirements: The methods of dewatering shall be as selected and designed by the Contractor, and may include such methods as pumping, well points, cut offs, grouting and other methods selected to keep the excavation and structures dry.

B. Dewatering shall remove, prior to or from the start of excavation, water from excavations. Ground water, including water from such sources as springs, seepage, leakage, perched water and surface water from such sources as rain, snow, runoff, streets, gutters, hydrants, accidental spillage and liquid mud, from whatever source shall be removed. Water and its removal shall be considered unclassified excavation, fully the responsibility of the Contractor without cost to the County.
C. Where necessary, the Contractor shall lower the water table around the subgrade sufficiently to prevent a “quick” condition that destroys the bearing capacity of the soil strata. The Contractor shall at no additional cost to the County, lower excavations and backfill to design subgrades with select backfill as approved by the Soils Engineer to obtain suitable bearing strata.

D. The responsibility for the performance of dewatering methods and devices shall lie entirely with the Contractor. The correction of settlement and damage to persons and property due to settlement shall be the responsibility of the Contractor.

E. Water, mud, etc. removed from the excavations shall be directed to an approved sediment control device.

F. If the Contractor elects to lower the water table, rather than using groundwater cut off, then the water table shall be lowered to a minimum of 2-feet below the proposed bottom of the excavation, and shall be continuously maintained at this level for the duration of construction.

G. Protect structures, utilities, pavements, and other facilities and improvements from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during dewatering operations.
   1. Prevent surface water and subsurface or groundwater from entering excavations, from ponding on prepared subgrades, and from flooding site and surrounding area.
   2. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.

H. Provide standby equipment on-site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of the primary system becomes inadequate or fails. If dewatering requirements are not satisfied, the Contractor shall restore the damaged structures and foundation soils at no additional expense to the County.

I. Remove dewatering system upon completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36-inches below overlying construction.

END OF SECTION
SECTION 02300
EARTHWORK

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Preparing subgrades for slabs-on-grade, walks, pavements and grasses.
2. Excavating and backfilling for buildings and structures.
3. Drainage course for concrete slabs-on-grade.
4. Subbase course for concrete walks and pavements.
5. Subsurface drainage backfill for walls and trenches.
6. Excavating and backfilling trenches for utilities and pits for buried utility structures.

B. All excavation work performed under this Contract is UNCLASSIFIED, and includes excavation and removal of all soil, shale, rock, boulders, wood, lumber, fill and other materials encountered of whatever nature.

1.02 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.
F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

G. Fill: Soil materials used to raise existing grades.

H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

I. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

J. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.03 SUBMITTALS

A. Submit product data for the warning tapes.

B. Qualification Data: For qualified testing agency.

C. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:
   1. Classification according to ASTM D 2487.
   2. Laboratory compaction curve according to ASTM D 1557.

D. Delivery Tickets: The Contractor shall submit delivery tickets with each load of common borrow and select borrow brought to the site showing the following information:
   1. Name and location of supplier or source.
   2. Type and amount of material delivered.
   3. Test information on the material as required by this specification.

1.04 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.
   1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
   2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Call Utility Locator Service: Notify Miss Utility at (800) 257-7777 at least 48 hours prior to starting excavation.
1. Request underground utilities to be located and marked within and surrounding construction areas.

C. Do not commence earth moving operations until temporary erosion and sedimentation control measures are in place.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations. All excavated material from within the limits of the project, which is to be used for the construction of embankments or fill or used for backfill, shall be approved by the Engineer, and shall meet the requirements as specified herein.

B. Satisfactory Soils: Including backfill and engineer fill shall be classified as SM, SP, SW or more granular per ASTM D-2487 and shall be free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Crushed Stone to be used for Base or Bedding Course and as Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2 inch (37.5-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.

D. Drainage Course: Narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2 inch (37.5-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.

2.02 ACCESSORIES

A. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; non-detectable tape to be applied directly to ductile iron pipe (DIP) wherever restrained joints are buried. colored as follows:

2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.
2.03 TESTS
A. The Contractor shall hire an independent inspection agency and testing laboratory for inspection and testing of soils and compaction.
B. It shall be the responsibility of the Contractor to notify the inspection agency three (3) days prior to the beginning of work so that the inspection agency can have a soils technician on the site during the work. The Contractor shall pay for all costs of this inspection service.

2.04 FILTER FABRIC
A. Filter fabric shall be Maryland SHA Class SE Geosynthetic, or approved equal, with the following minimum properties determined according to ASTM D4759 and referenced standard test methods:
   1. Grab Tensile Strength: 200 lbf; ASTM D4632
   2. Puncture Strength: 80 lbf; ASTM D4833
   3. Permittivity: 0.20/s; ASTM D4491
   4. Apparent Opening Size: 0.30 mm; ASTM D4751
   5. Trapezoid Tear Strength: 80 lbf; ASTM D4533

PART 3 - EXECUTION
3.01 PREPARATION
A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.
B. Protect and maintain erosion and sedimentation controls during earth moving operations.
C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.02 DEWATERING
A. Work shall comply with requirements of Section 02240.
B. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
C. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
1. Re-route surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.03 GENERAL EXCAVATION

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.04 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1-inch. Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.

2. Pile Foundations: Stop excavations 6 to 12 inches above bottom of pile cap before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.

3. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.

3.05 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.06 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide clearance, as indicated below, on each side of pipe or conduit.

1. For utilities or pipes 8” in diameter or smaller: 8”
2. For utilities or pipes larger than 8” in diameter: 12” or half the pipe diameter, whichever is larger.

C. Trench Bottoms: Excavate trenches 6 inches deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.

3.07 SUBGRADE INSPECTION

A. Notify Engineer when excavations have reached required subgrade.

B. If Engineer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-roll subgrade with a vehicle having an axle weight of at least 10 tons such as a loaded tandem axle dump truck to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction.

2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Engineer, and replace with compacted backfill or fill as directed.

D. Authorized additional excavation and replacement material will be paid for according to Contract provisions.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Engineer, without additional compensation.

3.08 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations.

3.09 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, sub-drainage, damp proofing, waterproofing, and perimeter insulation.

2. Surveying locations of underground utilities for Record Documents.

3. Testing and inspecting underground utilities.

4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring and bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.10 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Division 3.

D. Backfill voids with satisfactory soil while removing shoring and bracing.

E. Place and compact initial backfill of Crushed Stone/Engineered Fill to a height of 12-inches over the pipe or conduit.

1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

F. Place and compact final backfill of satisfactory soil, free of objects larger than 3” in any dimension to final subgrade elevation.

G. Install warning tape directly above utilities, 18-inches above pipe or other utility, or 6-inches below subgrade under pavements and slabs. Install non-detectable warning tape to top of DIP pipe.

3.11 SOIL FILL

A. Plow, scarify and bench sloped surfaces steeper than 1 vertical to 5 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use engineered fill.
4. Under building slabs, use engineered fill.
5. Under footings and foundations, use engineered fill.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.12 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within about 2 ± percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.

2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by about 2 percent and is too wet to compact to specified dry unit weight.

3.13 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8-inches in loose depth for material compacted by heavy compaction equipment, and not more than 6-inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:

1. Under structures, building slabs, steps, and pavements, compact each layer of backfill or fill soil material at 95 percent.

2. Under walkways, scarify and recompact top 6-inches below subgrade and compact each layer of backfill or fill soil material to at least 92 percent.

3. Under turf or unpaved areas, scarify and recompact top 6-inches below subgrade and compact each layer of backfill or fill soil material to at least 85 percent.

4. Any work within the State Highway Administration (SHA) right-of-way shall be compacted to 97% or in accordance with the latest SHA requirements, whichever is more stringent.

3.14 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within 1/2 inch plus or minus.

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.15 SUBSURFACE DRAINAGE

A. Subsurface Drain: Place subsurface drainage geotextile around perimeter of subdrainage trench. Place a 6-inch course of filter material on subsurface drainage geotextile to support subdrainage pipe. Encase subdrainage pipe in a minimum of 12-inches of filter material, placed in compacted layers 6-inches thick, and wrap in subsurface drainage geotextile, overlapping sides and ends at least 6-inches.

B. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12-inches of final subgrade, in compacted layers 6-inches thick. Overlay drainage backfill with one layer of subsurface drainage geotextile, overlapping sides and ends at least 6-inches.

1. Compact each filter material layer.

2. Place and compact impervious fill over drainage backfill in 6-inch thick compacted layers to final subgrade.

3.16 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

A. Place subbase course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place subbase course under pavements and walks as follows:

1. Install separation geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.

2. Place base course material over subbase course under hot-mix asphalt pavement.

3. Shape subbase course to required crown elevations and cross-slope grades.

4. Place subbase course 6-inches or less in compacted thickness in a single layer.

5. Place subbase course that exceeds 6-inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6-inches thick or less than 3-inches thick.

6. Compact subbase course at optimum moisture content to required grades, lines, cross sections, and thickness.
C. Pavement Shoulders: Place shoulders along edges of subbase course to prevent lateral movement. Construct shoulders, at least 12-inches wide, of satisfactory soil materials and compact simultaneously with each subbase layer.

3.17 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

A. Place drainage course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:

1. Install subdrainage geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.

2. Place drainage course 6-inches or less in compacted thickness in a single layer.

3. Place drainage course that exceeds 6-inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6-inches thick or less than 3-inches thick.

4. Compact each layer of drainage course to required cross sections and thicknesses.

3.18 BEARING PRESSURES

A. Provide a bearing pressure for the generator slab no less than 2,000psf.

3.19 FIELD QUALITY CONTROL

A. Special Inspections: Owner will not engage a qualified special inspector. Contractor is responsible for engaging a qualified independent testing agency to perform the following special inspections:

1. Determine prior to placement of fill that site has been prepared in compliance with requirements.

2. Determine that fill material and maximum lift thickness comply with requirements.

3. Determine, at the required frequency, that in-place density of compacted fill complies with requirements.

B. Testing Agency: Contractor will engage a qualified independent geotechnical engineering testing agency to perform tests and inspections.

C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

D. Footing Subgrade: At footing subgrades, at least one test shall be performed to verify design bearing capacities.
E. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:

1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2500 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.

2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 100 feet or less of wall length, but no fewer than two tests.

3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet or less of trench length, but no fewer than two tests.

F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.20 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Engineer; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.21 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's and/or City’s property.

3.22 TOLERANCES

A. Top Surface of Exposed Subgrade: Plus or minus one inch.

B. Top of Topsoil: Plus or minus 1/2 inch.

END OF SECTION
SECTION 02412

SELECTIVE EQUIPMENT DEMOLITION

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The Contractor shall furnish all labor, materials, equipment and incidentals required for demolition and disposal of all structures, building materials and equipment to be removed as indicated on the Contract Drawings and specified herein.

B. The extent of demolition of existing structures, utilities and equipment is shown on the Contract Drawings. Demolition includes the disconnection, disassembly and off-site disposal of items noted to be demolished, including all appurtenances, instrumentation, electrical and plumbing connections, and supports. Items noted to be abandoned shall be disconnected, removed back to a joint, fitting, or other suitable location, and capped or isolated as shown on the Contract Drawings or in accordance with applicable local, state, and federal standards. Some existing items shown on the Contract Drawings to be demolished may have been partially removed by Owner prior to the commencement of the Contract. In such instances, the Contractor shall complete the removal and demolition as shown on the Drawings.

C. Prior to demolition, or abandonment, the Contractor shall ensure that the item is out of service, with all power, water, and other utility connections disconnected and locked out as appropriate. The Contractor shall submit requests for shutdowns of appropriate water, sewer waste, process, communications, and/or electrical lines to the Engineer at least 10 days prior to date when shutdown is needed. Unless specifically approved by the Engineer, the Contractor shall not operate existing valves, pumps, electrical gear or mechanical equipment that is needed to effect a shutdown.

D. Contractor shall have no right or title to any of the equipment, materials or other items to be removed from the existing buildings or structures unless and until said equipment, materials and other items have been removed from the premises. Contractor shall not sell or assign, or attempt to sell or assign any interest in the said equipment, materials or other items until the said equipment, materials or other items have been removed from the premises.

E. The removal of all equipment and piping, and all materials from the demolition and structure modification work, when released by City, shall be the responsibility of the Contractor and all materials to be disposed of shall become Contractor’s property, unless otherwise noted, for disposal in a manner not contrary to the Contract requirements and said materials shall be removed from the site to the Contractor’s own place of disposal.

1.02 SUBMITTALS

A. Schedule: Submit for approval, proposed methods, equipment, and operations sequence. Include detailed sequence for all demolition work by structure and location. Include in the schedule the coordination for shut-off, dewatering, capping, temporary services, continuation of utility services, and other applicable items to ensure minimal interruption of City's operations. Sequence of demolition and removal of existing facilities shall be in accordance with the approved progress schedule as specified elsewhere.
1.03 QUALITY ASSURANCE

A. Items noted to be saved, salvaged, or remain in service shall be protected from demolition activities with appropriate coverings or enclosures by the Contractor.

B. Provide warning signs, barricades and safety barriers to protect personnel and plant operations.

C. Provide fire safety measures in areas where burning torches are being used.

1.04 CONDITION OF STRUCTURES

A. Protection

1. The City, County and the Engineer assume no responsibility for the actual condition of the structures to be demolished or removed.

2. Contractor shall perform all demolition and removal work to prevent damage or injury to adjacent structures, occupants thereof and adjacent features which might result from falling debris or other causes, and so as not to interfere with the use, and free and safe passage to and from adjacent structures. Blasting of any kind shall not be permitted. Burning of any debris resulting from the demolition will not be permitted.

3. Closing or obstructing of active roadways, sidewalks, and passageways adjacent to the work by placement or storage of materials will not be allowed. Contractor shall erect and maintain barriers, lights, sidewalk sheds, and other required protective devices as required and specified elsewhere. All traffic closures or interference shall be coordinated and approved by the County.

4. The Contractor shall make such investigations, explorations and probes as are necessary to ascertain any required protective measures before proceeding with demolition and removal. The Contractor shall give particular attention to shoring and bracing requirements so as to prevent any damage to existing construction.

5. The Contractor shall provide and maintain temporary protection of the existing structure(s) and equipment designated to remain where demolition and removal work is being done, connections are being made, materials are handled or equipment is being moved.

6. The Contractor shall take necessary precautions to limit dust from rising and scattering in the air to the lowest practical level by wetting demolished masonry, concrete, plaster and similar debris. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding and pollution. Existing buildings affected by the operations under this Section shall be protected by dust-proof partitions and other adequate means and shall be cleaned of dust, dirt and debris caused by demolition operations. Return adjacent areas to conditions that existed prior to the start of work.

7. Contractor shall provide interior and exterior shoring, bracing, or support to prevent movement or settlement or collapse of structures to be demolished and adjacent facilities to remain.
8. Contractor shall repair all damage done to adjacent facilities to remain, or to any property belonging to the City and/or County.

1.05 DISPOSAL OF MATERIAL

A. Except for any demolished items specifically identified by the County to remain the property of the City and/or County, all materials and equipment removed from existing structures shall become the property of the Contractor, and shall be removed from the site to the Contractor's own place of disposal at the Contractor's expense in conformance with all existing applicable laws and regulations.

B. Contractor shall schedule a meeting with the City and County prior to performing work to verify materials and equipment to be salvaged. Items to be salvaged shall be inspected by Contractor and Engineer for existing defects and damage prior to start of demolition activities. At a minimum, the following items shall be removed and returned to the City. Any items not listed herein will be identified at the onsite meeting with the County and City.

1. Motor starters, Unit heaters, Exhaust Fans, Batteries, Battery Chargers, Chart Recorders, Circuit Breakers, Contactors, Disconnect Switches, Gauges, Pressure Switches, Transducers, Time pulse, Frequency devices, Cone Valves, etc.

2. Items to be finalized at the site walkthrough prior to demolition.

PART 2 - PRODUCTS

(NOT USED)

PART 3 - EXECUTION

3.01 GENERAL

A. The demolition and removal work shall be performed as described in the Contract Documents. The work required shall be done with care, and shall include all required shoring, bracing, etc. The Contractor shall be responsible for any damage caused by demolition and removal work to any part or parts of existing structures or items designated for reuse or to remain. The Contractor shall perform patching, restoration and new work in accordance with applicable technical sections of the Specifications and in accordance with the details shown on the Drawings.

B. All supports, pedestals and anchors shall be removed with the equipment and piping unless otherwise specified or required. Concrete bases, anchor bolts and other support shall be removed to approximately 1-inch below the surrounding finished area and the recesses shall be patched to match the adjacent areas. Superstructure wall and roof openings shall be closed, and damaged surfaces shall be patched to match the adjacent areas, as specified under applicable sections of these Specifications, as shown on the Drawings, or as directed by the County. Wall sleeves and castings shall be plugged or blanked off, all openings in concrete shall be closed in a manner meeting the requirements of the appropriate Sections of these Specifications, as shown on the Drawings, and as directed and approved by the County.
C. Wherever piping is to be removed for disposition, the piping shall be drained by the Contractor and adjacent pipe and headers that are to remain in service shall be blanked off or plugged with plugs and caps then anchored in an approved manner. Drainage from process piping shall be disposed of on-site at locations to be directed by the County.

D. The Contractor shall, following approval from the City and County, shut off utilities serving structures of the existing facilities as required by demolition operations.

E. Surfaces of walls, floors, or other areas which are exposed to view by any of the removals specified herein, and which will remain as finished surfaces and which have holes, scars, chipped or other damaged surfaces revealed or caused by the removal shall be repaired by the Contractor with the same or matching materials as the existing surface or as may be otherwise approved by the County.

F. The Contractor shall be responsible for de-energizing all panelboards, lighting, fixtures, switches, circuit breakers, electrical conduits, motors, limit switches, pressure switches, instrumentation such as flow, level and/or other meters, wiring, and similar powered equipment prior to removal. Any electric panels or equipment which are affected by the demolition and removals specified which are required to remain in service shall be relocated or isolated prior to the demolition and removals specified herein.

3.02 MECHANICAL REMOVALS

A. Where equipment is shown or specified to be removed and relocated, the Contractor shall not proceed with removal of this equipment without specified prior approval of the City and County. Prior to commencing removal operations, the equipment shall be inspected before being removed in the presence of representatives of Contractor, City and County. Such items shall be removed with care, under the supervision of the trade responsible for reinstallation; protected and stored until required. Material or items damaged during removal shall be replaced with similar new material or item. Any equipment that is removed without authorization and is required for plant operation shall be replaced at no cost to the County.

B. Mechanical removals shall consist of dismantling and removal of existing tanks, piping, pumps, motors, equipment and other appurtenances as specified, shown, or required for the completion of the Work. It shall include cutting, capping, and plugging as required. The cutting of existing piping for the purpose of making connections thereto shall be as specified under the applicable section of these Specifications.

C. Any changes to potable water piping and other system work shall be made in conformance with all applicable codes and under the same requirements as other underground piping.

3.03 ELECTRICAL REMOVALS

A. Electrical removals shall consist of the removal of existing ductbanks, electrical manholes, distribution switchboards, control panels, motors, conduits and wires, panelboards, lighting fixtures, and miscellaneous electrical equipment required to perform the subsequent construction. All removals of electrical equipment shall be coordinated such that all equipment and facilities required to remain in service are kept operable without interruption. Where permanent removal of energized equipment is required, all associated wiring shall be completely removed to the power source.
B. Motors shall be disconnected and removed where shown or specified.

C. Conduits and wires shall be abandoned or removed where shown. Ductbanks shall be removed to the limits indicated on the Drawings.

D. Contractor shall verify the function of all wiring before disconnecting and removing it. Underground ducts shall be plugged beyond the limit of demolition and made watertight.

E. Lighting fixtures and ballasts shall be removed and disposed of where indicated.

F. Wall switches, receptacles, starters and other miscellaneous electrical equipment, shall be removed and disposed of off the site as required.

3.04 SITE RESTORATION

A. The Contractor shall remove from the site all debris resulting from the demolition operations as it accumulates. Upon completion of the work, all materials, equipment, waste, and debris of every sort shall be removed and premises shall be left, clean, neat and orderly. Excavation required for demolition shall be backfilled in accordance with the applicable sections of these Specifications to the grade shown on the Drawings.

END OF SECTION
PART 1 - GENERAL

1.01 DESCRIPTION

A. Work performed under this section shall include, but is not limited to, the inspection, cleaning, and flushing of the drain lines located at the Sparks Pumping Station and Elevated Tank sites to ensure proper and free drainage of the existing drainage systems. Drainage systems include, but are not limited to:

1. Altitude valve vault,
2. Suction surge and chlorine vaults,
3. Discharge surge valve vault,
4. Station interior floor and sanitary drain piping.

B. All investigation services shall be performed in accordance with commonly acceptable industry procedures, sound inspection practices and be inclusive of all items normally required to successfully complete these types of investigations. Prior to inspection, pipes shall be cleaned with up to three passes of an appropriately sized hydraulic jet cleaner. Should heavy debris or roots be encountered and prevent the inspection, heavy cleaning/root cutting shall be performed to allow a complete and unobstructed inspection of the pipe. All debris generated from either the light, heavy or root cutting shall be removed from the system and disposed of at a site approved by the County. The CCTV inspection work shall be completed in accordance with the guidelines outlined by the National Association of Sewer Service Companies (NASSCO) and all data shall be recorded using NASSCO's Pipeline Assessment and Certification Program (PACP) format. During all CCTV inspections, the pipe shall be located, traced and accurately located in the field and transferred to a copy of the site plan. Any manned-entry confined space entries required to complete the services shall comply with current OSHA confined space safety guidelines and be strictly followed by the contractor. Water required for all cleaning operations at the Pumping Station will be provided by the County. Contractor shall provide water for cleaning operations at the Elevated Storage Tank.

C. Services to be completed as part of this inspection and cleaning generally include the following major items of work. Each item of work will be further detailed herein.

1. Light cleaning up to 3 passes with a hydraulic cleaner
2. Heavy cleaning and root removal
3. Removal and disposal of all debris from the collection system
4. Pipe locating services (all pipes shall be located and mapped using a suitable tracing/tracking device)
5. PACP CCTV inspection
PART 2 - PRODUCTS

(NOT USED)

PART 3 - EXECUTION

3.01 PRE-CLEANING, CCTV INSPECTION AND LOCATING SERVICES

A. The CCTV Contractor shall perform light cleaning as part of the CCTV inspection. Light cleaning is defined as up to (3) three passes with an appropriately sized hydraulically propelled jet cleaning machine. If necessary, the contractor shall perform heavy cleaning and root removal to allow closed circuit television (CCTV) inspections of drains. If heavy debris or roots are present and will not allow the camera to move through the pipe or provide an adequate view of the pipe for condition assessment, heavy cleaning or root removal will be required.

B. Water required for all cleaning operations at the Pumping Station will be provided by the County. Contractor shall provide water for cleaning operations at the Elevated Storage Tank. No additional payment will be made for water needed to successfully complete this task.

C. All debris generated as part of the cleaning operations shall be removed from the storm drain system and disposed of at a disposal site approved by the County. Debris disposal shall be considered incidental to the respective item of work for which it is associated.

D. Mobilization: The Contractor shall be responsible for mobilizing/demobilizing all equipment and required personnel necessary to complete the cleaning and inspection operations.

E. Equipment: The Contractor shall be responsible for providing all manpower and equipment required to successfully complete the cleaning, root cutting, pipe locating and CCTV inspection services for the drains.

F. Drain Pre-Cleaning (Pre-Clean for CCTV Inspection): Drains shall be pre-cleaned with up to three passes of appropriately sized cleaning equipment as required to enable the inspector to capture the most accurate and complete depiction of defects and observations present within the pipe segment. The Contractor shall be responsible for completing all necessary cleaning operations for drain piping utilizing an appropriately sized hydraulically propelled, high-velocity jetting equipment or other suitable equipment required to adequately clean the storm drain for inspection. Cleaning shall be performed immediately before all CCTV inspection operations if the pipe conditions require cleaning to obtain accurate inspection data. Any accumulations of debris generated as a result of the cleaning operations will be removed from the system, documented (debris type and quantity), and disposed of at a disposal site approved by the County. If cleaning the entire storm drain segment (Altitude Valve Vault to MH) cannot be successfully completed from one manhole setup, all required equipment and personnel shall be relocated to the opposing manhole or structure and the cleaning operations attempted again. If once again cleaning operations cannot be successfully completed, it shall be assumed that a blockage or other significant defect exists in the pipe and the Engineer will be notified.
G. Closed Circuit Televised (CCTV) Inspection: The drain inspection survey shall be performed from the existing manhole. The CCTV inspection shall be completed in accordance with the requirements of the National Association of Sewer Service Companies (NASSCO) Pipeline Assessment Certification Program (PACP) defect coding classifications. Following cleaning operations, drain pipes shall be inspected and a report generated assessing the condition of the drain segment. The inspection shall be completed by a self-propelled remotely operated camera system. All inspection cameras shall be outfitted with sonde transmitters or other appropriate locating device to facilitate tracking of the pipe's alignment from the surface. The self-propelled inspection equipment shall utilize a pan-and-tilt radial viewing digital pipe inspection camera that pans +/-275 degrees and rotates 360 degrees. The camera used for the inspections shall be specifically designed and constructed for such use. The camera shall be capable of operation in 100% humidity with lighting suitable to allow a clear and unrestricted view of the entire periphery of the pipe being inspected. The importance of accurate distance measurement shall be emphasized. The camera shall utilize an accurate footage counter, which displays the monitor the exact distance of the camera from the centerline of the starting manhole. Accuracy of the cameras distance measuring device shall be checked prior to the inspection by the use of a calibrated measuring device. The camera shall have a height adjustment so that the camera is centered (to the extent possible) in the pipe being inspected. The inspection shall first be attempted in the upstream direction. If reversals are required to successfully complete the inspections, they shall be displayed in sequential order with the forward inspection contained first on the CD/DVD. If during the inspection, the inspection camera will not transverse the pipe, the camera setup shall be relocated to the altitude valve vault and the inspection attempted again. If once again the camera will not pass through the entire pipe segment due to a defect, the inspection shall be considered abandoned and the Engineer notified that a potential system defect exists.

H. Drain Pipe Rating Standards: As an accurate means of prioritizing maintenance and/or repairs of the storm drain pipe, the following rating system will be used to weight various types of structural defects or maintenance requirements occurring within a pipe segment. The following scale will be used to assign a rating to the drain pipe inspected as part of this project.

<table>
<thead>
<tr>
<th>Rating</th>
<th>Defects Observed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 – Excellent Condition</td>
<td>No or minor defects are observed.</td>
</tr>
<tr>
<td>2 – Good Condition</td>
<td>Defects observed have not started to deteriorate the pipe.</td>
</tr>
<tr>
<td>3 – Fair Condition</td>
<td>Moderate defects are observed that will continue to deteriorate the pipe and/or debris is observed within the pipe requiring removal.</td>
</tr>
<tr>
<td>4 – Poor Condition</td>
<td>Severe defects are observed which will become grade 5 defects in the foreseeable future and/or heavy debris or roots requiring removal are observed in the pipe.</td>
</tr>
<tr>
<td>5 – Immediate Attention Required</td>
<td>Severe structural defects or significant debris or other maintenance requirements are observed in the pipe that require immediate attention to successfully keep the pipe in operation are identified.</td>
</tr>
</tbody>
</table>
I. Video Record of Inspection (CD/DVD): The Contractor shall provide (2) two copies of the inspection data and digital color video captures of the complete inspection performed on CD/DVD. All inspection videos shall be continuous for pipe segments located between manholes. All inspections shall be performed and submitted at a resolution capable of providing a picture quality adequate for the purpose of inspection and rating the pipe segment. The inspections shall be submitted on CD/DVD in MPEG1 (mpg) format utilizing user-friendly and easy to view standard Windows software and become the property of the County. A location map shall accompany all CCTV inspection data submitted for ease in locating the segment investigated. Manhole, junction box and inlet numbering shall be as defined by the Contract Drawings. The CCTV inspections may result in finding additional structures that are not recorded on the maps provided, and in such cases the data will serve to update the mapping. In the case where unidentified manholes, junction boxes, inlets or other structures are located during the inspection process, these structures shall be numbered with the preceding structure number followed by the letter "A", "B", etc. or each additional structure located between the identified bounding structures of the survey. The following information at a minimum shall be permanently affixed to the face of each CD/DVD submitted:

<table>
<thead>
<tr>
<th>Title:</th>
<th>Project Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Segment(s) Inspected:</td>
<td>from _________ to _________</td>
</tr>
<tr>
<td>Date of Inspection:</td>
<td>____________________________</td>
</tr>
<tr>
<td>Date Submitted:</td>
<td>____________________________</td>
</tr>
<tr>
<td>Contractor’s Name:</td>
<td>____________________________</td>
</tr>
<tr>
<td>Inspector’s Name:</td>
<td>____________________________</td>
</tr>
<tr>
<td>PACP Identification No.:</td>
<td>____________________________</td>
</tr>
<tr>
<td>Contract Document Ref: (Sheet No. of Segment(s) Inspected)</td>
<td></td>
</tr>
<tr>
<td>CD/DVD Number:</td>
<td>____________________________</td>
</tr>
</tbody>
</table>

J. Documentation of CCTV Inspections (Report): A comprehensive CCTV inspection report containing the pipe segment ratings and a location record map shall be maintained at all times by the Contractor to clearly and accurately identify the condition and location of the completed CCTV inspection and newly identified pipe segments or structures. Two (2) copies of the complete video inspection report shall be provided. At a minimum, the report shall include the following information:

1. Utility owner:

2. Project name:

3. Name of Inspection Company:

4. Segment inspected (from ___ to ___)

5. Date of inspection:

6. Segment condition ratings

7. Location map, clearly showing the location of the segment inspected including upstream and downstream manhole designations and any new structures identified.
8. Starting/Ending manhole/structure, including identification numbers, depth and construction material

9. Direction of inspection (upstream to downstream)

10. Size, material and length of storm drain segment inspected

11. Name of the Inspector

12. List of inspection information, including locations of defects, areas of interest, connections, etc. new pipes or structures identified

13. Graphically show the location of defects, connections, items of interest etc. new pipes, and/or structures observed during the inspection

K. Locating Pipe: It is the intent to locate the drainage piping as part of this project. Previously identified pipes are shown on the contract drawings. A sonde or other appropriate electronic locating device shall be affixed to all inspection cameras and equipment and the pipes located, mapped and their location accurately recorded on the mapping provided. The costs associated with this item of work shall be considered incidental to the pre-cleaning and CCTV inspection cost.

L. Documentation of Debris Removed from the Storm Drain System: All debris generated from the cleaning operations shall be removed from the storm drain system and recorded as presented in the following Table.

<table>
<thead>
<tr>
<th>Date Removed</th>
<th>Material Removed</th>
<th>Approximate Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3.02 HEAVY CLEANING AND ROOT REMOVAL

A. When pre-cleaning has not adequately prepared the pipe for inspection, heavy cleaning and root removal shall be used. Heavy cleaning and root removal is defined as cleaning in excess of three passes of a specialized hydraulic cleaner or other equipment needed to remove accumulations of silt, rocks, and other debris from the collection system. Root removal is defined as removal of medium to heavy roots accumulations that prevent the movement of the inspection camera.

B. Mobilization: The Contractor shall be responsible for mobilizing/demobilizing all heavy cleaning and root removal equipment and required personnel necessary to complete these operations.

C. Equipment: The Contractor shall be responsible for providing all manpower and equipment required to successfully complete the heavy cleaning and root removal for the existing drains.

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D. Documentation of Debris Removed from the Drain Systems: All roots debris generated from the cleaning operations shall be removed from the drain systems and recorded as presented in the following Table:

<table>
<thead>
<tr>
<th>Date Removed</th>
<th>Material Removed</th>
<th>Approximate Weight</th>
</tr>
</thead>
</table>

END OF SECTION
SECTION 02675

DISINFECTION OF WATER DISTRIBUTION SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Contractor shall furnish labor, materials, equipment and services necessary for and incidental to the execution and completion of disinfection in accordance with AWWA standards.

1.02 REFERENCES

A. American Water Works Association (AWWA) Standards

1. ANSI/AWWA C652-11, Disinfection of Water Storage Facilities

1.03 QUALITY ASSURANCE

A. Tank Disinfection

1. After the tank is fitted for disinfection and held full for 24 hours, the Contractor shall obtain one sample of water from the top of the tank and one sample of water from the bottom of the tank and shall submit the samples to the Engineer for chlorine residual analyses.

2. After completion of chlorine residual testing, the Contractor shall obtain samples of water from the top of the tank and from the bottom of the tank and shall submit the samples to the Engineer for total coliform (bacteriological) analyses.

3. The Engineer will deliver the chlorine residual and bacteriological samples to the Baltimore City Water Quality Laboratory located at the Ashburton Water Filtration Plant.

B. COMAR

1. All materials that contact drinking water must comply with the Limit on Lead Content, COMAR 09.20.01.03.

2. In accordance with COMAR 26.04.01.33, Direct and Indirect Additives, the Contractor shall be limited to incorporating into this Contract only products (any materials that come into contact with water intended for use in the public water supply) which meet the applicable American National Standards Institute/NSF International (ANSI/NSF) standards for direct or indirect water additives. The products may be certified by an organization accredited by ANSI for such testing (i.e., International Association of Plumbing and Mechanical Officials Research and Testing, Ontario, CA; Underwriters Laboratory, Northbrook, IL; and Water Quality Association, Lisle, IL).
C. Wastewater Disposal Plan

1. Develop a plan for safe disposal of chlorinated wastewater. Submit plan to Engineer for review and approval at least two (2) weeks in advance of disinfection/testing activities. Do not perform disinfection/testing prior to receipt of approval from the Engineer.

2. Include in the disposal plan provisions for neutralizing chlorine and any other contaminants to levels acceptable to the Maryland Department of the Environment (MDE).

3. There are no sanitary sewer lines on site.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Materials for disinfection of the tank shall be as listed in Section 3: Forms of Chlorine for Disinfection of AWWA C652-11.

PART 3 - EXECUTION

3.01 TANK DISINFECTION

A. Sequencing:

1. The interior coating shall be properly cured.

2. The interior coating shall be washed with potable water.

3. Contractor shall flush and disinfect the tank.

4. Contractor shall take the samples and submit to the Owner. The Owner will perform the testing at the Ashburn Laboratory.

B. After proper curing of the interior paint and prior to disinfecting, the Contractor shall wash the tank interior surfaces with potable water. All equipment, including brooms, brushes, spray equipment, and worker’s boots, shall be disinfected before they are used to clean the tank. The Contractor shall supply an adequate flow of water (20 gpm minimum) with sufficient pressure (60 psi minimum at the nozzle) to wash thoroughly all the interior surfaces, including those surfaces above the high water level. All residue shall be removed from the tank and inlet/outlet pipe.

C. It is the Contractor’s responsibility to flush and disinfect the tank and connecting piping until two or more successive samples taken in a twenty-four hour period show that the samples are satisfactory.
D. The Contractor shall first clear the tank of all equipment, tools, scaffolding and debris and broom clean the floor in accordance with Section 2 of AWWA C652. All interior surfaces, including roof, shall be thoroughly washed with water to remove dirt, dust and other contaminants. Should the Contractor elect to use a fire hydrant for cleaning activities, the Contractor shall obtain a Fire Hydrant Connection Permit and shall pay all associated charges.

E. Following cleaning of the tank, disinfection shall be performed in accordance with Section 4.3 Chlorination Method 2 from Section 4 – Alternative Methods of Chlorination of AWWA C652, except that separate drain piping shall not be required to have available chlorine of not less than 10 mg/L when filled with water. Following this initial disinfection, perform the following:

1. Properly dispose of all chlorinated water either by hauling to an adjacent sewer or dechlorinating and sending to drain.

2. Fill the tank to 50-percent capacity (approximate elevation 537.2) with system water and isolate the tank. Initial chlorine residual should be approximately 0.80 ppm.

3. Turn on the submersible mixer and visually inspect for proper operation.

4. With the mixer in service, add approximately 65.6 pounds of calcium hypochlorite (with 65-percent available chlorine) evenly distributed thru multiple roof hatches. Fill the tank to overflow and isolate for a full 24 hours; leave mixer in operation.

5. Obtain samples for chlorine residual. Chlorine residual should be approximately 2.0 ppm.

F. The Contractor shall perform all disinfection operations, including furnishing all chlorination equipment and chemicals.

G. After the tank has been filled and held for 24 hours, the Contractor shall obtain water samples and shall submit the samples to the Engineer for analysis for total coliform per Method MMO-MUG. Two (2) or more successive bacteriological passing tests, from samples drawn a minimum of 24 hours apart, shall constitute a passing test. If the test for coliform is positive, the tank shall be drained and the disinfection and testing procedures repeated until two (2) consecutive samples are negative.

H. Bacteriological testing will be performed by the Baltimore City Water Quality Lab, located at Ashburton Water Filtration Plant. The results of the total coliform and E. coli analyses shall be furnished to the Maryland Department of the Environment Water Supply Program for approval prior to placing the tank into service.

I. Baltimore City personnel shall operate all valves.
J. The stored tank water shall comply with current State and USEPA standards for organic, inorganic, and biological contaminants as influenced by the operations of the Contractor. One tank of water for the disinfection shall be furnished by the Owner at no charge to the Contractor. Additional water shall be furnished at current municipal water rates charged by the Owner and shall be paid for by the Contractor.

END OF SECTION
SECTION 02740

ASPHALT PAVEMENT

PART 1 - GENERAL

1.01 SUMMARY
A. The work to be performed under this section includes, but is not limited to, the removal of existing macadam and furnishing of all materials, labor, tools and equipment necessary for the hot-mix asphalt paving as shown on the Contract Drawings.

1.02 DESCRIPTION
A. Provide hot-mix asphalt paving according to materials, workmanship, and other applicable requirements of Baltimore County’s Standard Specifications for Construction and Materials Section 504.

1.03 SUBMITTALS
A. Product Data: For each type of product required. Include technical data and tested physical and performance properties.
B. Job-Mix Designs: For each job mix proposed for the work.
C. Qualifications: For pavement manufacturer.
D. Material Test Reports: For each paving material.
E. Material Certificates: For each paving material, signed by its manufacturer.

1.04 QUALITY ASSURANCE
A. Manufacturer shall be a paving-mix manufacturer registered with, and approved by, Baltimore County or the MDSHA.
B. Testing Agency shall be qualified according to ASTM D3666 for testing indicated, as documented according to ASTM 6548.
C. Comply with Baltimore County and MOSHA requirements for asphalt paving work.
D. Comply with AI MS-22, “Construction of Hot Mix Asphalt Pavements”, unless more stringent requirements are indicated.

1.05 PROJECT CONDITIONS
A. Do not apply asphalt materials if subgrade is wet or excessively damp or if the following conditions are not met:
   1. Prime and Tack Coats: Minimum surface temperature of 60 deg F.
2. Slurry Coat: Comply with weather limitations of ASTM D3910.

3. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.

4. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.

B. Do not apply new asphalt pavement until all existing macadam pavement is removed and the subgrade is prepared.

PART 2 - MATERIALS

2.01 AGGREGATES

A. Use materials and gradations that have performed satisfactorily in previous installations.

B. Aggregates shall be in accordance with Baltimore County Specification Section 901.

2.02 ASPHALT MATERIALS

A. Asphalt binder shall be in accordance with AASHTO MP1.

B. Asphalt cement, prime coat and tack coat shall be in accordance with Baltimore County Specification Section 904.

C. Water shall be potable.

2.03 DESIGN MIXES

A. Design mixes shall be developed by the Contractor in conformance with Baltimore County Specification Section 904.

B. Design mixes shall be submitted to the Engineer for approval.

2.04 AUXILIARY MATERIALS

A. Herbicide shall be commercial chemical for weed control, registered with the EPA. Provide in granular, liquid, or wettable powder form.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that all existing macadam has been removed and subgrade is dry and in suitable condition to support paving and imposed loads.

B. Proof-roll subbase using heavy, pneumatic-tired roller to locate areas that are unstable or that require further compaction.

C. Proceed with paving only after unsatisfactory conditions have been corrected.
3.02 SURFACE PREPARATION

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving. Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.

B. Herbicide Treatment: Apply herbicide according to manufacturers recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving material.

C. Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.15 to 0.50 gal/sq. yd. Apply enough material to penetrate and seal but not flood surface. Allow prime coat to cure for 72 hours minimum.

1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.

2. Protect primed substrate from damage until ready to receive paving.

D. Tack Coat: Apply uniformly at a rate of 0.05 to 0.15 gal/sq. yd.

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.

2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.03 HOT-MIX ASPHALT PLACING

A. Place hot-mix asphalt on prepared surface, spread uniformly, and strike off in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.

B. Spread mix at a minimum temperature of 250 deg F, beginning on the high side.

C. Promptly correct surface irregularities in paving course. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix and use suitable hand tools to smooth surface.

3.04 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot hand tampers or vibratory-plate compactors in areas inaccessible to rollers. Complete compaction before mix temperature cools to 185 deg F.

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edges. Examine surface immediately after breakdown rolling for required grade and smoothness.
C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to an average density of 92 percent of reference maximum theoretical density according to ASTM D2041, but not less than 90 percent nor greater than 96 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot and compact thoroughly.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.05 INSTALLATION TOLERANCES

A. Thickness: Compact each course to produce the thickness indicated within the following tolerances:

1. Base Course: Plus or minus ½ inch.
2. Surface Course: Plus ¼ inch, no minus.

B. Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:

1. Base Course: ¼ inch.
2. Surface Course: 1/8 inch.

3.06 FIELD QUALITY CONTROL

A. Testing Agency: The Contractor shall engage a qualified independent testing and inspecting agency to perform field tests and inspections and to prepare test reports. Testing agency shall conduct and interpret tests and state in reports whether tested work complies with or deviates from the specified requirements.

B. Thickness: In-place compacted thickness of hot-mix asphalt courses shall be determined according to ASTM 133549.

C. Surface Smoothness: Finished surfaces of each hot-mix asphalt course shall be tested for compliance with smoothness tolerances.

D. Testing agency shall take samples of uncompacted paving mixtures and compacted pavement according to ASTM D979 or AASHTO T168
1. Reference maximum theoretical density shall be determined by averaging results from four samples of hot-mix asphalt paving mixture delivered to site, prepared according to ASTM 1320411 and compacted according to job-mix specifications.

2. In-place density of compacted pavement shall be determined by testing core samples according to ASTM D1188 or ASTM D2726.
   a. One core sample shall be taken for every 1,000 sq. yds. or less of installed pavement, with no fewer than 2 cores taken.
   b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM2950 and correlated with ASTM D1188 or ASTM D2726.

E. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

END OF SECTION
PART 1 - GENERAL

1.01 DESCRIPTION

A. This section includes requirements to furnish all materials, labor, equipment, power, maintenance, operation, etc. to implement and operate a temporary pumping system for the purpose of diverting water flows around the work area should the Contractor’s selected method of construction require such a system.

B. This section includes requirements to furnish all materials, labor, equipment, power, maintenance, operation, etc. to implement and operate a temporary sodium hypochlorite system.

C. It is essential to the operation of the existing water supply system that there is no interruption in the flow of water throughout the duration of the project. To this end, the Contractor shall provide, maintain, and operate all temporary facilities such as dams, plugs, pumping equipment (both primary and back-up units as required), conduits, all necessary power and fuel, and all other labor and equipment necessary to intercept the water before it reaches the point where it would interfere with his work, and return it to existing system.

D. The Contractor shall provide all necessary means to safely intercept the water before it reaches the work area. The Contractor will not be permitted to stop or impede the flows under any circumstances.

E. The Contractor shall maintain water flow in a manner that will not cause damage to the water system, and that will protect public and private property from damage and flooding.

F. The Contractor shall protect water resources, wetlands, and other natural resources. Contractor shall be liable for failure of the bypass system, which may result in discharge of chlorinated water to soils, water bodies, or other natural non-contaminated areas.

1.02 QUALITY ASSURANCE

A. The design, installation and operation of the temporary pumping system shall be the Contractor’s responsibility. The Contractor shall employ the services of a vendor who can demonstrate to the Engineer that he specializes in the design and operation of temporary bypass pumping systems. The vendor shall provide at least five (5) references to the Engineer of projects similar in size and complexity to this project that have been performed by his firm within the past three (3) years. The bypass pumping system shall meet the requirements of all codes and regulatory agencies having jurisdiction.

B. All equipment utilized within the bypass pumping system shall be NSF certified for use with drinking water.
C. The Contractor is responsible for providing any signals and communication required with the Owner’s system to ensure a complete and operable system.

1.03 SUBMITTALS

A. The Contractor shall submit detailed plans and descriptions outlining all provisions and precautions to be taken by the Contractor regarding the handling of water flows. This plan must be specific and complete, including such items as schedules, locations, elevations, capacities of equipment, materials, and all other incidental items necessary. No construction shall begin until all provisions and requirements have been reviewed and approved by the Engineer.

B. The Contractor shall submit working plans for the bypass pumping location, which shall include, but not be limited to, details of the following:

1. Staging area for pump(s), generator, and fuel storage area.
2. Number, size, material, location, and method of installation of suction and discharge piping.
3. Upstream and downstream discharge plan.
4. Bypass pump sizes, and power requirements.
5. Refueling plan.
6. Calculations of static lift, friction losses, and flow velocity. Pump curve showing pump operating point(s).
7. Force main tapping and connection plan.
8. Thrust and restrain block sizes and locations, if necessary.
9. Method of noise attenuation for pump(s).
10. Temporary pipe supports and anchoring, if necessary.
11. Calculations for selection of bypass pumping pipe sizes.
12. Schedule for installation and maintenance of bypass pumping system.
13. Contractor shall submit methods for reporting the following signals and alarms to Ashburton TCC:
   a. Signals:
      1) Station flow
      2) Station discharge and suction pressures
      3) Pump running
4) Tank Level (%full)

b. Alarms:

1) Pumps fail to start

C. The Contractor shall be responsible for the design of a complete support and protection of excavation plan, including any dewatering that may be required, in order to excavate the existing force main to perform line tapping and stopping services, as necessary to provide a connection for the temporary bypass pumping and to complete the improvements work as shown in the contract documents. This support and protection of excavation plan shall include design calculations and complete working drawings prepared and sealed by a Professional Engineer registered in the State of Maryland.

D. Cleaning Certificate: Submit cleaning certificate from a third-party inspector showing pumps and piping being used on the project have been cleaned in accordance with NSF requirements for use in potable water applications. Certification at a minimum shall indicate the pipe, meters, pump make, model and serial number and date cleaned. Pumps, piping, and meters not provided with this certification will be immediately rejected for installation and shall not entitle the Contractor for additional time or money.

E. Temporary Sodium Hypochlorite System: The Contractor shall submit working plans for the temporary sodium hypochlorite location, which shall include, but not be limited to, details of the following:

1. Staging area for pumps and sodium hypochlorite tank storage area.

2. Number, size, material, location, and method of installation of suction and discharge piping.

3. Discharge plan and feed location.

4. Pump sizes, and power requirements.

5. Refilling plan.

6. Calculations of static lift, friction losses, and flow velocity. Pump curve showing pump operating point(s).

7. Calculations for selection of pumping and pipe sizes.

8. Product data and method of chlorine residual analysis and reporting to City system.

9. Schedule for installation and maintenance of sodium hypochlorite system.
PART 2 - PRODUCTS

2.01 BYPASS PUMPING

A. EQUIPMENT AND PIPING:

1. All equipment and piping shall be rated for use with potable water. The system shall conform to all local, state, and federal requirements pertaining to drinking water.

2. All pumps used shall be fully automatic self-priming, units that do not require the use of foot-valves or vacuum pumps in the priming system. The pumps shall be diesel powered.

3. The Contractor shall provide the necessary start, stop, and variable speed pump controls. Each pump shall have a soft start with automatic ramping of speed to minimize flow and pressure spikes. Pumps shall have a control panel, supplied by the bypass pump vendor, at each pump location to provide means to control pump system flows, provide start/stop operation, and protect pump and piping system from high pressure or deadhead operating conditions. The control panel shall allow for manual/auto VFD speed control with infinite speed adjustment capability.

4. The Contractor shall include one stand-by pump of equal capacity to the largest primary pump, to be maintained on site. The stand-by pump shall be piped and on-line, isolated from the primary system by an isolation valve.

5. Piping: All piping and valves used shall be new. In order to prevent the accidental spillage of flows, all discharge systems shall be constructed of rigid pipe with leak proof joints, suitable for the intended use. Under no circumstances will aluminum “irrigation” type piping or glued PVC pipe be allowed. Contractor shall also be responsible for any damage to the existing force main as a result of this work, and shall be responsible for all overflows and/or spills and cleanup thereof, including all costs associated with such clean up. The Contractor shall also be liable for any civil and/or criminal penalties associated with any overflows and/or spills.

6. Provide all taps, isolation valves, etc. for sodium hypochlorite dosing.

7. Provide sample port for grab sample to permit verification of residuals.

8. Provide suction and discharge pressure readings. Pressure readings shall communicate with the City’s communication system.

9. Provide flow metering for pump system. Flow metering shall communicate with the City’s communication system.

10. The Contractor shall provide means (e.g. pressure monitoring system) to protect the bypass pumps against deadhead and loss of suction conditions.
11. Contractor shall be responsible for providing on-site fuel storage or other means of fueling standby generator. Provide berms, double tank containment or other means to contain fuel spills. Contractor shall be responsible for pump fuel shipments and fuel payment.

12. All provided pumps and piping shall be cleaned for use with potable water. The Contractor shall provide third party certification attesting for each pump, flow meter, and piping showing that it has been cleaned to meet NSF standards for drinking water. Certification at a minimum shall indicate the piping, flow meter, pump make, model and serial number and date cleaned. Pumps not provided with this certification will be immediately rejected for installation and shall not entitle the Contractor for additional time or money.

13. Each bypass pump’s control system shall include 8 programmable relays and 66 selectable features, including pump running, pump failure and others as directed by the County and City, as well as RS-232 and RS-485 communication ports which shall enable communication with SCADA and remote alarm equipment. The control system shall maintain an “event history” of up to 32 warning alarms.

14. Bypass pumping system shall be provided with a wireless, remote alarm monitoring and notification system (WRTU) capable of remotely notifying the Contractor and the City of any problem with the bypass pumping system in time to prevent a loss of adequate service pressure and flow. The WRTU shall be capable of monitoring and remotely notifying the Contractor and City of at least 8 different alarms and shall be installed in a NEMA 4X enclosure. The WRTU shall be a RACA model AA-102NEMA4XY, or approved equal. All temporary power, wireless network service plans, and programming for the remote alarm monitoring and notification system shall be the Contractor’s responsibility, at no additional cost to the County.

B. DESIGN REQUIREMENTS:

1. The bypass pumping system shall be capable of bypassing the flow around the work area as necessary for satisfactory performances of work. Proposed bypass system shall be capable of pumping receiving pressure from the 20” main feeding the Sparks Pumping Station and discharging into the existing 16” force main to the Sparks Elevated Storage Tank located north of the pumping station on York Road.

The bypass system shall be capable of providing the following flows:

<table>
<thead>
<tr>
<th>Capacity</th>
<th>Head</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,250 gpm</td>
<td>58 ft</td>
</tr>
</tbody>
</table>

The Contractor shall confirm the TDH requirements based upon their specific design and arrangement and submit calculations to the Engineer for review. The bypass pumping system will be required to be operated 24 hours per day, seven (7) days per week.
2. Suction pressure available at the site typically varies from 54 to 58psi. The Contractor and bypass system provider shall confirm available pressures and size their pumps to ensure the capacities listed herein can be conveyed to the Sparks Elevated Storage Tank at the varying incoming pressures.

3. The bypass pumping system shall be sound attenuated and shall not produce noise levels greater than 70 dBA at 30 feet at any time. Contractor shall coordinate noise requirements with Specification 01000 and provide sound mitigation as necessary to meet the specified noise levels. Contractor shall provide noise level testing at the start of bypass pumping operations. If noise levels are not being met at any time during the bypass pumping operation, the Contractor shall take necessary remedial actions and provide additional noise level tests to demonstrate compliance at no additional cost to the Owner.

4. The Contractor is responsible for excavation and installation of tapping sleeves and isolation valves on the existing force mains and providing means to isolate the force main so as to eliminate the potential for backflow into the work area. Alternate means for flow bypass will be considered. The Contractor shall provide details as part of the submittals for review and approval.

2.02 TEMPORARY SODIUM HYPOCHLORITE

A. EQUIPMENT AND PIPING

1. All equipment and piping shall be rated for use with potable water. The system shall conform to all local, state, and federal requirements pertaining to drinking water.

2. Provide all pumps, piping, valves, and appurtenances necessary to dose sodium hypochlorite throughout construction. All pumps used shall be fully automatic.

3. Provide secure tamper proof, lockable housing/shed for storage of the sodium hypochlorite system components.

4. Provide minimum sodium hypochlorite supply of 55 gallons. Sodium hypochlorite shall be 12.5% strength and shall be secured within the lockable housing/shed.

5. Contractor shall coordinate tapping and sampling locations on the bypass pumping system piping.

6. Provide chlorine analyzer on bypass pumping system discharge piping to record chlorine residuals. Chlorine residuals shall be communicated to the City’s existing system.

7. Provide freeze protection for all system components.
PART 3 - EXECUTION

3.01 INSTALLATION

A. Furnish cleaning certificate to the Owner’s on-site inspector prior to commencing equipment setup. Equipment setup shall not occur without provision of an acceptable cleaning certificate as specified above. Failure to furnish an acceptable cleaning certificate as specified above shall be cause to reject installation of the bypass system. No time or money will be provided with the need to provide the cleaning certificate.

B. The design, installation, maintenance, and operation of the temporary pumping and piping system shall be the Contractor’s sole responsibility.

C. The Contractor shall provide and install all incidental piping, valving and structural work as required to furnish a complete and operational system.

D. The Contractor shall maintain a minimum fuel reserve for 24 hours of continuous pumping operation.

3.02 FIELD QUALITY CONTROL AND MAINTENANCE

A. The Contractor shall perform leakage and pressure tests of the bypass pumping system using clean water prior to actual operation. The Contractor shall provide at least 48 hours notice prior to testing.

B. The Contractor shall demonstrate, to the satisfaction of the County and City, operation of the bypass pumping system at its design flow for a minimum period of 72 continuous hours prior to disconnecting any system components and/or taking the pumping station out of service.

C. The Contractor shall insure that the temporary pumping system is properly maintained and a responsible operator shall be available and on site within 90 minutes when pumps are operating to address any operational issues.

D. The Contractor shall ensure that the remote alarm system is operational at all times. The Contractor shall respond to all alarms and rectify all situations in sufficient time to prevent overflows. All alarms shall be sent to the City by the remote alarm system for informational purposes only.

E. Any spare parts for pumps and piping necessary to ensure continuous operation to handle the specified water flows for the necessary duration of bypass pumping shall be kept on site as required.

F. Operation and Maintenance: The Contractor shall ensure that the temporary pumping system is properly maintained and that the remote alarm system is operational at all times. The Contractor shall respond to all alarms and rectify all situations in sufficient time to prevent overflows. All alarms shall be sent to the City by the remote alarm system for informational purposes only.
3.03 REMOVAL

A. Upon receipt of written permission from the Engineer, the Contractor shall remove the complete bypass pumping system, including any line stops and taps, and restore all property to pre-construction condition. Removal shall not impact operations to station or elevated tank operations.

END OF SECTION
SECTION 02760

TEMPORARY HYDRO-PNEUMATIC TANK SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section includes requirements to furnish all materials, labor, equipment, power, maintenance, operation, etc. to implement and operate a temporary hydro-pneumatic tank system for the purpose of maintaining the water distribution system pressure during renovations to the existing Sparks Elevated Storage Tank.

B. It is essential to the operation of the existing water supply system that there is no interruption in the flow of water or pressure throughout the duration of the project. To this end, the Contractor shall provide, maintain, and operate all temporary facilities such as, tanks, conduits, all necessary power and fuel, and all other labor and equipment necessary to intercept the water before it reaches the point where it would interfere with their work, and return it to existing system.

C. The Contractor shall provide all necessary means to safely intercept the water before it reaches the work area. The Contractor will not be permitted to stop or impede the flows under any circumstances.

D. The Contractor shall maintain water flow in a manner that will not cause damage to the water system, and that will protect public and private property from damage and flooding.

E. The Contractor shall protect water resources, wetlands, and other natural resources. Contractor shall be liable for failure of the hydro-pneumatic system, which may result in discharge of chlorinated water to soils, water bodies, or other natural non-contaminated areas.

F. The Contractor is responsible for providing all components necessary to ensure a complete implementation of the temporary hydro-pneumatic tank system, tank level monitoring, and any communication requirements with the pumping station site. The County, City, and Engineer assume no responsibility for the actual condition of the existing system components and is not liable for functionality of existing system components utilized by the Contractor. Should the Contractor elect to utilize existing equipment during construction, they do so at their own risk and will not be entitled to time or compensation.

1.02 QUALITY ASSURANCE

A. The design, installation and operation of the temporary hydro-pneumatic tank system shall be the Contractor’s responsibility. The Contractor shall employ the services of a vendor who can demonstrate to the Engineer that he specializes in the design and operation of temporary hydro-pneumatic tank systems. The vendor shall provide at least five (5) references to the Engineer of projects similar in size and complexity to this project that have been performed by his firm within the past three (3) years. The hydro-pneumatic tank system shall meet the requirements of all codes and regulatory agencies having jurisdiction.
B. Tanks shall be disinfected in accordance with the latest AWWA Standards immediately prior to system hook-up and have been tested for bacteria with acceptable test results in accordance with the State of Maryland requirements. The disinfection procedure shall be repeated until the bacterial results meet the State of Maryland requirements.

C. Tanks previously used to store gas, oil, chemicals or non-potable water will be rejected.

1.03 SUBMITTALS

A. The Contractor shall submit detailed plans and descriptions outlining all provisions and precautions to be taken by the Contractor regarding the handling of water flows. This plan must be specific and complete, including such items as schedules, locations, elevations, capacities of equipment, materials, and all other incidental items necessary. No construction shall begin until all provisions and requirements have been reviewed and approved by the Engineer.

B. The Contractor shall submit working plans for the hydro-pneumatic tank location, which shall include, but not be limited to, details of the following:

1. Staging area for hydro-pneumatic tank(s)
2. Number, size, material, location, and method of installation of inlet/outlet piping.
3. Discharge plan.
4. Hydro-pneumatic tank sizes, and power requirements.
5. The Contractor shall confirm the pressure and flow requirements are met based upon their specific design and arrangement and submit calculations to the Engineer for approval.
6. Force main tapping and connection plan.
7. Thrust and restrain block sizes and locations, if necessary.
9. Tank level monitoring and control plan.
10. Temporary pipe supports and anchoring, if necessary.
11. Calculations for selection of tank and pipe sizes.
12. Schedule for installation and maintenance of system.

C. The Contractor shall be responsible for the design of a complete support and protection of excavation plan, including any dewatering that may be required, in order to excavate the existing force main to perform line tapping and stopping services, as necessary to provide a connection for the temporary hydro-pneumatic tank system and to complete the improvements work as shown in the contract documents. This support and protection of excavation plan shall include design calculations and complete working drawings prepared and sealed by a Professional Engineer registered in the State of Maryland.
PART 2 - PRODUCTS

2.01 DESIGN REQUIREMENTS

A. All tanks, piping, and appurtenances shall be designed and disinfected in accordance with all applicable AWWA and NSF Standards.

B. The design intent is for provision of multiple hydro-pneumatic tanks capable of meeting daily demand of 500,000 gallons/day within the given start/stop capabilities of the existing pumping station pumps. Minimum required capacity of the hydro-pneumatic tank system shall be 47,000 gallons. Potential location of the hydro-pneumatic tanks have been shown on the drawings. It is the Contractor’s responsibility to design and layout the hydro-pneumatic tank system which meet the design criteria specified herein while allowing execution of their work.

C. The hydro-pneumatic tank system shall be capable of accepting pumped flow and providing a minimum discharge pressure of 60psi while the existing 1MG Elevated Tank is offline. The hydro-pneumatic tank system shall intercept flow and divert flow to the existing 16-inch force main. Under no circumstances shall the Elevated Tank be taken offline without a fully functional, tested, and approved hydro-pneumatic system. The hydro-pneumatic tank system will be required to be operated 24 hours per day, seven (7) days per week until work associated with the Elevated Tank has been accepted.

D. The hydro-pneumatic tank system shall be adequately sized to protect the Sparks Pumping Station pumps from frequent starts/stops that may damage the pumps. It shall not be acceptable to utilize the new pumps being provided under this Contract to perform the work. The Contractor shall coordinate the number of allowable starts/hr with the pump manufacturer. Any damage which occurs to the pumps as a result of using the provided hydro-pneumatic tank system shall be remedied to the County’s satisfaction by the Contractor at no additional time or cost.

E. The Contractor shall provide sample taps on the piping within the vicinity of the temporary storage tanks.

F. The Contractor shall provide a manual air release valve on the inlet/outlet piping in the vicinity of the temporary storage tanks.

G. The hydro-pneumatic tank system shall be sound attenuated and shall not produce noise levels greater than 70 dBA at 30 feet at any time. Contractor shall coordinate noise requirements with Specification 01000 and provide sound mitigation as necessary to meet the specified noise levels. Contractor shall provide noise level testing at the start of hydro-pneumatic tank system operations. If noise levels are not being met at any time during the hydro-pneumatic tank system operation, the Contractor shall take necessary remedial actions and provide additional noise level tests to demonstrate compliance at no additional cost to the Owner.

H. The Contractor is responsible for excavation and installation of tapping sleeves and isolation valves on the existing force mains and providing means to isolate the force main(s) so as to divert flows and eliminate the potential for backflow into the work area. Alternate means for flow and pressure will be considered. The Contractor shall provide details as part of the submittals for review and approval.
I. The Contractor shall provide the necessary reliable communications and controls to signal pump start and stop. The control system shall incorporate use of existing signals from the Elevated Tank to signal pump run at the Pumping Station.

J. Provide pressure transducer with range between 0 and 100 psi with a 4-20mA output signal and 2-wire looped power on the temporary storage tanks.

K. The Contractor shall coordinate the pump controls with the hydro-pneumatic tanks to provide means to control pump system flow and pressure similar to the elevated storage tank. Controls shall allow for manual and auto control.

L. Piping: In order to prevent the accidental spillage of flows, all discharge systems shall be constructed of rigid pipe with leak proof joints, suitable for the intended use. Under no circumstances will aluminum “irrigation” type piping be allowed. Contractor shall also be responsible for any damage to the existing force main as a result of this work, and shall be responsible for all overflows and/or spills and cleanup thereof, including all costs associated with such clean up. The Contractor shall also be liable for any civil and/or criminal penalties associated with any overflows and/or spills.

M. The Contractor shall provide means of freeze protection for the hydro-pneumatic tank(s) and all system components which are subject to freezing. At a minimum, heat tracing and insulation shall be provided.

N. The Contractor is responsible for providing temporary power and controls as required by the hydro-pneumatic tank provider.

O. The Contractor shall provide means (e.g. pressure monitoring system, pressure relief valves, etc.) to protect the hydro-pneumatic tank(s) system.

P. The Contractor shall provide system monitoring and provide any necessary equipment to send an alarm when the tank pressure is exceeded and a blow off is occurring. All temporary power, wireless network service plans, and programming for the remote alarm monitoring and notification system shall be the Contractor’s responsibility, at no additional cost to the County.

Q. System Suppliers:

Provide temporary hydro-pneumatic tank by:

1. Portable Water Systems, LLC,
2. TomCat Consultants,
3. or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The design, installation, maintenance, and operation of the temporary hydro-pneumatic tank system, piping, and all associated appurtenances shall be the Contractor’s sole responsibility.
B. The Contractor shall provide and install all incidental piping, valving and structural work as required to furnish a complete and operational system.

C. The Contractor shall ensure that all erosion and sediment control devices are in place prior to use of the hydro-pneumatic tank system. These devices shall be maintained throughout the duration of the project.

3.02 FIELD QUALITY CONTROL AND MAINTENANCE

A. The Contractor shall perform leakage and pressure tests of the hydro-pneumatic tank system using clean water prior to actual operation. The Contractor shall provide at least 48 hours notice prior to testing.

B. The Contractor shall demonstrate, to the satisfaction of the County and City, operation of the hydro-pneumatic tank system at its design flow and pressure for a minimum period of 72 continuous hours prior to disconnecting any system components and/or taking the Elevated Tank out of service.

C. The Contractor shall insure that the hydro-pneumatic tank system is properly maintained and a responsible operator shall be available (24 hr/day, 7 day/week) and on site within 90 minutes when the hydro-pneumatic tank system is operating to address any operational issues.

D. The Contractor shall ensure that the remote alarm system is operational at all times. The Contractor shall respond to all alarms and rectify all situations in sufficient time to prevent overflows. All alarms shall be sent to the City by the remote alarm system for informational purposes only.

E. Operation and Maintenance: The Contractor shall ensure that the hydro-pneumatic tank system is properly maintained and that the remote alarm system is operational at all times. The Contractor shall respond to all alarms and rectify all situations in sufficient time to prevent overflows. All alarms shall be sent to the City by the remote alarm system for informational purposes only.

3.03 REMOVAL

A. Upon receipt of written permission from the Engineer, the Contractor shall remove the complete hydro-pneumatic system and restore all property to pre-construction condition.

B. Upon receipt of written permission from the Engineer, the Contractor shall remove the complete bypass pumping system, including any line stops and taps, and restore all property to pre-construction condition. Removal shall not impact operations to station or elevated tank operations.

END OF SECTION
SECTION 02821
FENCE AND GATES

PART 1 - GENERAL

1.01 DESCRIPTION

A. This Section includes requirements for providing chain link fence, gates, and accessories, as indicated herein and as shown on the Drawings at the Elevated Tank Site. Fence fabric shall be polyvinyl chloride (PVC)-coated steel.

B. This Section includes requirements for providing security fencing, gates, and accessories as indicated herein and as shown on the Drawings at the Pumping Station Site. Fence fabric shall be galvanized steel with fusion bonded coating.

1.02 SUBMITTALS

A. Submit the following shop drawings:

1. Plan layout including spacing of posts and other components, locations of gates, post foundation dimensions, abrupt changes in grade, locations of corner end and pull posts, hardware anchorage, and schedule of components.

2. Cross sectional dimensions of posts, braces, rails, fittings, gates, accessories, and hardware.

3. Design of gates and details of gate hardware and accessories.

4. Fence grounding layout and details.

5. Complete design calculations certified by a Professional Engineer registered in the State of Maryland, including pump station fence post, gate post, and drop bolt footers.

B. Product data on fabric, post, fittings, accessories and hardware.

C. One (1) sample of fence fabric for each fence type with post, 12 x 12 inches in size, illustrating construction and color of PVC coating (Elevated Tank Site) or fusion bonded coating (Pump Station Site), and attaching hardware.

1.03 PROJECT RECORD DOCUMENTS

A. Submit as-built drawings of the fence and gates.

B. Accurately record actual locations of perimeter posts relative to property lines. As-built drawings shall include updated location coordinates for all major fence post and gate corners.
1.04 PRODUCT DELIVERY, STORAGE AND PROTECTION

A. Materials shall be delivered to the site in an undamaged condition. Materials shall be carefully stored off the ground to provide proper protection against damage, or staining caused by ground contact. Defective or damaged materials shall be replaced by the Contractor at no expense to the County.

PART 2 - PRODUCTS

2.01 PUMP STATION FENCE

A. General

1. All steel materials shall be of good commercial quality galvanized steel in accordance with ASTM F1083.

2. All pipes shall be galvanized and of single-piece construction (without joints) in accordance with ASTM F1083. Furnish moisture-proof caps for all posts.

3. Zinc coating shall be in accordance with ASTM A123/A123M and be smooth and free from lumps, globs, or points.

4. Miscellaneous materials shall be galvanized.

5. All Fixtures shall be on the inside face of fence line.

B. Manufacturers

1. Cochrane USA

2. Or approved equal.

C. Panels

1. Panels shall be of equal width across each respective fence face, with a maximum width of 130 inches.

2. Panels shall be 7 feet in height.

3. Panel aperture size shall be 3” x 1/2”.

4. Panels shall be reinforced with 4” high x 2” deep ‘V’ formation horizontal recessed bands.

5. Panels shall have 2 x 70-degree flanges along sides.

6. Panels shall have 2 x 30-degree flanges along top and toe.

7. Panel shall be affixed to post over 48 line wires using 8 double-bolt comb clamps, 8 single-bolt comb clamps, and 24 anti-vandal bolts.
8. Panels and fixtures shall be galvanized. Panels and all fixtures readily visible from outside of fence line shall have fusion bonded coating.

D. Posts

1. Posts shall be minimum 10 feet long to account for specified fabric height and required foundation embedment.
2. Post width shall be 3.3”, tapering to 1.75” on the inside face. Post sectional depth shall be 3.3”.
3. Post shall include locking recess mechanism to secure panel edge.
4. Post shall have a flush panel post finish with no climbing aid.
5. Post shall be sealed with a UV-stabilized polymer cap.
6. Post finish shall be galvanized with a fusion bonded coating.

E. Gates

1. Steel pipe shall be zinc-coated and seamless in accordance with ASTM A53.
2. Steel tubes shall be zinc-coated and seamless in accordance with ASTM A500 Grade B.
3. Steel shall be carbon structural steel, strength in accordance with ASTM A36.
4. Panel Fabric shall be welded wire mesh in accordance with ASTM F2453.
5. Fittings shall be zinc coated in accordance with ASTM F626.
6. Drop Bar shall be round bar type as indicated on the Contract Drawings.
7. Weld all connections and joints to form rigid frames or assembled with corner fittings.
8. Fabricate hinges so that they will not twist or turn under the action of the gate and arranged so that a closed gate cannot be lifted off the hinges to obtain entry.
9. Gates shall be provided with means to lock both gate leaves together with a chain and padlock, as indicated on the drawings. Each gate leaf shall be provided with an anti-theft type of lock to accommodate a chain and City’s standard padlock.

F. Accessories

1. Topping shall be 4” high ‘castle’ spikes shall hot-dipped galvanized with fusion bonded coating in accordance with A934 ASTM. Topping spikes shall be affixed to panel edge internally at 6” intervals using anti-vandal bolts.
2. Clamps, anti-scale, and anti-vandal bolts shall be hot-dipped galvanized with fusion bonded epoxy coating.

2.02 ELEVATED TANK FENCE

A. Fence Fabric

1. Fence fabric shall be made from Class 2b polyvinyl chloride (PVC)-coated steel fabric with 0.3 ounces of zinc coating per square foot in accordance with ASTM F668. Fabric shall be fabricated of 9-gauge wire woven in 1-inch mesh. PVC coating for fabric and all other fence components shall be manufacturer’s standard, in a color to be selected by the County from the manufacturer’s standard range. Fabric height shall be 7-feet. Fabric shall be twisted and barbed on the top selvage and knuckled on the bottom selvage.

B. Gates

1. Gates shall be the types and sizes as shown on the drawings. Swing gates shall be in accordance with ASTM F900 and horizontal slide gate shall be in accordance with ASTM F1184. Gate frames shall be PVC-coated steel pipe Group IC with external coating Type A, minimum nominal pipe size (NPS) 1-5/8-inch, conforming to ASTM F1043. Gates shall be same height as fencing.

2. Swing gate leaves more than 8-feet wide shall have either intermediate members and diagonal truss rods or shall have tubular members as necessary to provide rigid construction, free from sag or twist. Gate leaves less than 8-feet wide shall have truss rods or intermediate braces.

3. Gate fabric shall be same as specified for fence fabric. Gate fabric shall be attached to the gate frame by method standard with the manufacturer, except that welding will not be permitted.

4. Latches, hinges, stops, keepers, rollers, and other hardware items shall be furnished for the operation of the gates. Latches shall be arranged for padlocking so that the padlocks will be accessible from both sides of the gates. Stops shall be provided for holding the gates in the open position.

5. Gates shall be provided with means to lock both gate leaves together with a chain and padlock, as indicated on the drawings. Each gate leaf shall be provided with an anti-theft type of lock to accommodate a chain and City’s standard padlock.

C. Posts

1. Posts shall be zinc coated Group IC steel pipe and PVC-coated conforming to the requirements of ASTM F1043 and F1083. Minimum sizes shall be as shown on the drawings. Line posts and terminal (corner, gate, and pull) posts selected shall be of the same designation throughout the fence. Gate posts shall be for the gate type indicated to the limitations specified in ASTM E900 and ASTM F1184, with minimum NPS of 2-1/2 inch for line posts, 3-inch for terminal posts, and 4-inch for gate posts.
D. Brace and Rails

1. Braces and top and bottom rails shall be zinc coated Group IC steel pipe minimum NPS 1- 5/8 inch and PVC-coated conforming to the requirements of ASTM F1043.

E. Wire

1. Tension wire shall be 0.177-inch diameter, Type II, Class 2 coating, in accordance with ASTM A824.

F. Accessories

1. All accessories shall be in accordance with ASTM F626. Ferrous accessories shall be zinc coated and PVC-coated with minimum thickness of 0.006-inch and maximum thickness of 0.015-inch. Color coating of fittings shall match the color coating of the fabric.

2. Truss rods shall be furnished for each terminal post. Truss rods shall be provided with turnbuckles or other equivalent provisions for adjustment.

3. Tie wire for attaching fabric to rails, braces, and posts shall be 9-gauge steel wire and match the coating of the fence fabric.

4. Miscellaneous hardware coatings shall conform to ASTM A153 unless modified. Threaded hardware shall be painted to match PVC coatings.

5. Barbed wire arms shall be corrosion-resistant, with clips, slots, or other means for attaching strands of barbed wire, and means for attaching to posts or integral with post cap; for each post. Line posts shall have arms that accommodate top rail or tension wire. Fence corner posts shall have corner arms. Barbed wire arms shall be Type I, single slanted arm.

G. Barbed Wire

1. Zinc-coated steel barbed wire shall be in accordance with ASTM A121, chain-link fence grade for standard three-strand barbed wire. Barbed wire shall consist of 0.099-inch diameter line wire with 0.080-inch diameter, 4-point round barbs spaced not more than 5-inches on center.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Fence shall be installed to the lines and grades indicated. Line posts shall be spaced equidistant at intervals as shown on the Contract Drawings. Terminal (corner, gate, and pull) posts shall be set at abrupt changes in vertical and horizontal alignment. Fabric shall be continuous between posts. Any damage to galvanized surfaces, including welding, shall be repaired with paint containing zinc dust in accordance with ASTM A780 and the manufacturer’s recommendations.
B. All fences shall be provided with minimum 12-inch mowing strips. Refer to Contract Drawings for mow strip details.

3.02 EXCAVATION

A. Post holes shall be cleared of loose material. Waste material shall be disposed of by the Contractor. Ground surface irregularities along the fence line shall be eliminated to the extent necessary to maintain no clearance between the bottom of the fence fabric and finish grade.

3.03 PUMP STATION FENCE

A. Posts

1. Posts shall be set plumb and in alignment. Posts shall be set in concrete to the depth indicated in the Contractor’s signed and sealed design calculations, once approved. Concrete and grout shall be thoroughly consolidated around each post, shall be free of voids and finished to form a dome. Concrete and grout shall be allowed to cure a minimum of seventy-two (72) hours prior to attachment of any item to the posts.

B. Place the taper post against the panel flange, with the post flush with the front of the panel.

C. Secure the clamps in the following configuration (from top to bottom, either side of the reinforcing ribs):

   1. Single-single
   2. Double-double
   3. Double-double
   4. Single-single

D. The manufacturer supplied drilling tool shall be inserted into the drill. The manufacturer supplied tech bolt shall be inserted into the drill bit cup. Bolt shall be drilled through the locking clamp. Bolt must be completely inserted into the post. Any burr shall be removed by reversing the tech bolt. Do not overtighten the tech bolt.

E. Taper post shall be inserted vertically into the central position of the excavated foundation. The hole in the post to be inserted in the ground. The wider side of the post shall face the external side of the fence.

F. Place the panel in an upright position on the fence line as shown on the Contract Drawings. Once the taper post is centrally positioned, concrete shall be poured in the excavation. Posts and panels to be supported with stays on both sides, ensuring the installation stays upright.

G. New locking clamps to be secured. Panels and posts shall be flush. Maximum variance from plumb shall be ¼-inch.
H. Gates shall be installed at the locations shown on the Contract Drawings. Hinged gates shall be mounted to swing as indicated. Latches, stops, and keepers shall be installed as required.

3.04 ELEVATED TANK FENCE

A. Posts

1. Posts shall be set plumb and in alignment. Posts shall be set in concrete to the depth indicated on the Contract Drawings. Hole diameters shall be not less than 16-inches for terminal posts and not less than 12-inches for line posts. Concrete and grout shall be thoroughly consolidated around each post, shall be free of voids and finished to form a dome. Concrete and grout shall be allowed to cure a minimum of seventy-two (72) hours prior to attachment of any item to the posts.

B. Tank Rail, Tension Wire Braces and Truss Rods

1. Top rails shall be supported at each post to form a continuous brace between terminal posts. Where required, sections of top rail shall be joined using sleeves or couplings that will allow expansion or contraction of the rail.

2. Bottom rails shall be bolted to double rail ends and double rail ends shall be securely fastened to the posts. Bolts shall be peened to prevent easy removal. Bottom rails shall be installed before chain link fabric.

3. Braces and truss rods shall be installed as indicated and in conformance with the standard practice for the fence furnished. Horizontal compression braces and diagonal tension truss rods shall be installed. Braces and truss rods shall extend from terminal posts to line posts. Diagonal braces shall form an angle of approximately 40 to 50 degrees with the horizontal.

4. Tension wire shall be installed in accordance with ASTM F567, maintaining plumb position and alignment of fencing. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch diameter hog rings of same material and finish as fabric wire, spaced a maximum of 24 inches o.c. Install bottom tension wire within 6 inches of bottom of fabric and tie to each post with not less than same diameter and type of wire.

C. Fabric

1. Chain link fabric shall be installed on the side of the post indicated. Fabric shall be attached to terminal posts with stretcher bars and tension bands. Bands shall be spaced at approximately 15-inch intervals. The fabric shall be installed and pulled taut to provide a smooth and uniform appearance free from sag, without permanently distorting the fabric diamond or reducing the fabric height. Fabric shall be fastened to line posts at approximately 15-inch intervals and fastened to all rails and tension wires at approximately 12-inch intervals. Fabric shall be cut by untwisting and removing pickets. Splicing shall be accomplished by weaving a single picket into the ends of the rolls to be joined. The bottom of the installed fabric shall be to the finished grade, but not more than 2-inches above the ground.
D. Gates

1. Gates shall be installed at the locations shown on the drawings. Hinged gates shall be mounted to swing as indicated. Latches, stops, and keepers shall be installed as required. Slide gate shall be installed as recommended by the manufacturer. Hinge pins, and hardware shall be welded or otherwise secured to prevent removal.

E. ERECTION TOLERANCES

1. Maximum Variation from Plumb: 1/4-inch.

F. BARBED WIRE

1. Install barbed wire uniformly spaced and angle outward, pull wire taut and install securely to extension arms and secure to end post or terminal arms.

3.05 GROUNDING

A. Install fence grounding at maximum intervals of 150-feet by driving a grounding rod vertically until the top is 6-inches below finished grade. Connect rod to fence with No. 6 AWG conductor. Connect conductor to each fence component at the grounding location. Ground fence on each side of gate openings. Bond metal gates to gate posts using No. 2 AWG wire and bury it at least 18-inches below finished grade. Connect bonding jumper between gate post and gate frame. Make connections so possibility of galvanic action or electrolysis is minimized.

3.06 ADJUSTING AND DEMONSTRATION

A. Adjust gate to operate smoothly, easily, and quietly, free of binding, warping, excessive deflection, distortion, non-alignment, misplacement, disruption, or malfunction, throughout the entire operating range. Confirm that latches and locks engage accurately and securely without forcing or binding.

B. Lubricate hardware and other moving parts.

END OF SECTION
SECTION 03301

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

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

1.02 SUMMARY
   A. This Section specifies cast-in-place concrete, including reinforcement, concrete materials,
      mixture design, placement procedures, and finishes.

1.03 SUBMITTALS
   A. General: In addition to the following, comply with submittal requirements in ACI 301.
   B. Product Data: For each type of product indicated.
   C. Design Mixtures: For each concrete mixture.

1.04 QUALITY ASSURANCE
   A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete
      products and that complies with ASTM 094 requirements for production facilities and
      equipment.
   B. Source Limitations: Obtain each type of cement of the same brand from the same
      manufacturer’s plant, obtain aggregate from one source, and obtain admixtures through
      one source from a single manufacturer.
   C. Comply with ACI 301, “Specification for Structural Concrete,” including the following
      sections, unless modified by requirements in the Contract Documents:
      1. “General Requirements.”
      2. “Formwork and Formwork Accessories.”
      3. “Reinforcement and Reinforcement Supports.”
      4. “Concrete Mixtures.”
      5. “Handling, Placing, and Constructing.”
   D. Comply with ACI 117, “Specifications for Tolerances for Concrete Construction and
      Materials.”
E. Testing Agency: Testing of concrete shall be by an independent testing agency acceptable to the Owner and authorities having jurisdiction. Personnel conducting field tests shall be qualified as an ACI Concrete Field-Testing Technician, Grade I according to ACI CP-1, or an equivalent certification program.

1. An inspection and testing agency shall be employed by the Contractor to inspect and test all concrete as to mix, strength and other matters pertaining thereto, as directed by the Engineer.

2. The duties, responsibilities and minimum requirements of the inspection and testing agency shall be in accordance with ASTM E329.

3. Inspection and testing services shall be paid for by the Contractor.

F. All concrete work shall comply with the requirements of ACI 318 latest edition.

PART 2 - PRODUCTS

2.01 FORMWORK
A. Furnish formwork and formwork accessories according to ACI 301.

2.02 STEEL REINFORCEMENT
A. Reinforcing Bars: ASTM A615, Grade 60, deformed, with fusion bonded epoxy powder coating in accordance with ASTM D3963. Coating shall be a bright color in contrast to the color of reinforcement steel and rust.


2.03 CONCRETE MATERIALS
A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source throughout Project:

1. Portland Cement: ASTM C150, Type I/II.

2. The use of blast furnace slag is prohibited.

B. Normal-Weight Aggregate: ASTM C33, graded, 1-1/2-inch nominal maximum aggregate size.


D. Water: ASTM C94; potable.

2.04 ADMIXTURES
B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C494, Type A.
2. Retarding Admixture: ASTM C494, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C494, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C494, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C494, Type G.
6. Plasticizing and Retarding Admixture: ASTM C1017, Type II.

2.05 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.

B. Absorptive Cover AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C1315, Type 1, Class A.

F. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C1315, Type 1, Class A.

2.06 CONCRETE MIXTURES

A. Comply with ACI 301 requirements for concrete mixtures.

B. Normal-Weight Concrete: Prepare design mixes, proportioned according to ACI 301, as follows:

1. Minimum Compressive Strength: 4,000 psi at 28 days, unless noted otherwise.
2. Maximum Water-Cementitious Materials Ratio: 0.45.
3. Slump Limit: 4 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
4. Air Content: Maintain within range permitted by ACI 301.

2.07 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C94, and furnish batch ticket information.

1. When air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C94. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.

2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.

3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mix type, mix time, quantity, and amount of water added. Record approximate location of final deposit in structure.

2.08 RELATED MATERIALS

A. Bonding Adhesive: ASTM C 881, two component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit construction requirements, and as follows:

1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to harden concrete.

B. Bonding Agent: ASTM C 1059/1059M, Type II, non-redispersible, acrylic emulsion or styrene butadine.

PART 3 - EXECUTION

3.01 FORMWORK

A. Design, construct, erect, brace, and maintain formwork according to ACI 301.

3.02 STEEL REINFORCEMENT

A. Comply with CRSI’s “Manual of Standard Practice” for fabricating, placing, and supporting reinforcement.
3.03 JOINTS

A. General; Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints; Locate and install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Engineer.

3.04 CONCRETE PLACEMENT

A. Comply with ACI 301 for measuring, batching, mixing, transporting, and placing concrete.

B. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

C. Consolidate concrete with mechanical vibrating equipment.

3.05 FINISHING FORMED SURFACES

A. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch.

1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.

B. Rubbed Finish: Apply the following rubbed finish, defined in ACI 301, to smooth-formed finished as-cast concrete:

1. Smooth-rubbed finish.
2. Grout-cleaned finish.
3. Cork-floated finish.

C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.06 FINISHING UNFORMED SURFACES

A. General: Comply with ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Screed surfaces with a straightedge and strike off.

1. Do not further disturb surfaces before starting finishing operations.
C. Trowel Finish: Apply a hard trowel finish.

3.07 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer’s written instructions after placing, but before finishing.

C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

D. Curing Methods: Cure formed and unformed concrete for at least seven days by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
   a. Water.
   b. Absorptive cover water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3. Curing Compound: Apply uniformly in continuous operation by roller according to manufacturer’s written instructions. Maintain continuity of coating and repair damage during curing period.

3.08 FIELD QUALITY CONTROL

A. Concrete Testing:

1. Perform compressive strength, slump, and air content tests for each 50 cubic yards of concrete placed, or any portion thereof, for each structure. Cast at least 5 cylindrical strength test specimens for each batch. Test 2 cylinders at 7 days; test 2 cylinders at 28 days. Hold the remaining cylinder for testing in the event that any of the other cylinders are damaged prior to testing.

2. Determine concrete strength from standard test specimens made and cured according to ASTM C31 and ASTM C172, and tested in accordance with ASTM C39. Perform core drilling and testing in accordance with ASTM C42. Compute and evaluate in accordance with ASTM C94.
3. Determine air content in accordance with ASTM C231 or ASTM C173, as applicable.

4. Determine slump in accordance with ASTM 0143,

5. Keep a slump cone and an air meter in close proximity to all concrete placements.

3.09 REPAIRS

A. Remove and replace concrete that does not comply with requirements in this Section.

END OF SECTION
PART 1 - GENERAL

1.01 DESCRIPTION

A. Contractor shall provide all materials, labor, equipment and services necessary to design, construct and install precast structures, as shown on the Contract Drawings.

B. The structures shall be constructed of precast reinforced concrete. They shall be watertight, non-corrosive, durable and structurally sound. All inlet and outlet connections shall be sealed.

1.02 SUBMITTALS

A. Shop Drawings: Submit detailed fabrication and installation drawings certified by a Professional Engineer registered in the State of Maryland prior to fabrication. Show plans, elevations, dimensions, cross sections, openings, joint design, and indicate location, size, and type of reinforcing steel.

B. Calculations: Submit manufacturer’s complete design calculations certified by a Professional Engineer registered in the State of Maryland, including load calculations, buoyancy calculations, and concrete mix design.

C. Certifications: Submit manufacturer’s certifications and laboratory test reports including mill certification for the reinforcing steel, certificates of compliance for all flexible connectors and/or inlet and outlet seals, and certified test reports specified in referenced ASTM Standards.

1.03 DESIGN CRITERIA

A. All precast structures shall be designed in accordance with ACI 350 “Building Code Requirements for Environmental Engineering Concrete Structures.”

B. Top slab must be separate and removable from structure. Structures shall be designed to accommodate pumps, piping, valves and other equipment, as shown or specified.

C. Loads:
   2. Dead Load: Earth at 120 pcf and 60 pcf equivalent fluid pressure.

D. Concrete and reinforcing shall conform to the Baltimore County Standard Specifications.

E. Flotation design shall have a factor of safety of 1.5 minimum, and shall be addressed by the certifying Engineer to the satisfaction of the Baltimore County Bureau of Engineering/Construction.
F. Wall thicknesses shown on Contract drawings are the minimum.

G. All mechanical connections between precast units and any cast-in-place concrete or precast units shall be 316 stainless steel.

1.04 QUALITY ASSURANCE

A. Fabricator Qualifications: Fabrication shall be by a firm experienced in the manufacturing of precast concrete units similar to the ones indicated for this project and with a record of successful in-service performance.


1.05 DELIVERY, STORAGE AND HANDLING

A. Store precast concrete units at the project site in a manner to prevent cracking, distorting, warping, or other physical damage, and so that markings are visible.

B. Lift and support precast concrete units only at designated lifting and supporting points as shown on approved shop drawings.

1.06 JOB CONDITIONS

A. Verify dimensions at the project site and prepare shop drawings to reflect actual field conditions and dimensions.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements, manufacturers that may be used to include:

   1. Gillespie Precast Concrete.
   
   
   3. or approved equal.

2.02 MATERIALS

A. Concrete Materials

   1. Portland Cement: ASTM C150, Type II.
   
   2. The use of blast furnace slag is prohibited.


5. Air-Entraining Admixture: ASTM C260, certified by the manufacturer to be compatible with other required admixtures.


7. Fly Ash or Natural Pozzolans: ASTM C618.


9. Calcium chloride or admixtures containing chlorides shall not be used.

B. Reinforcing Steel

1. Reinforcing Bars: ASTM A615, Grade 60, deformed, epoxy coated.

2. Wire Fabric: ASTM A185, welded steel, epoxy coated or galvanized.

3. Epoxy Coating: Epoxy coated reinforcing steel shall be fusion bonded epoxy powder. The epoxy protective coating shall be a one coat, heat curable, thermosetting powdered coating that is electro-statically applied on metal surfaces. For reinforcement steel the color shall be a bright color to contrast with the normal color of the reinforcement steel and rust (e.g. orange, red, green, yellow, etc. and not brown or any color in the rust family). If reinforcement steel is coated before fabrication, all hairline cracks and minor damage on fabrication bends shall be patched, even if there is no bond loss. Epoxy coatings shall conform to ASTM D3963.

2.03 CONCRETE MIXES

A. Compressive Strength: 5,000 psi at 28 days.

B. Maximum Water-Cement Ratio: 0.40.

C. Add air-entraining admixture at manufacturer’s prescribed rate to result in normal-weight concrete at point of placement having an air-content as follows, with a tolerance of plus or minus 1-1/2 percent:

1. Air Content: 5 percent for 1-1/2 inch nominal maximum aggregate size.


3. Air Content: 7 percent for ½-inch nominal maximum aggregate size.
2.04 COATINGS
A. Coat exterior surface of precast concrete units with Carboline Bitumastic 300-M or approved equal coating. Coat interior surfaces in accordance with Specification 09900.

2.05 FABRICATION
A. Reinforcement: Comply with recommendations in CRSI’s “Manual of Standard Practice” for fabricating, placing and supporting reinforcement.
B. Mix concrete in accordance to PCI MNL 116. After concrete batching, no additional water may be added.
C. Place concrete in a continuous operation to prevent seams or planes of weakness from forming in the precast concrete units. Comply with PCI MNL 116 for measuring, mixing, transporting, and placing concrete.
D. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items. Use equipment and procedures complying with PCI MNL 116.
E. Cure concrete, according to requirements in PCI MNL 116, by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture.
F. Product tolerances: Fabricate precast concrete units straight and true to size and shape with exposed edges and corners precise and true so the finished units comply with PCI MNL 116 product tolerances.
G. Pipe openings: All pipe openings in the precast units shall be provided with a gasket cast integrally into the structure. Gasket shall be rubber, meeting the requirements of ASTM C923, and manufactured by A-Lok Products Corp., or approved equal. Pipe opening elevations are fixed. Non-standard riser units shall be provided, as necessary, so that joints do not occur at pipe openings.

PART 3 - EXECUTION

3.01 INSTALLATION
A. Install precast concrete units on undisturbed soil with a stone bedding, which has been leveled and compacted as shown on the Contract Drawings. Excavation shall be free of standing water until backfilling is complete.
B. Install precast concrete units level, plumb, square and true, without exceeding the recommended erection tolerances in PCI MNL 127, “Recommended Practice for Erection of Precast Concrete”.

END OF SECTION
PART 1 - GENERAL

1.01 DESCRIPTION

A. The work of this section includes grouting as indicated on the drawings or specified in other sections. Unless otherwise specified, all grouting shall be done with non-shrinking grout.

B. This section also covers epoxy grouting of anchor bolts, threaded rod anchors, and reinforcing bars to be installed in hardened concrete.

1.02 REFERENCES

A. American Concrete Institute:

1. ACI 308, Recommended Practice for Curing Concrete.

B. American Society for Testing and Materials:

1. ASTM C33; Concrete Aggregates.

2. ASTM C109; Test Method for Compressive Strength of Hydraulic Cement Mortars (Using two inch or 50-mm Cube Specimens).

3. ASTM C150; Specification for Portland Cement.


5. ASTM C596; Test Method for Drying Shrinkage of Mortar Containing Portland Cement.


1.03 SUBMITTALS

A. Submit a statement of compliance, together with supporting data, from the materials suppliers attesting to the conformance of products and ingredients with these specifications.

B. Submit manufacturer’s instructions for mixing, handling, surface preparation, and placing the epoxy type and the non-shrink, non-metallic type grouts.
1.04 QUALITY ASSURANCE

A. Manufacturer’s Qualifications: Grout manufacturer shall furnish copies of current independent laboratory test results showing the non-shrink, non-metallic grout as non-shrink from time of placement according to the following:

1. The grout indicates no expansion after final set according to ASTM C827.
2. The grout indicates 4,000-psi strength developed with a trowelable mix within 24 hours according to ASTM C109.
3. The grout indicates placement time limitation based on initial set of not less than 60 minutes according to ASTM C191.
4. Test results, as supplied by the grout manufacturer, shall indicate that in projects of similar scope and size, the effective bearing area was between 95 and 100 percent.

1.05 DELIVERY, STORAGE AND HANDLING

A. Provide protection for the products to prevent moisture damage and contamination of the grout materials.

B. Store the grout in undamaged condition with seals and labels intact as packaged by the manufacturer.

1.06 PROJECT CONDITIONS

A. Protect freshly poured grout against high and low temperatures and unfavorable environmental conditions in accordance with ACI Standards 308.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Portland Cement: ASTM C150, Type II.

B. Water: Potable; containing no impurities, suspended particles, algae, organic substances, acids, alkalis, or dissolved natural salts in quantities that will cause:

2. Volume change that will increase shrinkage cracking.
3. Efflorescence.
4. Excess air entraining.
C. Fine Aggregate:
   1. Washed natural sand.
   2. Gradation in accordance with ASTM C33 and represented by a smooth granulometric curve within the required limits.
   3. Free from injurious amounts of organic impurities as determined by ASTM C40.

2.02 RAPID-CURING EPOXY GROUT
   A. High strength, three-component epoxy grout formulated with thermosetting resins and inert fillers.
   B. Grout shall be rapid curing, have high adhesion, and be resistant to ordinary chemicals, acids and alkalis.

   C. Physical Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
<th>Reference Spec.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compressive Strength</td>
<td>12,000 psi (7-day)</td>
<td>ASTM C579</td>
</tr>
<tr>
<td>Tensile Strength</td>
<td>2,000 psi minimum</td>
<td>ASTM C307</td>
</tr>
<tr>
<td>Coefficient of Expansion</td>
<td>$3 \times 10^{-6}$ in/in/°F</td>
<td>ASTM C531</td>
</tr>
<tr>
<td>Shrinkage</td>
<td>None</td>
<td>ASTM C827</td>
</tr>
</tbody>
</table>

2.03 NON-SHRINK, NON-METALLIC CEMENTITIOUS GROUT
   A. Pre-mixed ready for use formulation requiring only the addition of water; non-shrink, non-corrosive, non-metallic, non-gas forming, no chlorides. No more water shall be used than is necessary to produce a flowable grout.
   B. Certified to maintain initial placement volume or expand after set and meet the following minimum properties when tested in accordance with Corps of Engineers Specification CRD-C621, for Type D non-shrink grout:

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setting Time: Initial</td>
<td>2 hours (Approx.)</td>
</tr>
<tr>
<td>ASTM C191</td>
<td>Final</td>
</tr>
<tr>
<td>Expansion:</td>
<td>3 hours (Approx.)</td>
</tr>
<tr>
<td>CRD-C621</td>
<td>0.4% Maximum</td>
</tr>
<tr>
<td>Compressive Strength: 1 day</td>
<td>4,000 psi</td>
</tr>
<tr>
<td>CRD-C621 7 days</td>
<td>7,000 psi</td>
</tr>
<tr>
<td>CRD-C621 28 days</td>
<td>10,000 psi</td>
</tr>
</tbody>
</table>

PART 3 – EXECUTION

3.01 SURFACE PREPARATION
   A. Remove defective concrete, laitance, dirt, oil, grease and other foreign material from concrete surfaces by brushing, hammering, chipping or other similar means until a sound, clean concrete surface is achieved. Perform additional surface preparation in accordance with non-shrink, non-metallic grout manufacturer’s instructions.
B. Lightly roughen the concrete, but not enough to interfere with the proper placement of grout.

C. Remove foreign materials from metal surfaces in contact with grout.

D. Align, level and maintain final positioning of components to be grouted.

E. Take special precautions during periods of extreme weather conditions in accordance with the manufacturers written instructions.

F. Saturate concrete surfaces with clean water; remove excess water, leave none standing.

3.02 FORMWORK

A. Construct leakproof forms anchored and shored to withstand grout pressures, so that no movement is possible.

B. Provide clearance between the formwork and the area to be grouted to permit proper placement of grout.

C. Forms shall be provided where structural components of baseplates or bedplates will not confine the grout.

D. Pre-treat wood forms with forming oils so that they do not absorb moisture.

E. Remove supports only after grout has hardened.

3.03 MIXING

A. Portland Cement Grout:

1. Prepare grout composed of Portland cement, sand and water; do not use ferrous aggregate or staining ingredients in grout mix.

2. Use proportions of 2 parts sand and 1 part cement, measured by volume.

3. Prepare grout with sufficient water to obtain consistency to permit placing and packing.

4. Mix water and grout in two steps; pre-mix using approximately 2/3 of the water; after partial mixing, add the remaining amount of water to bring mix to the desired placement consistency and continue mixing 2-3 minutes.

5. Mix only that quantity of grout that can be placed within 30 minutes after mixing.

6. After the grout has been mixed, do not add more water for any reason.

B. Epoxy Grout & Non-Shrink Cementitious Grout: Mix and prepare epoxy grout and non-shrink cementitious grout in strict accordance with the manufacturer’s instructions.
3.04 PLACING

C. Mix grout components as close to the work area as possible and transport the mixture quickly and in a manner that does not permit segregation of materials.

A. Unless otherwise specified or indicated on the drawings, the thickness of grout under baseplates shall be 1-1/2 inches. Grout shall be placed in strict accordance with the directions of the manufacturer so that all spaces and cavities below the top of baseplates and bedplates are completely filled, without voids.

B. Place grout material quickly and continuously.

C. Do not use pneumatic-pressure or dry-packing methods.

D. Apply grout from one side only to avoid entrapping air. The final installation shall be thoroughly compacted and free of air pockets.

E. Do not vibrate the placed grout mixture, or permit it to be placed if the area is being vibrated by nearby equipment.

F. In all locations where the edge of the grout will be exposed to view, the grout shall be finished smooth after it has reached its initial set. Except where shown to be finished on a slope, the edges of grout shall be cut off flush at the baseplate, bedplate, member, or piece of equipment.

G. Do not remove leveling shims for at least 48 hours after grout has been placed.

H. Anchor bolts, threaded rod anchors, and reinforcing bars shall be epoxy grouted in holes drilled into hardened concrete. Diameters of holes shall be as follows:

<table>
<thead>
<tr>
<th>Item</th>
<th>Diameter of Hole</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reinforcing Bars and Threaded Rod Anchors</td>
<td>1/8 inch larger than the bar or rod outside diameter</td>
</tr>
</tbody>
</table>

I. The embedment depth for epoxy grouted anchor bolts, threaded rod anchors, and reinforcing bars shall be not less than 15 bolt or rod diameters, unless otherwise indicated on the drawings. Holes shall be prepared for grouting as recommended by the grout manufacturer.

J. Anchor bolts, threaded rod anchors, and reinforcing bars shall be clean, dry, and free of grease and other foreign matter at time of installation. The bolts, rods, and bars shall be set and positioned, and the epoxy grout shall be placed and finished in accordance with the recommendations of the grout manufacturer. Particular care shall be taken to ensure that all space and cavities are filled with epoxy grout, without voids.

K. During assembly of all threaded stainless steel components, anti-seize thread lubricant shall be liberally applied to the threaded portion not embedded in concrete.
3.05 CURING

A. After grout has attained its initial set, keep damp for a minimum of 3 days.

B. Prevent rapid loss of water from the grout during the first 48 hours by the use of an approved membrane-curing compound or with the use of the wet burlap method.

END OF SECTION
SECTION 03732

CONCRETE REHABILITATION

PART 1 - GENERAL

1.01 DESCRIPTION

A. Application of concrete protective coating as shown on the drawings and manufacturer's requirements.

B. Work shall consist of removing deteriorated concrete in cracks/spalls, furnishing and placing epoxy mortar as specified.

C. Drill through wall and pump epoxy mix to seal cracks in the concrete.

1.02 REFERENCE STANDARDS

A. American Society For Testing And Materials (ASTM)
   1. ASTM C109 - Test Method for Compressive Strength of Hydraulic Cement Mortars (using 2 in. or 50 mm. cube specimens).

B. American Concrete Institute (ACI)
   1. ACI-301 - Specification for Structural Concrete for Buildings.
   2. ACI-318 - Building Code Requirements for Reinforced Concrete.
   3. ACI-503.4 - Guide to Joint Sealants for Concrete Structures.
   4. ACI-504R - Standard Specifications for Repairing Concrete with Epoxy Mortars.

C. International Code Council (ICC)

D. The Occupational Health And Safety Administration (OSHA)
   1. Safety and Health Regulations for Construction.
1.03 SUBMITTALS

A. General: Refer to Contract requirements for Submittals, Shop Drawings, Product Data, and Samples.

B. Product Data: The Contractor shall submit to the Engineer, catalog cuts for each material specified and shall state the specific usage for each product submitted.

C. Certificates: The Contractor shall submit to the Engineer, manufacturer's certification verifying that the resins, cement, aggregate, water, concrete mix, etc. conform to the requirements of these specifications.

D. Installation Methods: The Contractor shall submit to the Engineer, manufacturer's recommended procedures for mixing, application and curing of all repair products.

E. Shop Drawings: Submit drawings, or diagrams to scale, that indicate the overall element and the location and limits of each area to be repaired. Areas shown on the plans are only approximate and are those in need of repair at the time of inspection. They are not guaranteed to be all the areas that will need repair at the time of construction.

1.04 QUALITY ASSURANCE

A. Quality Control shall be by the Contractor and as required by applicable codes, Reference Standards, and Contract Documents.

B. The manufacturer shall clearly mark all containers with the following information:

1. Name of Manufacturer.


3. Date of expiration of shelf life.

4. Manufacturer's instructions for mixing and application.

5. Warning for handling and toxicity.

6. The manufacturer shall have a knowledgeable technical representative available for site assistance to the Contractor during material application procedures.

1.05 DELIVERY

A. All materials shall be delivered in sealed containers with labels legible and intact.

1.06 STORAGE OF MATERIALS

A. The Contractor shall store all materials at temperatures between 40° - 80°F unless otherwise recommended by the manufacturer.

B. Storage shall conform to the requirements of ACI 301.
1.07 HANDLING OF MATERIALS

A. Handle all materials in a safe manner and in a way to avoid breaking container seals.

B. The Contractor shall provide all necessary protective equipment, clothing, goggles, etc. for work around chemicals, polymers, etc. that may cause skin and eye irritation.

PART 2 - PRODUCTS

All mortars, grouts, sealants, bonding agents and other concrete products must be EPA approved or approved by local organization having jurisdiction.

2.01 CONCRETE

A. See Cast-In-Place Concrete specification 03301 for product requirements of concrete.

2.02 NON-SHRINK CONCRETE GROUT

A. Concrete around pipe flanges shall be non-metallic non-shrink grout FX-228, a blend of Portland cement, of compressive strength 5,000 psi by Simpson Strong-Tie, or approved equal.

2.03 REINFORCING STEEL

A. Reinforcing steel shall be deformed, intermediate billet, ASTM A 615, Grade 60, clean and free from excessive rust, scale, or coatings that will reduce bond, sized and grades as indicated.

2.04 RUST PROTECTION COATING

A. A single component self-priming, rust inhibitive, ultraviolet (U.V.) resistant coating FX-406 by Simpson Strong-Tie or approved equal.

2.05 PATCHING MORTAR FOR SPALL REPAIR

A. Concrete spalls at vertical face of walls shall be repaired by FX-32GMF, a fiber reinforced repair mortar by Simpson Strong-Tie, or approved equal.

2.06 REPAIR OF CRACKS

A. A two-component, high solids injection epoxy, ETI-SLV by Simpson Strong-Tie, or approved equal, for crack repair of cracks up to ¼” wide.

2.07 PROTECTIVE COATING ON TOP OF SLAB

A. A two-component, moisture insensitive, epoxy resin FX-761M by Simpson Strong-Tie, or approved equal to provide high tensile strength, high impact resistant epoxy floor topping.
2.08  PROTECTIVE COATING INSIDE WALL AND FLOOR

    A. A two component 100% solids, moisture insensitive, epoxy coating FX-70-9 by Simpson Strong-Tie, or approved equal to provide a tough, chemical and abrasion-resistant coating for damp concrete.

2.09  EPOXY BONDING AGENT

    A. A two component 100% solids, moisture tolerant epoxy system FX-752 by Simpson Strong-Tie, or approved equal, to provide bond between freshly placed mortars or concrete mixes and existing concrete. Bonding agent shall meet or exceed the requirements of ASTM C881 Types I and II, Grade 1, Class B.

2.10  CRACK SEALER

    A. A trowel grade epoxy, moisture tolerant epoxy system FX-763 Hydro-Ester by Simpson Strong-Tie, or approved equal.

PART 3 - EXECUTION

3.01  REPLACEMENT OF CONCRETE AT OPENINGS

    A. Saw cut concrete around pipe flanges and at openings and remove with jack hammer or methods approved by the Engineer. Surface must be roughened to assure optimum bond of the new concrete. The concrete and reinforcing steel shall be cleaned by sandblasting and water-blasting.

    B. Remove concrete for repair in areas with deteriorating/spalling concrete as approved by the Engineer.

    C. To ensure removal down to sound concrete, the chipping shall continue until the condition is reached when coarse aggregate is being broken while still held in the existing concrete surface.

    D. Formwork shall be used as required to place concrete as shown on the drawings.

    E. Air blasting shall be used to remove all dust, etc. before placement of bonding agent and new concrete.

    F. Install approved rust protection coating to reinforcing steel pre manufacturer recommendations and allow time for it to become tack free.

    G. At the time of bonding agent application, existing substrate surfaces shall be completely dry.

    H. Cover steel and concrete with approved bonding agent per manufacturer instructions.

    I. Place new concrete as shown on the drawings, and within time limit set by bonding agent manufacturer.
J. Minimum ambient and surface temperatures must be at least 45° and rising at the time of application.

K. Concrete shall be cured by keeping surface wet or applying curing compound as recommended by manufacturer.

3.02 PROTECTIVE COATING ON TOP SURFACE OF SLAB AND ON WALLS

A. The coating shall be applied after sealing of cracks.

3.03 CRACK REPAIRS BY EPOXY PRESSURE INJECTION

A. General Construction Requirements: The work under this item consists of a system of two epoxy materials to seal the cracks.

1. FX-763 – Surface seal cracks.

2. ETI-SLV – Injection seal cracks and joint.
   a. The locations for the pressure injection shall be per manufacturer's recommendation. The location of cracks will be approved by the Engineer.
   b. The Contractor shall be required to have a manufacturer's technical representative present for the duration of the injection process. Also, the details, methods of repairs and the injection procedure should be submitted for the Engineer's approval.
   c. The epoxy injection procedure shall utilize the E-Z-Click system by Simpson Strong-Tie, and shall follow the manufacturer’s recommended procedures.
   d. Past E-Z-Click ports to wall over cracks using the FX-763 trowel grade epoxy at locations consistent with manufacturer guidelines.
   e. All working personnel shall be familiar with the equipment, materials and procedures to be used during the operation. Extra (backup) equipment to assure the continuous injection of the epoxy, in the event of primary equipment failure, shall be required.
   f. All materials and equipment, including backup equipment, shall be at the work site before injection is begun. All equipment shall be in proper calibration and in good working order as determined by, and to the full satisfaction of, the Engineer.
   g. The two components shall be mixed in accordance with the manufacturer's recommendations. The ratio of the components shall be maintained within a tolerance of five percent.
   h. Any solvent used for cleaning shall be non-chlorinated. Acceptable solvents are mineral spirits, methyl ethyl ketone, acetone, low boiling naphtha, xylene, and any other non-chlorinated solvent.

B. Port Installation

1. To adhere ports to concrete, apply small amount of FX-763 to bottom of port base and place the port at one end of the crack. Take care not to post-over the block port or crack when installing ports.
2. Install ports 8” apart along the length of the crack.

3. After ports are installed, install surface seal material FX-763 over crack per manufacturer’s recommendations.

4. Allow surface seal material to harden prior to injection procedures.

C. Injection Procedures

1. No epoxy injection or surface sealing shall be done when the concrete temperature or ambient temperature is, or is expected to fall, below 50 degrees F during the 24 hours following the time of epoxy injection.

2. Injection shall be started at the lowest row of holes and at the hole nearest to the centerline of structure. Injection shall continue at the first port until the epoxy adhesive begins to flow out of the port at the next highest elevation. The first port shall be plugged and injection started at the second port until the adhesive flows from the next port. This sequence shall be followed until the entire crack is repaired.

3. During the course of all operations, extreme care shall be given to observe for breaking out of adhesive material, and when such breaking out occurs, the injection line shall be moved to some other part of the structure. Injecting may be resumed in the original location after the elapse of 24 hours.

4. The feed line from the mixing equipment shall be securely held or properly attached to the port. The operator shall then initiate epoxy injection and flow shall be allowed at a maximum injection pressure of 150 psi or per manufacturer’s recommendations.

5. The injection procedure shall be monitored to assure the epoxy flow does not cease before the injected epoxy exudes from the adjacent port. When the epoxy flows from the adjacent port, injection shall be stopped, the feed line removed from the port, and the port sealed. The feed line shall then be attached to the next port and the procedure repeated until the last port is sealed. If the epoxy flow stops before epoxy appears at the adjacent port, the feed line shall be moved to the adjacent port and the port just used shall be sealed.

6. In the event of leakage from the crack, injection will be stopped until the leak is sealed. Any work stoppage of fifteen (15) minutes, or longer, will necessitate clearing of the mixing chamber and any equipment in contact with mixed epoxy.

7. After injection process has been completed and the epoxy allowed to fully cure, the injection ports and surface seal shall be removed from all surfaces. Ports shall be cut and sealed. The surface seal and any spillage shall be ground off flush with the original surface, using a hand grinder. Any damage to the concrete during the cleanup procedure shall be repaired in a manner satisfactory to the Engineer at no additional cost to the Owner.

8. Test cores shall be drilled as directed by Engineer to assess the sealing of joints, cracks and sealing of surface.

END OF SECTION
SECTION 04900

MASSONRY RESTORATION

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes restoration of masonry, including repairing and replacing damaged or missing brick and concrete masonry units (CMU), patching masonry openings, and repointing mortar joints.

1.02 SUBMITTALS

A. Product Data: For each type of product indicated. Include recommendations for application and use. Include test data substantiating that products comply with requirements.

B. Samples for Verification:

1. Masonry Units: For replacement bricks, provide straps or panels containing at least four bricks.

2. Pointing Mortar: For pointing mortar, provide sample mortar strips, 6-inches long by ½ inch wide, set in aluminum or plastic channels.

C. Restoration Plan: Provide a detailed description of materials, methods, equipment, and sequence of operations to be used for restoration work, including protection of surrounding materials on building and project site. Include methods for keeping pointing mortar damp during curing period. Provide plans and elevations indicating locations and extents of repairs for approval prior to construction.

1.03 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of material of a uniform quality, texture and color, through one source from a single manufacturer.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver masonry units to the project site strapped together in suitable packs or pallets, or in heavy duty cartons.

B. Deliver other materials to the project site in manufacturer’s original and unopened containers, labeled with manufacturer’s name and type of products.

C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
D. Store sand where grading and other required characteristics can be maintained and contamination avoided.

1.05 PROJECT CONDITIONS
A. Repoint mortar joints and repair masonry only when air temperature is between 40 and 90-degrees F and is predicted to remain so for at least 7 days after completion of work.

PART 2 - PRODUCTS

2.01 MASONRY UNITS
A. Face Brick, CMU and Accessories: Provide face brick, CMU and accessories, including specially molded, ground, cut, or sawed shapes where required to complete masonry restoration work.
   1. Provide CMU with colors, surface texture, size and shape to match existing block work and with physical properties in accordance with ASTM.
   2. Provide brick units with colors, surface texture, size and shape to match existing brickwork and with physical properties in accordance with ASTM.

2.02 MORTAR MATERIALS
A. Portland Cement: ASTM 0150, Type I or II. Provide natural color or white cement containing not more than 0.60-percent total alkali when tested according to ASTM C114.
B. Hydrated Lime: ASTM C207, Type S.
C. Quicklime: ASTM C5, pulverized lime.
D. Factory-Prepared Lime Putty: Screened, fully-slaked lime putty, prepared from pulverized lime complying with ASTM C5.
E. Mortar Pigments: Natural and synthetic iron oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.
F. Aggregate: ASTM C144, clean natural colored sand of color necessary to produce required mortar color. For pointing mortar, provide sand with rounded edges. Match size, texture, and gradation of existing mortar sand as closely as possible.
G. Water: Clean and potable.

2.03 MASONRY PATCHING COMPOUND
A. Masonry patching compound shall be factory-mixed cementitious product that is custom manufactured for patching masonry, is vapor and water-permeable, exhibits low shrinkage, and develops high bond strength to all types of masonry.
B. Formulate compound to match color and texture of brick being patched.
2.04 MORTAR MIXES

A. Preparing Lime Putty: Slake quicklime and prepare lime putty according to appendix to ASTM C5 and manufacturer’s written instructions.

B. Measurement: Measure cementitious materials and sand in a dry condition by volume or equivalent weight. Do not measure by shovel; use known measure.

C. Mixing Pointing Mortar: Thoroughly mix cementitious materials and sand together before adding any water. Then mix again adding only enough water to produce a damp, unworkable mix that will retain its form when pressed into a ball. Maintain mortar in this dampened condition for 15 to 30 minutes. Add remaining water in small portions until mortar reaches desired consistency. Use mortar within one hour of final mixing. Do not retemper or use partially hardened material.

D. Do not use admixtures of any kind in mortar. Where mortar pigments are necessary, do not exceed a pigment-to-cement ratio of 1:10 by weight.

E. Mortar Proportions: Mix mortar materials in the following proportions:

1. Pointing Mortar: 1 part Portland cement, 2 parts lime, and 6 parts sand. Add mortar pigments to produce mortar color required.

2. Rebuilding (Setting) Mortar: Same as pointing mortar or comply with ASTM C270, Proportion Specification, Type N, with cementitious material content limited to Portland cement and lime.

PART 3 - EXECUTION

3.01 MASONRY UNIT REMOVAL AND REPLACEMENT

A. Remove bricks and CMU that are damaged, spalled, or deteriorated, and as necessary for the completion of other work. Carefully demolish or remove entire units from joint to joint, without damaging surrounding masonry, in a manner that permits replacement with full-size units.

B. Support and protect remaining masonry that surrounds removal area. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.

C. Clean bricks and CMU surrounding removal areas by removing mortar, dust, and loose particles in preparation for replacement.

D. Install replacement brick and CMU into bonding and coursing pattern of existing units. If cutting is required, use a motor-driven saw designed to cut masonry with clean, sharp, unchipped edges.

E. Lay replacement units with completely filled bed, head, and collar joints. Butter ends with sufficient mortar to fill head joints and shove into place. Wet both replacement and surrounding bricks that have ASTM C67 initial rates of absorption of more than 30g/30 sq. in. per min. Use wetting methods that ensure that units are nearly saturated but surface is dry when laid. Maintain joint width for replacement units to match existing joints.
1. Tool exposed mortar joints in repaired areas to match joints of surrounding existing brickwork.

2. Rake out mortar used for laying brick before mortar sets and point new mortar joints in repaired area to comply with requirements for repointing existing masonry, and at the same time as repointing of surrounding area.

3.02 MASONRY UNIT PATCHING

A. Patch masonry units with holes and small areas of deep deterioration.

B. Patching Masonry Units:
   1. Remove loose material from block and brick surfaces. Remove additional material so patch will not have feathered edges and will be at least ¼-inch thick, but not less than recommended by patching compound manufacturer.
   2. Mask or remove surrounding mortar joints if patch will extend to edge of brick.
   3. Rinse surface to be patched and leave damp, but without standing water.
   4. Brush-coat surfaces with slurry coat of patching compound according to manufacturer’s written instructions.
   5. Place patching compound in layers as recommended by patching compound manufacturer, but not less than ¼-inch or more than 2-inches thick. Roughen surface of each layer to provide a key for next layer.
   6. Trowel, scrape, or carve surface of patch to match texture and surface plane of surrounding brick. Shape and finish surface before or after curing, as determined by testing, to best match existing brick.
   7. Keep each layer damp for 72 hours, or until patching compound has set.

3.03 REPOINTING MASONRY

A. Rake out and repoint mortar joints where mortar is missing or where they contain holes, cracked joints where cracks are 1/8-inch or more in width, and any joints that are deteriorated to the point that mortar can be easily removed by hand. Do not rake out and repoint joints where not required.

B. Rake out joints as follows:
   1. Remove mortar from joints to depth of joint width plus 1/8-inch, but not less than 1/2-inch or not less than that required to expose sound, unweathered mortar.
   2. Remove mortar from masonry surfaces within rake-out joints to provide reveals with square backs and to expose masonry for contact with pointing mortar. Brush, vacuum, or flush joints to remove dirt and loose debris.
3. Do not spall edges of masonry units or widen joints. Replace or patch damaged masonry units as directed by the Engineer.

4. Cut out mortar by hand with chisel and mallet.

C. Point joints as follows:

1. Rinse masonry-joint surfaces with water to remove dust and mortar particles. At time of pointing, joint surfaces shall be damp but free of standing water.

2. Apply pointing mortar first to areas where existing mortar was removed to depths greater than surrounding areas. Apply in layers not greater than 3/8-inch until a uniform depth is formed. Fully compact each layer thoroughly and allow to become thumbprint hard before applying next layer.

3. After low areas have been filled to same depth as remaining joints, point all joints by placing mortar in layers not greater than 3/8-inch. Fully compact each layer thoroughly and allow to become thumbprint hard before applying next layer. Where existing bricks have worn or rounded edges, slightly recess finished mortar surface below face of masonry to avoid widened joint faces. Take care not to spread mortar over edges onto exposed masonry surfaces or to featheredge mortar.

4. When mortar is thumbprint hard, tool joints to match original appearance of joints. Remove excess mortar from edge of joint by brushing.

D. Cure mortar by maintaining in thoroughly damp condition for at least 72 hours including weekends and holidays.

1. Acceptable curing methods include covering with wet burlap and plastic sheeting, periodic hand misting, and periodic mist spraying using system of pipes, mist heads and timers.

2. Adjust curing methods to ensure that pointing mortar is damp throughout its depth without eroding surface mortar.

3.04 FINAL CLEANING

A. After mortar has fully hardened, thoroughly clean exposed masonry surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or fiber brushes, and clean water, spray applied at low pressure. Do not use metal scrapers or brushes. Do not use acidic or alkaline cleaners.

B. Clean all exterior masonry to remove any dirt, debris, graffiti, etc. Do not use acidic or alkaline cleaners.

C. Wash adjacent non-masonry surfaces. Use detergent and soft brushes or cloths suitable for surface material being cleaned.
D. Sweep and rake adjacent pavement, concrete and grounds to remove masonry debris. Where necessary, pressure wash surfaces to remove mortar, dust, dirt and stains.

END OF SECTION
SECTION 05120

STRUCTURAL STEEL

PART 1 - GENERAL

1.01 SUMMARY

A. This Section specifies structural steel, including monorail columns, lintels, and other miscellaneous structural steel and accessories.

1.02 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication of structural steel components.
   1. Include details of cuts, connections, splices, camber, holes and other pertinent data.
   2. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
   3. Indicate type, size, and length of bolts, distinguishing between shop and field bolts.

C. Mill Test Reports: Signed by manufacturers certifying that the following products comply with requirements:
   1. Structural steel including chemical and physical properties.
   2. Bolts, nuts, and washers including mechanical properties and chemical analysis.

D. Welding certificates.

E. Qualification Data: For fabricator.

1.03 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1, “Structural Welding Code—Steel”.

B. Comply with applicable provisions of the following specifications and documents:
   1. AISC’s “Code of Standard Practice for Steel Buildings and Bridges”.
   2. AISC’s “Manual of Steel Construction”.
   3. RCSC’S “Specification for Structural Joints Using ASTM A325 or A490 Bolts”.

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1.04 DELIVERY, STORAGE, AND HANDLING
   A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from erosion and deterioration.
   B. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or exhibit corrosion before use.

PART 2 - PRODUCTS

2.01 STRUCTURAL STEEL MATERIALS
   A. W-Shapes: ASTM A992.
   B. Channels, Angles, M-Shapes: ASTM A36.
   C. Plate and Bar: ASTM A36.
   D. Welding Electrodes: Comply with AWS requirements.

2.02 BOLTS, CONNECTORS, AND ANCHORS
   A. High-Strength Bolts, Nuts and Washers: ASTM A325, Type 1, heavy hex steel structural bolts; ASTM A563 heavy hex carbon steel nuts; and ASTM F436 hardened carbon steel washers; hot-dip zinc coating per ASTM A153.

2.03 FABRICATION
   A. Fabricate and assemble in shop to the greatest extent possible. Fabricate according to AISC’s “Code of Standard Practice for Steel Buildings and Bridges”.
   B. Cut, drill or punch standard bolt holes perpendicular to metal surfaces. Do not thermally cut bolt holes or enlarge holes by burning.

2.04 SHOP CONNECTIONS
   A. Shop install high-strength bolts according to RCSC’s “Specifications for Structural Joints Using ASTM A325 or A490 Bolts” for type of bolt and type of joint required.
   B. Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.

2.05 GALVANIZING
   A. Apply zinc coating by the hot-dip process to structural steel according to ASTM A123. Fill vent holes and grind smooth after galvanizing.
PART 3 - EXECUTION

3.01 PREPARATION

A. Provide temporary shores, guys, braces and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections and braces are in place.

3.02 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC’s “Code of Standard Practice for Steel Buildings and Bridges”.

B. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.

C. Maintain erection tolerances of structural steel within AISC’s “Code of Standard Practice for Steel Buildings and Bridges”.

D. Align and adjust various members forming part of complete frame or structure before permanent fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
   1. Level and plumb individual members of the structure.
   2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
   3. Splice members only when shown, accepted and approved on shop drawings.

E. Remove erection bolts on welded structural steel, fill holes with plug welds, and grind smooth at exposed surfaces.

F. Do not use thermal cutting during erection.

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.03 FIELD CONNECTIONS

A. Shop install high-strength bolts according to RCSC’s “Specifications for Structural Joints Using ASTM A325 or A490 Bolts” for type of bolt and type of joint required.

B. Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
3.04 QUALITY CONTROL

A. Engage a qualified independent testing and inspection agency to inspect field welds and high-strength bolted connections.

B. Shop-bolted connections shall be inspected according to RCSC’s “Specifications for Structural Joints Using ASTM A325 or A490 Bolts”.

C. Field welds shall be visually inspected according to AWS D1.1.

3.05 REPAIRS AND PROTECTION

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A780 and manufacturer’s written instructions.

B. Clean, prepare surfaces and paint in accordance with Section 09900.

END OF SECTION
SECTION 05500

METAL FABRICATIONS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section specifies steel supports, loose bearing and leveling plates, steel weld plates and angles, metal bollards, loose steel lintels, anchor bolts, steel pipe sleeves, and other miscellaneous metal fabrications and accessories.

B. All metal fabrications that are to be located within underground vaults shall be stainless steel Type 316.

1.02 SUBMITTALS

A. Shop Drawings: Show fabrication and installation details for all metal fabrications,
   1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
   2. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
   3. Indicate type, size, and length of bolts, distinguishing between shop and field bolts.
   4. Provide templates for anchors and bolts.
   5. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the licensed Professional Engineer registered in the State of Maryland and responsible for their preparation.

B. Mill Certificates: Signed by manufacturers of stainless-steel sheet certifying that products furnished comply with requirements.

C. Welding certificates.

D. Qualification Data: For Professional Engineer

1.03 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to the following:
   1. AWS D1.1, “Structural Welding Code—Steel”
4. AWS D1.6, “Structural Welding Code—Stainless Steel”

1.04 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicate measurements on Shop Drawings.

1.05 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry.

B. Coordinate installation of steel weld plates and angles for casting into concrete.

1.06 PERFORMANCE REQUIREMENTS

A. Structural Performance of Ladders: Provide ladders capable of withstanding the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.

PART 2 - PRODUCTS

2.01 METALS, GENERAL

A. Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.02 FERROUS METALS

A. Steel Shapes: ASTM A992.

B. Steel Plates and Bars: ASTM A36.

C. Stainless Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666, Type 316L.

D. Stainless Steel Bars and Shapes: ASTM A276, Type 316L.

E. Steel Tubing: ASTM A500, cold-formed steel tubing.

F. Steel Pipe: ASTM A53, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.

G. Cast Iron: ASTM A48, Class 30, unless another class is indicated or required by structural loads.

2.03 NONFERROUS METALS


C. Aluminum Castings: ASTM B26, Alloy 443.0-F.

2.04 FASTENERS

A. General: Provide Type 316 stainless steel fasteners unless indicated otherwise in contract documents. Provide stainless steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.

B. Steel Bolts and Nuts: If indicated, provide regular hexagon-head bolts, ASTM A325, Type 1; with ASTM A563 heavy hex nuts, and ASTM F436 hardened carbon steel washers; with hot-dip zinc coating per ASTM A153.

C. Stainless Steel Bolts and Nuts: Regular hexagon-head annealed stainless steel bolts, nuts and flat washers; ASTM F593 for bolts and ASTM F594 for nuts.

D. Anchor Bolts: ASTM F1554, Grade 55.

1. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts where item being fastened is indicated to be galvanized.

E. Machine Screws: ASME B18.6.3.


H. Cast-in-Place Anchors in Concrete: Anchors capable of sustaining, without failure, a load equal to four times the load imposed, as determined by testing according to ASTM E488, conducted by a qualified independent testing agency.

1. Threaded or wedge type; galvanized ferrous castings, either ASTM A47 malleable iron or ASTM A27 cast steel. Provide bolts, washers, and shims as needed, hot dip galvanized per ASTM A153.

I. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete as determined by testing according to ASTM E488, conducted by a qualified independent testing agency.


2.05 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
B. Shop Primers: Provide primers that comply with Section 09900.

C. Zinc-Rich Primer: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.
   1. Use primer with a VOC content of 3.5 lb/gal or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   2. Products shall be Carboline Carbozinc 621, Sherwin-Williams Corothane I GalvaPac Zinc Primer, Tnemec Tneme-Zinc 90-97, or approved equal.


E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187.

2.06 FABRICATION, GENERAL

A. Shop Assembly: Pre-assemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32-inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work true to line and level with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts, unless otherwise indicated. Locate joints where least conspicuous.
G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill and tap metal fabrications to receive finish hardware, screws and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-½ inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8-inches from ends and corners of units and 24-inches o.c., unless otherwise indicated.

2.07 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the work.

B. Fabricate units from steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items. Furnish inserts if units are installed after concrete is placed.

C. Galvanize miscellaneous framing and supports.

2.08 LOOSE STEEL LinteLS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions. Weld adjoining members together to form a single unit where indicated.

B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span, but not less than 8-inches, unless otherwise indicated.

C. Galvanize loose steel lintels.

2.09 FINISHES, GENERAL

A. Comply with NAAMM’s “Metal Finishes Manual for Architectural and Metal Products for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

2.10 STEEL AND IRON FINISHES

A. Galvanizing: Hot dip galvanize items as indicated to comply with applicable standard listed below:
1. ASTM A123, for galvanizing steel and iron products.
2. ASTM A153, for galvanizing steel and iron hardware.

B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:

1. Exteriors (SSPC Zone 1B) and Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, “Commercial Blast Cleaning.”
2. Interiors (SSPC Zone 1A): SSPC-SP 3, “Power Tool Cleaning.”

C. Shop Priming: Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete or masonry, unless otherwise indicated. Comply with SSPC-PA 1, “Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel,” for shop painting. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.11 STAINLESS STEEL FINISHES
A. Remove tool and die marks and stretch lines or blend into finish.
B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
C. Dull Satin Finish: No. 6.
D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

2.12 ALUMINUM FINISHES
A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
B. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating (0.018 mm or thicker) complying with AAMA 611.

2.13 METAL LADDERS
A. General:
   1. Comply with ANSI A14.3, unless otherwise indicated.
   2. Space siderails 18 inches apart, unless otherwise indicated.
   3. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted brackets, made from same metal as ladder.
B. Aluminum Ladders:

1. Side rails: Continuous extruded-aluminum channels or tubes, not less than 2-1/2 inches deep, 3/4-inch-wide, and 1/8 inch thick.

2. Rungs: Extruded-aluminum tubes, not less than 3/4-inch-deep and not less than 1/8-inch-thick, with ribbed tread surfaces.

3. Fit rungs in centerline of side rails; fasten by welding or with stainless-steel fasteners or brackets and aluminum rivets.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of units that have been hot dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use material and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.

4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.
3.02 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturer’s written instructions and requirements indicated on shop drawings.

3.03 INSTALLING BEARING AND LEVELING PLATES


B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.

1. Use non-shrink grout.

2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.04 INSTALLING METAL BOLLARDS

A. Anchor bollards in place with concrete footings as indicated. Center and align bollards in holes 6-inches above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.

B. Fill bollards solidly with concrete, mounding top surface to shed water.

3.05 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2-mil dry film thickness.

B. Touchup Painting: Clean and touchup paint field welds, bolted connections, and abraded areas of shop paint in accordance with Section 09900.

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780.

END OF SECTION
SECTION 05521

PIPE AND TUBE RAILINGS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This work shall perform the activities as described herein.

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.

1. ASCE 8, “Specification for the Design of Cold-Formed Stainless Steel Structural Members.”

2. ASTM A 312, Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.

3. ASTM A 554, Welded, Stainless Steel Mechanical Tubing.

4. ASTM A 666, Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.


7 NAAMM’s “Metal Finishes Manual for Architectural and Metal Products” for recommendations for applying and designating finishes.

8 OSHA Part 190.23, Guarding Floor and Wall Openings and Holes.

1.04 PERFORMANCE REQUIREMENTS

A. In engineering handrails and railings to withstand structural loads indicated, determine allowable design working stresses of handrail and railing materials based on the following:
1. Stainless Steel: ASCE 8, "Specification for the Design of Cold-Formed Stainless Steel Structural Members."

B. Structural Performance of Handrails, Railings and Safety gates:

1. Provide handrails and railings capable of withstanding structural loads required by the current building code required by the authorities having jurisdiction without exceeding allowable design working stresses of materials for handrails, railings, anchors, and connections.

2. Provide a handrail and railing system that conforms to OSHA, Part 1910.23, including the 200 pound loading requirement. In addition, the system shall conform to the following requirements of ANSI A 12.1:
   a. Completed railing shall withstand a load of 50 pounds per linear foot applied in any direction at the top of the railing.
   b. Intermediate rail shall withstand a horizontal load of 50 pounds per linear foot applied in any direction at the top of the railing.
   c. All above loads are not additive.

C. Thermal Movements: Provide handrails and railings that allow 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 connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and night time-sky heat loss.

1. Temperature Change (Range): 120°F (67°C), ambient; 180°F (100°C), material surfaces.

D. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.05 SUBMITTALS

A. Shop Drawings, brochures, and samples submitted shall be submitted for all items to be furnished in accordance with the provisions of Section 01000, and shall include at least the following:

1. Shop Drawings, including all equipment and components.

2. Brochures and/or Catalogue Cuts.

3. Performance characteristics.

4. Indicate all welds both shop and field by Standard Units of Measure.

B. Product Data: For the following:

1. Manufacturer's product lines of mechanically connected handrails and railings.
C. Shop Drawings: Show fabrication and installation of handrails and railings. Include plans, elevations, sections, component details, and attachments to other work.

1. For installed handrails and railings indicated to comply with design loads, include structural analysis data signed and sealed by the qualified Professional Engineer, licensed in the State of Maryland, responsible for their preparation.

D. Samples for Verification: For each type of exposed finish required, prepared on components indicated below and of same thickness and metal indicated for the work. If finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.

1. Six-inch-long sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.

2. Fittings and brackets.

3. Assembled sample of railing system, made from full-size components, including top rail, post, handrail, and infill. Show method of finishing members at intersections. Sample need not be full height.

E. Qualification Data: For firms and persons specified in 1.07 QUALITY ASSURANCE, to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of Cities, and other information specified.

F. Product Test Reports: From a qualified testing agency indicating handrails and railings comply with ASTM E 985, based on comprehensive testing of current products or current building code required by authority having jurisdiction, whichever is more stringent.

G. Certification: Furnish certification by manufacturer that loading tests have been performed on the handrail, and that it conforms to all applicable OSHA and ANSI requirements for load and deflection.

1.06 QUALITY ASSURANCE

A. Fabricator Qualifications:

1. Engage in a single firm, with undivided responsibility for performance of handrail and railing systems Work.

2. Engage a firm which can show five years previous successful experience in the fabrication of handrail and railing systems of scope and type similar to the required Work.

3. Provide fabricator capable of providing custom details shown.
4. Materials and fabrication procedures shall be subject to inspection and tests in the mill, shop, and field, conducted by a qualified inspection agency. Such inspections and tests shall not relieve CONTRACTOR of responsibility for providing materials and fabrication procedures in compliance with specified requirements.

B. Installer Qualifications:

1. Engage a single installer skilled, trained and with a record of successful experience in the installation of aluminum handrail and railing systems and who has a successful record of performing Work in accordance with the approved recommendations and requirements of the fabricator or who can submit evidence in writing of being acceptable to the fabricator; and who agrees to employ only tradesmen with specific skill and successful experience in this type of work. Submit names and qualification to County along with the following information on a minimum of three successful projects:

   a. Names and telephone numbers of City, architects or engineers responsible for projects.

   b. Approximate contract cost of the handrails and railings.

   c. Amount of area installed.

C. Source Quality Control:

1. Obtain all handrails and railing systems components and accessories from the same manufacturer.

D. Allowable Tolerances:

1. Limit variation of cast-in-place inserts, sleeves and field-drilled anchor and fastener holes to the following:

   a. Spacing: ± 3/8 inch.

   b. Alignment: ± 1/4 inch.

   c. Plumbness: ± 1/8 inch.

2. Minimum Handrails and Railings System Plumb Criteria:

   a. Limit variation of completed handrail and railing system alignment to 1/4 inch in 12 feet-0 inches with posts set plumb to within 1/16 inch in 3 foot – 0 inches.

   b. Align rails so variations from level for horizontal members and from parallel with rake of stairs and ramps for sloping members do not exceed 1/4 inch in 12 feet – 0 inches.

3. Provide “pencil-line” thin butt joints.
E. Professional Engineer Qualifications: A Professional Engineer registered in the State of Maryland and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of handrails and railings that are similar to those indicated for this project in material, design, and extent.

F. Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated.

1.07 DELIVERY, STORAGE, AND HANDLING
A. Store handrails and railings in a dry, well-ventilated, weathertight place.

1.08 PROJECT CONDITIONS
A. Field Measurements: Verify handrail and railing dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Established Dimensions: Where field measurements cannot be made without delaying the work, establish dimensions and proceed with fabricating handrails and railings without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.09 COORDINATION
A. Coordinate installation of anchorages for handrails and railings. Furnish setting Contract Drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to project site in time for installation.

1.10 SCHEDULING
A. Schedule installation so handrails and railings are mounted only on completed walls. Do not support temporarily by any means that does not satisfy structural performance requirements.

PART 2 - PRODUCTS
2.01 MANUFACTURERS
A. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:

1. ATR Technologies, Inc.
2. Blum, Julius & Co., Inc.
4. CraneVeyor Corp.
8. Sterling Dula Architectural Products, Inc; Div. of Kane Manufacturing.
9. Superior Aluminum Products, Inc.
10. Thompson Fabricating, LLC.
11. Tri Tech, Inc.
12. Tubular Specialties Manufacturing, Inc.

2.02 METALS

A. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of alloy and temper designated below for each aluminum form required.

B. Alloys and tempers in first six paragraphs below are typical for products listed when used in railings; revise to suit structural performance requirements.

C. Yield strength for Alloy 6063-T5/T52 is 15 to 16 ksi (105 to 110 MPa).

D. Extruded Bars and Tubing: ASTM B 221, Alloy 6063-T5/T52.

E. Yield strength for Alloy 6063-T6 is 25 ksi (172 MPa).


G. Provide Standard Weight (Schedule 40) pipe unless otherwise indicated.

H. Yield strength for Alloy 6063-T832 is 35 to 36 ksi (240 to 250 MPa).

I. Drawn Seamless Tubing: ASTM B 210, Alloy 6063-T832.

J. Yield strength for Alloy 6061-T6 is 32 to 35 ksi (220 to 240 MPa). Note that 6061-T6 is not suitable for bending, is somewhat less corrosion resistant than 6063, and does not anodize as well as 6063; however, 6063 is not available in plate and sheet form.


2.03 WELDING MATERIALS, FASTENERS, AND ANCHORS

A. Welding Electrodes and Filler Metal: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

B. Fasteners for Anchoring Handrails and Railings to Other Construction:

1. For Aluminum handrails and railings, use fasteners fabricated from Type 304 stainless steel.

C. Cast-in-Place and Post-installed Anchors: Anchors of type indicated below, fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

   1. Expansion anchors.

2.04 GROUT AND ANCHORING CEMENT

A. Refer to Section 03600 Non-Shrink Grout.

2.05 FABRICATION

A. Fabricate handrails and railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

B. Assemble handrails and railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces. No field welding of aluminum shall be allowed.

C. Form changes in direction of railing members as shown.

D. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.

E. Welded Connections: Fabricate handrails and railings for connecting members by welding. Cope components at perpendicular and skew connections to provide close fit, or use fittings designed for this purpose. Weld connections continuously to comply with the following:

   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.

3. Remove flux immediately.

4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

F. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect handrail and railing members to other work, unless otherwise indicated.

G. Provide inserts and other anchorage devices for connecting handrails and railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by handrails and railings. Coordinate anchorage devices with supporting structure.

H. Fabricate end and corner posts and brackets, spaced as shown.

I. Fabricate other posts and brackets spaced to meet the structural requirements listed in 1.04.B.

J. For railing posts set in concrete, provide preset sleeves of stainless steel not less than 6 inches long with inside dimensions not less than 1/2-inch greater than outside dimensions of post, and steel plate forming bottom closure.

K. For removable railing posts, fabricate slip-fit sockets from steel tube whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height. Provide socket covers designed and fabricated to resist being dislodged.

L. Fabricate hinges, latches, and cane bolts as shown.

M. Shear and punch metals cleanly and accurately. Remove burrs from exposed cut edges.

N. Ease exposed edges to a radius of approximately 1/32-inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the Work.

O. Cut, reinforce, drill, and tap components, as indicated, to receive finish hardware, screws, and similar items.

P. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members that are exposed to exterior or to moisture from condensation or other sources.

Q. Fabricate joints that will be exposed to weather in a watertight manner.

R. Close exposed ends of handrail and railing members with prefabricated end fittings.
S. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns, unless clearance between end of railing and wall is 1/4-inch or less.

T. Toe Boards: Provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

U. Fillers: Provide fillers made from steel plate, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

V. All handrails and guardrails assemblies shall be fully welded. No mechanically fastened joints are acceptable except where connections are made to walls, floors or supports, or as indicated in the Contract Documents.

2.06 ALUMINUM FINISHES

A. 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 unacceptable. 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.


2.07 SAFETY GATES

A. Every platform shall be guarded with a swinging gate as shown on contract drawings. The safety gate stainless spring shall automatically close after each passage and adjustment bolts provide positive stop without handrail contact.

B. Gate hardware for installation on handrails or to existing walls shall be provided by gate manufacturer.

C. Aluminum swing gate shall be A-series manufactured by Fabenco Inc. or approved equal.

PART 3 – EXECUTION

3.01 INSPECTION

A. Contractor shall examine the surfaces to receive the pipe and tube railings, and the conditions under which the pipe and tube railings Work is to be performed, and notify County in writing of all conditions detrimental to the proper and timely completion of the Work. Do not proceed with the pipe and tube railing Work until unsatisfactory conditions have been corrected in a manner acceptable to County.

3.02 INSTALLATION

A. Fit exposed connections together to form tight, hairline joints.
B. Perform cutting, drilling, and fitting required to install handrails and railings. Set handrails and railings accurately in location, alignment, and elevation; measured from established lines and levels and free from rack.

1. Do not weld, cut, or abrade surfaces of handrail and railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.

2. Set posts plumb within a tolerance of 1/16-inch in 3 feet.

3. Align rails so variations from level for horizontal members and from parallel with rake of steps and ramps for sloping members do not exceed 1/4-inch in 12 feet.

C. Corrosion Protection: Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

D. Adjust handrails and railings before anchoring to ensure matching alignment at abutting joints. Space posts at interval indicated, but not less than that required by structural loads.

E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing handrails and railings and for properly transferring loads to in-place construction.

3.03 RAILING CONNECTIONS

A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

B. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches of post.

3.04 ANCHORING POSTS

A. Use stainless steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves with epoxy adhesive mixed and placed to comply with anchoring material manufacturer's written instructions:

B. Form or core-drill holes not less than 5 inches deep and 3/4-inch larger than outside diameter of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with grout material, mixed and placed to comply with anchoring material manufacturer's written instructions.

C. Install removable railing sections, where indicated, in type 66 galvanized ground sockets.

D. Side mount post to concrete fascia with brackets as shown.
E. Mount posts to roof deck with sleeves, attached to pipe shafts as shown.

3.05 ANCHORING RAILING ENDS

A. Anchor railing ends into concrete and masonry with round flanges connected to railing ends and anchored into wall construction with post-installed anchors and bolts.

B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces:

1. Connect flanges to railing ends using nonwelded connections.

3.06 ATTACHING HANDRAILS TO WALLS

A. Attach handrails to wall with wall brackets. Provide bracket with 1 1/2-inch clearance from inside face of handrail and finished wall surface.

B. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

C. Secure wall brackets to building construction as follows:

1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.

2. For hollow masonry anchorage, use toggle bolts.

3.07 CLEANING

A. Clean aluminum by washing thoroughly with clean water and soap and rinsing with clean water.

3.08 PROTECTION

A. Protect finishes of handrails and railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at the time of Substantial Completion.

B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit or provide new units.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. The Contractor shall design, fabricate, furnish, and install all fiberglass reinforced plastic (FRP) products, including grating, structural shapes, handrail, and all appurtenances, accessories and incidentals necessary to produce a complete, operable and serviceable installation as shown on the Contract Drawings and as specified herein.

1.02 REFERENCES

A. American Society for Testing and Materials Test Methods:

1. ASTM D638 Tensile Properties of Plastics
2. ASTM D790 Flexural Properties of Unreinforced and Reinforced Plastics
3. ASTM D2344 Apparent Interlaminar Shear Strength of Parallel Fiber Composites by Short Beam Method
4. ASTM D696 Coefficient of Linear Thermal Expansion for Plastics
5. ASTM D635 Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position
6. ASTM E84 Surface Burning Characteristics of Building Materials

1.03 SUBMITTALS

A. All products furnished shall include structural design data, structural properties data, grating load/deflection tables, corrosion resistance tables, certificates of compliance, test reports, as applicable; and concrete anchor systems and their allowable load tables.

B. Shop Drawings: Show fabrication and installation details, including plans, elevations, sections, and details of FRP fabrications and their connections. Show material sizes, types, styles, part or catalog numbers, complete details for fabrication and erection of components including, but not limited to, location, lengths, type and sizes of fasteners, clip angles, member sizes and connection details. Show anchorage and accessory items. Provide templates for anchors and bolts.

C. All FRP products, anchor systems, fasteners, and accessory items shall comply with manufacturers published product data. All structural analysis data and design calculations for installed products shall meet or exceed the performance requirements specified herein and must be signed and sealed by a Professional Engineer licensed in the State of Maryland, who shall be responsible for their preparation.
1.04 PERFORMANCE REQUIREMENTS

A. FRP products shall be capable of withstanding the following applied loads and stresses within the limits, and under the conditions, indicated:

1. Grating:
   a. Uniform Load: 200 psf
   b. Point Load: 1,000 lbs
   c. Maximum Deflection: L/120 or 0.375-inch, (whichever is less)

2. Structural Shapes:
   a. Allowable Bending Stress: 10,000 psi (FS = 3)
   b. Allowable Shear Stress: 1,500 psi (FS = 3)
   c. Allowable Bearing Stress: 10,000 psi (FS = 3)
   d. Maximum Deflection: L/180
   e. Flange Width-to-Flange Thickness Ratio: b/t ≤ 12

1.05 PRODUCT DELIVERY AND STORAGE

A. Manufactured materials shall be delivered in original, unbroken pallets, packages, containers, or bundles bearing the label of the manufacturer. Adhesives, resins and their catalysts and hardeners shall be crated or boxed separately and noted as such to facilitate their movement to a dry indoor storage facility.

B. All materials shall be carefully handled to prevent them from abrasion, cracking, chipping, twisting, other deformations, and other types of damage. Adhesives, resins and their catalysts are to be stored in dry indoor storage facilities between 70 and 85 degrees Fahrenheit until they are required.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Subject to compliance with requirements, FRP products shall be manufactured by Fibergrate Composite Structures, Inc., or approved equal.

2.02 GENERAL

A. All FRP items furnished under this section shall be composed of fiberglass reinforcement and resin in qualities, quantities, properties, arrangements and dimensions as necessary to meet the design requirements and dimensions as shown and specified in the Contract Documents.
B. Fiberglass reinforcement shall be continuous roving in sufficient quantities as needed by the application and/or physical properties required.

C. Unless specified otherwise, all resin shall be fire retardant polyester with chemical formulations, as necessary, to provide the corrosion resistance, strength and other physical properties required.

D. All finished surfaces of FRP products shall be smooth, resin-rich, free of voids and without dry spots, cracks, crazes or unreinforced areas. All glass fibers shall be well covered with resin to protect against their exposure due to wear or weathering.

E. All molded FRP products shall have no dry glass fibers visible after molding on any surface of bearing bars or cross bars. All bars shall be smooth and uniform with no evidence of fiber orientation irregularities, interlaminar voids, porosity, resin rich or resin starved areas.

F. All pultruded structural shapes shall be further protected ultraviolet (UV) attack with:
   1. Integral UV inhibitors in the resin.
   2. A synthetic surfacing veil to help produce a resin rich surface.

G. The manufacturer shall certify that the stiffness of all molded FRP panels manufactured is never more than 2.5% below the published load-deflection values.

H. All FRP products shall have a tested flame spread rating of 25 or less per ASTM E84 Tunnel Test. Fire retardant gratings shall also have a tested burn time of less than 30 seconds and an extent of burn rate of less than or equal to 10 millimeters per ASTM D635.

I. All FRP products shall be integrally pigmented yellow. All wall and floor mounting brackets shall be gray.

J. All mechanical clips, fasteners and hardware shall be Type 316 stainless steel.

2.03 FRP PRODUCTS

A. Molded Grating
   1. Grating shall be of one-piece molded construction with tops and bottoms of bearing bars and cross bars in the same plane. Grating shall have a square mesh pattern providing bidirectional strength. Grating shall be reinforced with continuous rovings of equal number of layers in each direction. The top layer of reinforcement shall be no more than 1/8-inch below the top surface of the grating so as to provide maximum stiffness and prevent resin chipping of unreinforced surfaces. Percentage of glass shall not exceed 35% by weight so as to achieve maximum corrosion resistance, and as required to maintain the structural requirements of the contract.
2. Grating shall be manufactured with a concave, meniscus profile on the top of each bar.

3. Grating bar intersections are to be filleted to a minimum radius of 1/16” to eliminate local stress concentrations and the possibility of resin cracking at these locations.

4. The resin system used in the manufacture of the grating shall be Corvex. Manufacturer shall be required to submit corrosion data from tests performed on actual grating products in standard chemical environments.

5. Depth of grating shall be 2-inches with a tolerance of plus or minus 1/16”.

6. Mesh Configuration shall be 2-inch by 2-inch with a tolerance of plus or minus 1/16” mesh centerline to centerline.

7. Grating spans shall be determined based on manufacturer’s published load/deflection tables, not to exceed the allowable deflection at the design loads.

8. Grating may be cantilevered, as required, to a maximum of 6-inches, or as permitted by the manufacturer’s design. Cantilevered grating must be fastened to a minimum of two supports, with adequate fasteners to prevent overturning or failure of the grating.

9. Abutting edges of molded grating panels shall be supported by structural members or fastened together to prevent differential deflection. Spacing of fasteners shall be a maximum of 24 inches, or as recommended by the manufacturer.

10. In locations were grating is shown without handrails, the Contractor shall provide an FRP kickplate. Kick plate shall be 1/4-inch deep x 4-inches wide and fastened to the grating in accordance with the manufacturer’s recommendations.

11. Hold-down clips shall be provided and spaced at a maximum of four feet apart with a minimum of four per piece of grating, or as recommended by the manufacturer.

B. Structural Shapes

1. All structural shapes are to be manufactured by the pultrusion process with a glass content minimum of 45%, maximum of 55% by weight. The structural shapes shall be composed of fiberglass reinforcement and resin in qualities, quantities, properties, arrangements and dimensions as necessary to meet the design requirements and dimensions as shown and specified in the Contract Documents.

2. Fiberglass reinforcement shall be a combination of continuous roving, continuous strand mat bi-directional roving mat and surfacing veil in sufficient quantities as needed by the application and/or for the physical properties required.
3. Resins shall be fire retardant isophthalic polyester with chemical formulation necessary to provide the corrosion resistance, strength and other physical properties required.

4. All pultruded structural shapes shall be further protected from ultraviolet (UV) attack with:
   a. An integral UV inhibitor in the resin
   b. A synthetic surfacing veil to produce a resin rich surface
   c. An appropriate UV resistant coating for outdoor exposures

5. Pultruded structural shapes are to have the minimum longitudinal mechanical properties listed below:

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<th>ASTM Method</th>
<th>Value</th>
<th>Units</th>
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PART 3 - EXECUTION

3.01 FRP FABRICATION

A. General

1. All shop fabricated cuts, machined edges, holes, and notches shall be sealed with vinyl ester resin to provide maximum corrosion resistance. All field fabricated cuts shall be coated similarly by the Contractor in accordance with the manufacturer’s instructions.

B. Molded Grading

1. Grating shall meet the dimensional requirements and tolerances as shown and specified. The Contractor shall provide and verify measurements in field for work fabricated to fit field conditions as required by grating manufacturer to complete the work. Contractor shall determine correct size and locations of required holes or cutouts from field dimensions before fabrication,

2. Each grating section shall be readily removable, except where indicated on drawings. Manufacturer to provide openings and holes where located on the contract drawings. Grating openings which fit around protrusions (pipes, cables, machinery, etc.) shall be discontinuous at approximately the centerline of opening so each section of grating is readily removable.
C.  Structural Shape Fabrication

1.  Structural Shapes supplied shall meet the intended application as shown on the contract drawings and specified herein. The Contractor shall provide and verify measurements in field for work fabricated to fit field conditions as required by manufacturer to complete the work. Determine correct size and locations of required holes or coping from field dimensions before structural shape fabrication.

2.  Hardware: Type 316 stainless steel bolts and anchors shall be provided.

3.02  INSPECTION

A.  The County reserves the right to conduct a shop inspection at the County’s expense. The Contractor shall give the County two (2) weeks notice prior to the beginning of any fabrication work so that the inspection can be arranged, at the County’s discretion.

B.  The grating shall be free from visual defects such as foreign inclusions, delamination, blisters, resin burns, air bubbles and pits. The surface shall have a smooth finish (except for grit top surfaces).

3.03  INSTALLATION

A.  Contractor shall install FRP products in accordance with manufacturer’s assembly drawings. Fasten FRP products securely in place with fasteners as specified herein. Field cut and drill FRP products with carbide or diamond tipped bits and blades. Seal cut or drilled surfaces in accordance with manufacturer’s instructions.

END OF SECTION
SECTION 07311

ASPHALT SHINGLES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Asphalt shingles.
2. Underlayment.

1.02 SUBMITTALS

A. Product Data: For each type of product indicated.
B. Samples: For each exposed product and for each color and blend specified.
C. Product test reports.
D. Research/evaluation reports.
E. Maintenance data.
F. Warranties: Sample of special warranties.

1.03 QUALITY ASSURANCE

A. Fire-Resistance Characteristics: Where indicated, provide asphalt shingles and related roofing materials identical to those of assemblies tested for fire resistance per test method below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.

1. Exterior Fire-Test Exposure: Class A; ASTM E 108 or UL 790, for application and roof slopes indicated.

B. Pre-installation Conference: Conduct conference at Project site.

1.04 WARRANTY

A. Special Warranty: Standard form in which manufacturer agrees to repair or replace asphalt shingles that fail in materials or workmanship within specified warranty period.

1. Material Warranty Period: 30 years from date of Substantial Completion, prorated, with first five years nonprorated.
2. Algae-Discoloration Warranty Period: Asphalt shingles will not discolor five years from date of Substantial Completion.
PART 2 - PRODUCTS

2.01 GLASS-FIBER-REINFORCED ASPHALT SHINGLES


1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   b. CertainTeed Corporation.
   c. GAF Materials Corporation.
   d. IKO.
   e. Malarkey Roofing Products.
   f. Owens Corning.
   g. PABCO Roofing Products.
   h. TAMKO Roofing Products, Inc.

2. Tab Arrangement: Three tabs regularly spaced.

3. Cutout Shape: Square.


5. Strip Size: Manufacturer's standard.

6. Algae Resistance: Granules treated to resist algae discoloration.

7. Color and Blends: As selected by Owner from manufacturer's full range.

B. Hip and Ridge Shingles: Manufacturer's standard units to match asphalt shingles.

2.02 UNDERLAYMENT MATERIALS

A. Felt: ASTM D 226, Type I, asphalt-saturated organic felts, nonperforated.

B. Self-Adhering Sheet Underlayment, Granular Surfaced: ASTM D 1970, minimum of 55-mil (1.4-mm) thick sheet; glass-fiber-mat-reinforced, SBS-modified asphalt; mineral-granule surfaced; with release paper backing; cold applied.
PART 3 - EXECUTION

3.01 UNDERLAYMENT INSTALLATION

A. General: Comply with underlayment manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.

B. Single-Layer Felt Underlayment: Install on roof deck parallel with and starting at the eaves. Lap sides a minimum of 2 inches (50 mm) over underlying course. Lap ends a minimum of 4 inches (100 mm). Stagger end laps between succeeding courses at least 72 inches (1830 mm). Fasten with felt underlayment nails.

1. Install felt underlayment on roof deck not covered by self-adhering sheet underlayment. Lap sides of felt over self-adhering sheet underlayment not less than 3 inches (75 mm) in direction to shed water. Lap ends of felt not less than 6 inches (150 mm) over self-adhering sheet underlayment.

2. Install fasteners at no more than 36 inch (900 mm) o.c.

C. Self-Adhering Sheet Underlayment: Install, wrinkle free, on roof deck. Comply with low-temperature installation restrictions of underlayment manufacturer if applicable. Install at locations indicated below, lapped in direction to shed water. Lap sides not less than 3-1/2 inches (89 mm). Lap ends not less than 6 inches (150 mm) staggered 24 inches (600 mm) between courses. Roll laps with roller. Cover underlayment within seven days.
3.02 ASPHALT SHINGLE INSTALLATION


B. Install starter strip along lowest roof edge, consisting of an asphalt shingle strip with tabs removed at least 7 inches (175 mm) wide (or manufacturer’s starter strip) with self-sealing strip face up at roof edge.

1. Extend asphalt shingles 1/2 inch (13 mm) over fasciae at eaves and rakes.
2. Install starter strip along rake edge.

C. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.

D. Fasten asphalt shingle strips with a minimum of four roofing nails located according to manufacturer's written instructions.

1. Where roof slope is less than 4:12, seal asphalt shingles with asphalt roofing cement spots.
2. When ambient temperature during installation is below 50 deg F (10 deg C), seal asphalt shingles with asphalt roofing cement spots.

E. Ridge Cap Shingles: Maintain same exposure of cap shingles as roofing shingle exposure. Lap cap shingles at ridges to shed water away from direction of prevailing winds. Fasten with roofing nails of sufficient length to penetrate sheathing.

END OF SECTION
SECTION 07320

ROOFING TRIM AND DRAINAGE

PART 1 - GENERAL

1.01 SUMMARY

A. The work of this section includes the requirements to furnish the materials, equipment, labor, and quality control (QC) necessary to integrate the work into the total building system. The installation of Roofing Trim and Drainage includes, but is not limited to,

1. Aluminum fascia, soffit, gutter, downspout, and other related materials necessary for a complete trim and drainage systems for the existing roofing system.

1.02 REFERENCES

A. ASTM B209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate

1.03 SUBMITTALS

A. Product Data: For each type of product indicated.

1. Color samples for fascia, gutter, downspouts and soffit for selection by the Owner and Engineer. Include descriptive literature for all components indicating conformance with the specifications.

2. Include preparation instructions and recommendations, and installation methods.

B. Shop Drawings: Provide plans, elevations, and section cut details of fascia, and soffit layout with details of installation. Provide plans, elevations, attachment and section cut details of gutters and downspouts. Include preparation instructions and recommendations, and installation methods.

1.04 QUALITY ASSURANCE

A. Facia, soffits, gutters and downspouts shall be fabricated in accordance with Industry Standards and the following references for proper design and installation of architectural sheet metal:

1. SMACNA “Architectural Sheet Metal Manual”.

1.05 DELIVERY STORAGE AND HANDLING

A. Deliver materials to the site the manufacturer’s unopened bundles and containers with the manufacturer’s brand name and product description marked clearly thereon. Keep materials dry, covered completely, and protected from the weather. Store according to the manufacturer’s written instructions.
B. Store rolled goods on end.

1.06 WARRANTY

A. Soffit, Fascia, gutters and downspouts shall be guaranteed to remain free of leaks and defects for a period of two (2) years from the date of Substantial Completion.

B. Special Warranty on Aluminum Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period. Usually retain "Exposed Panel Finish" Subparagraph below for fluoropolymer or siliconized-polyester finishes; verify availability with manufacturer.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
   a. Color fading more than 5 Delta E units when tested according to ASTM D2244.
   b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
   c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Subject to compliance with requirements, facia, soffits, gutters, and downspouts shall be manufactured by Petersen Metals, Merchant and Evans, Inc., Southern Aluminum Finishing Co., or approved equal.

2.02 ALUMINUM FASCIA

A. Fascia Covers: Depth to match existing wood fascia, matte finish sheets, with an average thickness of 0.040-inches. Attach to existing wood fascia using Adhesive on the back and non-corrosive (stainless steel or galvanized) fasteners. No fasteners shall be left exposed to view.

B. Aluminum Fascia and Components: Provide products made of formed aluminum as specified in this section and manufactured to comply with requirements of ASTM B209.

C. Finish: 70% KYNAR 500 PVDF resin. Color shall be selected by the Owner or Engineer from the manufacturer’s standard range of colors.

2.03 ALUMINUM SOFFIT

A. Aluminum soffit shall be 4-inch center vented, matte finish, with an average thickness of 0.040-inches.
B. Aluminum soffit shall have an 8-inch exposure with single nailing hem, 1-inch height, 1.95 square inches of ventilation per square foot, and a maximum warp of 0.25-inches per two panels.

C. Aluminum Soffit and Components: Provide products made of formed aluminum as specified in this section and manufactured to comply with requirements of ASTM B209.

D. Finish: 70% KYNAR 500 PVDF resin. Color shall be selected by the Owner or Engineer from the manufacturer’s standard range of colors.

2.04 GUTTERS

A. Gutter Section: 0.063-inch formed aluminum, 5-inches wide unless indicated otherwise. Provide slotted anchorage holes.

B. Spacers: 0.063-inch formed aluminum, 1-inch wide, spaced at 30-inches on centers unless indicated otherwise, alternate with gutter brackets.

C. Brackets: 0.25-inch formed aluminum, 1-inch wide, spaced at 30-inches on centers unless indicated otherwise, alternate with gutter spacers.

D. Joint Splice: 0.063-inch formed aluminum, 5-inches wide, spaced at 10-feet on centers maximum. Splice contour shall match gutter section.

E. Expansion Joints: 0.063-inch formed aluminum, 6-inch wide top cover, bottom cover and caps. Provide concealed 2-inch expansion space between end caps. Expansion joint shall match profile of gutter section.

F. Finish: 70% KYNAR 500 PVDF resin. Color shall be selected by the Owner or Engineer from the manufacturer’s standard range of colors.

2.05 DOWNSPOUTS

A. Starters: 0.063”-inch formed aluminum.

B. Downspouts: 0.063”-inch formed aluminum, 3-inches by 4-inches unless indicated otherwise.

C. Offset Brackets: 0.125-inch formed aluminum, 2-inches wide fasteners shall be stainless steel screws with washers set into lead shields. Anchor holes shall be drilled into masonry walls.

D. Elbows and Transitions: 0.063” -inch formed aluminum, all welded joints, fabricate to match approved shop drawings, custom assemble to match field conditions.

E. Finish: 70% KYNAR 500 PVDF resin. Color shall be selected by the Owner or Engineer from the manufacturer’s standard range of colors.

F. Provide 12-inch x 24-inch precast concrete splash block at base of all downspouts.
2.06 ACCESSORIES

A. All accessories including installation components, corner lineal, corner systems, and decorative moldings shall be compatible with fascia and soffit system furnished, and shall be by, or recommended for use with this system by, the fascia and soffit manufacturer.

B. Corners: Provide mitered and welded comers to match custom gutter sections. Corner legs to be approximately 4-feet long.

C. Anchorage Holes: Provide slotted anchorage holes for connection of gutter to fascia sections to wood nailers. Align anchorage holes of gutter and fascia sections so that gutter is installed only through slotted anchorage holes in the fascia sections.

2.07 FASTENERS

A. Provide galvanized or other corrosion-resistant nails as recommended by manufacturer of soffit products.

PART 3 - EXECUTION

3.01 PREPARATION

A. Examine, clean, and repair as necessary any substrate conditions which would be detrimental to proper installation.

B. Do not begin installation until unacceptable conditions have been corrected.

3.02 INSTALLATION

A. Install fascia, gutters and downspouts in accordance with the Industry Standards referenced, manufacturer’s published instructions, and recommendations, and approved shop drawings.

B. Install fascia, soffit panels, and downspouts straight, level and plumb. Slope gutters to downspout at 1/16” per foot.

C. Align slotted anchorage holes in gutter and fascia. Fasten linear components through slotted anchorage holes in a manner to allow normal expansion/contraction to occur without distortion of the materials.

D. Install in a secure, watertight manner with anchorage which allows adequate expansion and contraction movements of all fascia and gutter sections so that no “oil canning” or other distortions of the metal work occurs.

E. Remove and replace any sections which are warped, twisted, cramped, scraped, dented, or otherwise distorted in any manner.

F. Install soffit in accordance with the latest printed instructions of the manufacturer.

G. Nail soffit panels by placing nail in center of slot. Drive nails straight, leaving 1/16 inch space between nail head and flange of panel.
3.03 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products as necessary or as directed by the owner and engineer.

3.04 CLEANING

A. At completion of work, remove debris caused by installation from project site.

END OF SECTION
SECTION 07900

SEALANTS AND CAULKING

PART 1 - GENERAL

1.01 DESCRIPTION

A. This Section includes requirements for providing sealant, caulking, and related accessories to weather seal and fill joints in accordance with the Contract Documents.

1.02 SUBMITTALS

A. Submit the following information in accordance with the General Conditions:

1. Manufacturer’s descriptive product data and certification of compliance with referenced specification.

2. Manufacturer’s detailed description for handling, recommendation on intended use and installation recommendations.

B. Submit samples in accordance with the General Conditions for the following:

1. One cartridge of each type of sealant and caulking compound.

2. One pint of each primer.

3. One linear foot of backup material.

4. One linear foot of compression seal.

5. One cartridge of expansion joint material.

C. Submit full range of manufacturer’s colors of each sealant and caulking compound to be used for selection by the County.

1.03 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer’s original unopened containers with labels intact along with referenced specification number, type and class as applicable.

B. Handle and store product in accordance with manufacturer’s recommendations.

C. Maintain sealant and caulking at a temperature of at least 70 degrees F for a period of not less than 24 hours prior to installation.
1.04 JOB CONDITIONS

A. Environmental Requirements
   1. Unless otherwise recommended by the manufacturer, do not apply sealant and caulking when temperature is below 40 degrees F and when there is ice, frost or dampness visible on surfaces to be sealed.

B. Safety Requirements
   1. Avoid contact with skin. Wear protective clothing, goggles, gloves and/or barrier creams. Avoid breathing vapors in confined areas.

PART 2 – MATERIALS

2.01 GENERAL
   A. Sealant, caulking, primers and accessories shall be the non-staining type and of a color specified or selected by the County from the Manufacturer’s standard color chart.

2.02 CAULKING
   A. Caulking shall be a one-component gun grade butyl-rubber system, such as Butyl-Flex as manufactured by DAP, Inc., Dayton, Ohio or approved equal. Coordinate colors with adjacent work.

2.03 SEALANTS
   A. Sealant shall be a two-component base system. Sealant shall be FX-572/573 Polymeric Joint Sealant conforming to NBS and GSA TT-S-0227E (1970) Polymeric as manufactured by Fox Industries, Baltimore, Maryland, or approved equal.

2.04 PRIMERS AND ACCESSORIES
   A. Primers, where applicable, shall be in accordance with sealant manufacturer’s recommendations.
   B. Provide backup materials, fillers and joint packing compatible with sealant and primer.
      1. Use back-up material to control caulking depth as recommended by the sealant manufacturer.
      2. Unless otherwise specified use closed-cell tube or rope shaped stock expanded polyethylene or polyurethane foam.
      3. The width or diameter of backup material shall be 1-1/3 to 1-1/2 time the width of the joint.
      4. Use semi-rigid vinyl or polyethylene foam, solid neoprene rod or similar approved backing for joints subject to horizontal traffic or puncture.
      5. Do not use bituminous or oily product as a backup material.
PART 3 – EXECUTION

3.01 PREPARATION

A. Inspect joint surfaces before starting work. Verify surfaces are dry and meet sealant manufacturer’s requirements.

B. Clean joint surfaces immediately before installation of gaskets and sealant. Remove dirt, moisture, frost, coatings and other foreign substances that will interfere with performance of compression seal and sealant.

C. Etch concrete and masonry joint surfaces as recommended by sealant manufacturer.

D. Prime or seal joint surfaces as recommended by the sealant manufacturer and as shown.

E. Confine primer or sealer to areas of the compression seal and sealant bond area.

3.02 APPLICATION

A. General

1. Install material in accordance with manufacturer’s recommendations for materials intended use and instructions using appropriate and approved equipment, except where more stringent requirements are shown or specified.

2. Prevent sealant and compounds from spilling onto adjoining surfaces or to migrate into voids of exposed finishes by using masking tape or other methods. Clean spill on adjoining surfaces immediately.

B. Sealant and Accessories

1. Sealant shall be used on slab and wall control and expansion joints, pipe sleeves through walls and roofs, and on joints and cracks.

2. Install backup material to control caulkling depth in accordance with sealant manufacturer’s instructions.

3. Place sealant in a manner that will fill the joint without air pockets and form a smooth surface. For exposed surfaces of gun and knife grade sealant that cannot be made smooth during initial application, smooth with tool moistened with either water or sealant solvent.

4. Prepare sealant mixtures in quantities that can be applied within the time period recommended by the manufacturer. Materials mixed and not used within this time period shall be discarded.

5. Finish joint to a smooth concave surface slightly lower than adjoining surfaces except horizontal surfaces shall have joints finished so moisture and debris will not be entrapped. Finished surface shall be free of wrinkles and sags.
3.03 CAULKING

A. Caulking compound shall be used for caulking of interior and exterior doors, windows, louvers, frames, and elsewhere as necessary and shall be applied in accordance with the manufacturer’s recommendations.

3.04 CURING AND PROTECTION

A. Cure joint sealers and accessories in accordance with manufacturer’s instructions.

B. Protect joint sealers during construction period to prevent damage, soiling or deterioration other than normal wear and weathering up to time of final acceptance. Replace or restore joint sealers damaged, soiled or deteriorated, as directed.

3.05 CLEANUP

A. Clean adjacent surfaces of sealant and soiling resulting from the joint sealer operations. Use cleaning materials and methods recommended by manufacturer for the different surfaces.

END OF SECTION
SECTION 08220

FIBERGLASS REINFORCED PLASTIC (FRP) DOORS

PART 1 - GENERAL

1.01 SUMMARY

A. Work performed under this section includes, but is not limited to, furnishing all labor, tools, materials and services necessary to furnish and install Fiberglass Reinforced Plastic (FRP) doors as shown on the drawings and specified herein.

B. The doors shall be furnished complete with fiberglass resin transfer molded door frames.

1.02 SUBMITTALS

A. Shop Drawings: Submit detailed fabrication and installation drawings prior to fabrication. Include door type, frame type, size, handing, accessories and hardware. Include front and rear door elevations showing hardware, bill of materials and dimensional locations of each hardware item and FRP part or product. Provide construction and mounting detail for each frame type.

B. Product Data: Submit manufacturer’s product data for all materials in this specification. Include a statement acknowledging that the products submitted meet the requirements of specifications and referenced standards. Include certificates of compliance, manufacturer’s installation instructions, details of core and edge construction, and certification of manufacturer’s qualifications.

C. Prior to submission, the Contractor and Door Manufacturer shall coordinate with the City and the City’s Security Contractor to ensure that the provided doors and lock system maintain full functionality of the City’s current key card electronic access system. Upon submission, the Contractor and manufacturer shall certify that the provided submittal includes the coordinated requirements of the City’s Security Contractor.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications: Fabrication shall be by a firm experienced in the manufacturing of FRP doors similar to those indicated for this project and with a record of 25-years of documented experience and successful in-service performance.

B. Source Limitations: FRP doors and frames shall be obtained from one source, and fabricated by a single manufacturer. Hardware and accessories shall be installed by the FRP door and frame manufacturer.

1.04 DELIVERY, STORAGE AND HANDLING

A. Doors and frames shall be delivered individually crated for protection from damage in the manufacturer’s original containers, and clearly marked with the project information. Each crate shall contain all fasteners necessary for installation as well as complete installation instructions.
1.05 WARRANTY

A. Warranty FRP doors and frames for a period of 25-years against corrosion. Additionally, warranty FRP doors and frames against defects in materials and workmanship for a period of 10-years, including warp, separation or delamination, and expansion of the core.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements, manufacturers that may be used include:

1. Chem-Pruf Door Co., Ltd., Brownsville, Texas,

2. or approved equal.

2.02 FRP DOORS

A. Door Slabs: Fiberglass reinforced plastic (FRP) construction using resins tailored to a high humidity, corrosive environment and shall have a fiberglass content of 25-percent by weight. The doors shall be flush construction, having no seams or cracks. All mortises shall be molded in at the factory. The doors shall be 1-3/4 inches thick with a 25-mil color gelcoat and have an R-factor of 10 or greater. Secondary painting over pultrusions to achieve color is not acceptable. Adequate reinforcing and compression members shall be used to accommodate surface hinges, closers, locksets, kickplates, etc.

B. Door Plates: 1/8-inch thick, molded in one continuous piece, starting with a 25-mil color gelcoat of the color specified, integrally molded with at least two layers of 1.5-ounce per square foot fiberglass mat and one layer of 16-ounce per square yard unidirectional roving to yield a plate weight of 0.97 lbs per square foot at a ratio of 30/70 glass to resin.

C. Internal Stiles and Rails: The stile and rail shall be molded in one continuous piece to a U-shaped configuration and to the exact dimensions of the door, with no miter joints or disparate materials used. Hollow pultruded shapes shall not be used.

D. Core: 2 psf expanded polyisocyanurate foam, which completely fills all voids between door plates.

E. Internal Reinforcement: shall be firestop of sufficient amount to adequately support required hardware and function of same.

F. Finish: Door and frame shall be gray in color and have identical texture. At time of manufacture, 25-mil of resin-rich gelcoat shall be integrally molded into both door and frame. Secondary painting to achieve color is not acceptable.
G. Fire Rating: Door assembly shall have a 1-1/2 hour fire rating

2.03 FRP DOOR ACCESSORIES

A. Windows: Window openings in door slabs shall be provided for at time of manufacture and shall be completely sealed so that the interior of the door is not exposed to the environment. Fiberglass retainers, which hold the glazing in place, shall be resin transfer molded with a profile that drains away from glazing. The retainers must match the color finish of the door plates. Glass shall be furnished and installed by door and frame manufacturer. At time of manufacture, 25 mil of resin-rich gelcoat must be integrally molded into the window and window retainer.

B. Louvers: Louver openings shall be completely sealed so that the interior of the door slab is not exposed to the environment. Louvers are to be solid fiberglass inverted “V” vanes and shall match the color, texture, and finish of the door plates. At time of manufacture, 25 mil of resin-rich gelcoat must be integrally molded into louver and louver retainer.

C. Transoms: Transoms shall be identical to the door slab in construction, materials, thickness and reinforcement, and shall be removable. Transom shall include lifting handles capable of supporting the transom weight.

D. Cutout: Standard cutout for door penetrations shall be bound with a neoprene keeper made from FRP astragal. Neoprene shall be cut in the field to fit exactly around the I-beam with a maximum clearance of 1/8-inch.

E. Threshold: Fiberglass grooved saddle ½-inch threshold, 5-inches wide, color molded in to match doors with stainless steel fasteners, Chem-Pruf FRP Threshold, or approved equal.

F. Weatherstrip: Self-adhesive, high-grade silicone V-strip door gasket/weatherstrip, Pemko, or approved equal.

G. Astragals: Molded fiberglass 2-1/2-inch wide astragal with seal, color molded in to match doors and stainless steel screws, Chem-Pruf FRP Astragal, or approved equal.

H. Door Sweep: Molded fiberglass with neoprene wiper, color molded in to match doors and stainless steel screws, Chem-Pruf FRP Door Sweep w/Neoprene, or approved equal.

2.04 FRAMES

A. Frames: Fiberglass are manufactured using resin transfer method in closed rigid molds to assure uniformity in color and size. Beginning with a minimum 25-mil gelcoat and a minimum of two layers continuous strand fiberglass mat saturated with resin. The frame shall be solid flat back of one-piece construction with molded stop. All frame profiles up to ¼-inch shall be solid fiberglass. All frame profiles between ¼ to ¾ inch shall be of one-piece with neither solid nor foam filled profiles. All frame profiles greater than ¾ inch shall have a core material of 2 psf polyisocyanurate foam. Metal frames or pultruded fiberglass frames are not acceptable.

B. Finish: Door and frame shall be identical in color and texture. At time of manufacture, 25-mil of resin-rich gelcoat shall be integrally molded into both door and frame. Secondary painting to achieve color is not acceptable.
C. Jamb/Header: Connection shall be CNC machined for a tight mitered fit.

D. Internal Reinforcement: Continuous within the structure to allow for mounting of specified hardware. Material shall be completely non-organic with a minimum hinge screw holding value of 656 lbs. Frame screw holding value to accommodate screw shall be a minimum of 1,000 lbs. per screw.

E. Mortises: Mortises for hardware shall be accurately machined by CNC to facilitate heavy duty hinges at all hinge locations, using spacers when standard weight hinges are used.

2.05 HARDWARE

A. General: All hardware shall be stainless steel unless otherwise noted, and furnished and installed by the door and frame manufacturer.

B. The Contractor and Door Manufacturer shall coordinate the provided locks, doors, and door frames with the City and the City’s Security Contractor to ensure that the provided doors and lock system maintain full functionality of the City’s current key card electronic access system.

C. Locks:

1. Entrance: Locksets shall be suitable for receiving standard Baltimore City cylinders, and shall be keyed to the Baltimore City lock System. Lockset shall be Corbin Russwin ML 2051 LWA, US32D, or approved equal.

   a. Contractor shall coordinate locks and keying with Baltimore City.

   b. Provide six (6) keys for each lock.

2. Privacy: Locksets shall be suitable for bathroom applications and shall contain deadbolt by thumb turn lever inside or by emergency release tool outside. Lockset shall be Corbin Russwin ML 2030 LWA, US32D, or approved equal.

3. Panic Device: Panic listed mortise exit device and lockset trim shall be suitable for receiving standard Baltimore City cylinders, and shall be keyed for Baltimore City lock system. Panic listed rim exit device and lockset trim shall be Corbin Russwin ED5600 L955, US32D, or approved equal.

   a. Contractor shall coordinate locks and keying with Baltimore City.

   b. Provide six (6) keys for each lock.

D. Hinges: Full mortise, standard weight, ball bearing hinges with non-removable stainless steel pins.

E. Closer: Corrosion resistant aluminum, size as recommended by the door manufacturer, with sweep speed, latch speed, backcheck cushioning and backcheck positioning, Norton Series 7500, or approved equal.
F. Bolts:
   1. Zinc-plated steel surface bolt and strike equipped with a strong hard-drawn wire spring, which throws the bolt automatically when chain is released, Stanley 1055 Chain Bolt, or approved equal, with extra chain as indicated.
   2. 304 stainless steel barrel bolt and stop, Chem-Pruf BBS 1, or approved equal.

G. Kickplate: 304 stainless steel, Trimco Model 1034, or approved equal.

H. Door Stops: Where possible, provide wall-mounted type bumpers. Where wall bumper is not practical, provide floor mounted dome stop.

I. Push/Pulls: 304 stainless steel, Trimco Models 1001 and 1017, or approved equal.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Any work related to the doors shall be coordinated with William Dove prior to demolition. Contractor shall inform and coordinate with William Dove in writing to ensure all required provisions are made regarding the existing security system to ensure a complete installation. William Dove is available at (410) 396-0360.

B. Install door-opening assemblies in accordance with shop drawings and manufacturer’s written installation instructions, using installation methods and materials specified in installation instructions.

C. Field alteration of doors or frames to accommodate field conditions is prohibited.

D. Maintain plumb and level tolerances specified in manufacturer’s printed installation instructions.

3.02 ADJUSTING

A. Adjust doors in accordance with door manufacturer’s maintenance instructions to swing open and shut without binding and to remain in place at any angle without being moved by gravitational influence.

B. Adjust door hardware to operate correctly in accordance with hardware manufacturer’s maintenance instructions.

3.03 CLEANING

A. Clean surfaces of door opening assemblies and exposed door hardware in accordance with respective manufacturer’s maintenance instructions.

END OF SECTION
SECTION 08310

ACCESS HATCH

PART 1 - GENERAL

1.01 SUMMARY

A. Contractor shall provide all materials, labor, equipment, and services necessary to furnish and install factory-fabricated access hatches as shown on the Contract Drawings and specified herein.

B. Access hatches installed within existing floors and slabs shall be furnished with a retrofit angle frame. The retrofit frame shall have side mounting holes to allow the frame to be fastened from within the access opening.

C. The access hatch shall be constructed of aluminum, and shall be non-corrosive, durable and structurally sound.

D. All hatches shall be installed so that they are flush to the finished slab.

1.02 SUBMITTALS

A. Shop Drawings: Submit detailed fabrication and installation drawings prior to fabrication. Show profiles, accessories, locations, and dimensions.

B. Product Data: Submit manufacturer’s product data for all materials in this specification.

C. Warranty: Submit manufacturer’s written warranty.

1.03 QUALITY ASSURANCE

A. Fabricator Qualifications: Fabrication shall be by a firm experienced in the manufacturing of access hatches similar to the hatches indicated for this project and with a record of successful in-service performance.


1.04 DELIVERY, STORAGE AND HANDLING

A. All materials shall be delivered to the job site in manufacturer’s original packaging.

B. Store materials in a dry, protected, well-ventilated area. The Contractor shall thoroughly inspect product upon receipt and report damaged material immediately to delivering carrier and note such damage on the carrier’s freight bill of lading.

C. Remove protective wrapping immediately after installation.
1.05 JOB CONDITIONS

A. Mounting surfaces shall be straight and secure; substrates shall be of proper width.

B. Refer to the contract documents, shop drawings, and manufacturer’s installation instructions.

C. Observe all applicable OSHA safety guidelines for this work.

1.06 WARRANTY

A. Access hatches shall be free of defects in material and workmanship for a period of ten (10) years from the date of final acceptance. Should a part or material fail to function in normal use within this period, manufacturer shall furnish a new part at no charge.

PART 2 – PRODUCTS

2.01. H2O ACCESS HATCH

A. The access hatch shall be pre-assembled from the manufacturer, suitable for installation within existing concrete, and installed with the access hatch size and hinge locations as shown on the contract drawings. The access hatch shall be Model THS for single leaf hatches as manufactured by U.S.F. Fabrication, Inc., or approved equal.

B. Hatch Panel: The cover of the hatch panel shall be ¼-inch thick aluminum diamond plate, reinforced to withstand AASHTO H20-44 wheel load. The hatch panel shall open to 90 degrees, be equipped with a flush lifting handle that does not protrude above the cover, and a 316 stainless steel hold open arm with a vinyl grip that automatically keeps the panel in its upright open position. The door shall be equipped with a watertight 316 stainless steel slamlock with threaded plug, removable outside key, and fixed inside handle. The slamlock shall latch onto a 316 stainless steel striker plate that is bolted to the frame.

C. Frame: The trough frame shall be minimum ¼-inch extruded aluminum trough section with an integral anchor flange around the entire perimeter of the frame. The frame shall include an EPDM odor reduction gasket and a 1-½ inch threaded drain coupling. Frame shall be designed to be drainable. Unless noted otherwise, The Contractor shall provide Schedule 80 PVC pipe drains for all trough type drain hatches serving over dry spaces below. Piping shall be piped out of the way of the hatch free opening to the nearest drain and shall not interfere with any other equipment.

D. Hinges: The door shall have 316 stainless steel hinges with 316 stainless steel tamper resistant bolts/locknuts.

E. Lifting Mechanisms: Manufacturer shall provide the required number and size of enclosed spring operators to provide smooth easy and controlled cover operation throughout the entire arc of opening and to act as a check in retarding downward motion of the cover when closing. Spring and spring enclosures shall be stainless steel. Operation of cover shall not be affected by temperature.
F. Locking: Door shall be equipped with a 316 stainless steel slamlock with threaded plug, removable outside key and fixed inside handle. Additionally, a flush-type recessed padlock capable of accepting the City standard padlock shall be provided on all hatches.

G. Hardware: All hardware shall be Type 316 stainless steel throughout.

PART 3 – EXECUTION

3.01 INSPECTION

A. Verify that the substrate is suitable, dry, clean and free of foreign matter. Correct any defects prior to installation.

3.02 INSTALLATION

A. The Contractor shall field verify dimensions and project conditions, and verify the manufacturer’s access hatch details for accuracy to fit the application prior to fabrication. The Contractor shall comply with the access hatch manufacturer’s installation instructions.

B. The Contractor shall furnish mechanical fasteners, as necessary, in accordance with the access hatch manufacturer’s instructions.

C. The access hatch shall be installed so that the hinges are as shown on the contract drawings.

END OF SECTION
SECTION 09800

GENERAL SPECIFICATIONS FOR COATING SYSTEMS

PART 1-GENERAL

1.01 SECTION INCLUDES

A. General specifications for coating systems for steel storage tanks.

1.02 REFERENCES

A. SSPC: The Society for Protective Coatings (SSPC) [formerly Steel Structures Painting Council]


2. "Visual Standard for Abrasive Blast Cleaned Steel" SSPC-VIS 1-02.


6. "Mineral and Slag Abrasives" SSPC-AB 1


8. "Newly Manufactured or Re-Manufactured Steel Abrasives" SSPC-AB 3


10. "Measurement of Dry Paint Thickness with Magnetic Gages" SSPC-PA 2


12. SSPC-SP 12, Surface Preparation and Cleaning of Steel and Other Hard Materials by High- and Ultrahigh-Pressure Water Jetting Prior to Recoating

13. SSPC-SP 13, Surface Preparation of Concrete

14. SSPC-SP 14, Industrial Blast Cleaning
15. SSPC-SP 15, Commercial Grade Power Tool Cleaning

B. American Water Works Association (AWWA) Standards
   1. D100-11, Standard for Welded Steel Tanks for Water Storage.
   2. D102-14, Standard for Painting Steel Water-Storage Tanks

C. NSF International (NSF) Standard *(formerly National Sanitation Foundation)*

D. The paint manufacturer's published product data shall be adhered to unless changed in writing by the home office of the manufacturer.

E. Where the foregoing standards, recommendations, and specifications are conflicting, said conflicts shall be brought to the attention of the ENGINEER.

1.03 QUALITY ASSURANCE

A. Personnel: The CONTRACTOR shall have a full complement of personnel, for the proper coordination and expeditious of the Work, on a daily basis until the Work is completed.

B. Quality of Paint Application: All cleaning and painting shall be done in a workmanlike manner. Curing times and ventilation requirements of the paint manufacturer shall be strictly adhered to by the CONTRACTOR.

C. Ventilation: Forced ventilation shall be supplied to the interior of the tank (or a period of time equal to the paint manufacturer's recommended recoat times and for a continuous period of at least 48 hours after the final coat has been applied. Adequate ventilation of the container bottom, riser, and other low lying areas of the tank and container shall be provided by the CONTRACTOR as required for solvent release and coating cure. This ventilation shall, at a minimum, be in accordance with AWWA D102 and shall be submitted for review. The CONTRACTOR shall furnish, install, and operate the equipment that is necessary to provide forced ventilation to aid curing. If supplementary heating or dehumidification is required to effect curing, the CONTRACTOR shall furnish, install, and operate the equipment to perform the supplementary heating or dehumidification required at no additional cost to the OWNER.

D. Inlet/Outlet Piping and Overflow Piping: The CONTRACTOR shall be responsible for assuring that no foreign material including, but not limited to paint, abrasive, rags, or tools enter the inlet/outlet piping or overflow piping during the prosecution of the work. Any material found in this piping at the time the tank is placed back into service shall be removed at the expense of the CONTRACTOR. To aid in preventing the entrance of foreign material, the CONTRACTOR shall drain the pipe and either tack weld a plate over the inlet/outlet pipe or place an expandable plug in the pipe. If a plate is tack welded over the pipe, any water in the pipe shall be drained and the plate shall completely cover the pipe and shall not be removed until the interior and exterior painting is complete. After the plate is removed the damaged areas of coating and weld
burrs shall be ground smooth and recoated in accordance with the applicable paragraphs in these specifications. If an expandable plug is inserted in the pipe, the plug shall be placed approximately 18 in. down in the pipe to allow the proper coating of the inlet/outlet pipe. The inlet/outlet pipe interior shall be cleaned and painted approximately 1 pipe diameter below the top of the pipe.

E. Diesel Powered Equipment: Due to possible contamination of the surfaces to be painted, diesel powered equipment shall not be used inside the tank.

F. Recoat Cycle: The CONTRACTOR shall review the manufacturer's published product data for minimum and maximum recoat times for all the coating systems selected for use. No succeeding coat shall be applied prior to the minimum recoat time of the preceding coat. If the maximum recoat window is exceeded prior to application of the succeeding coat, then the CONTRACTOR shall prepare the surfaces in accordance with the manufacturer's published product data prior to the application of the next coat. The cost for this additional surface preparation shall be borne by the CONTRACTOR with no additional cost to the OWNER. The Contract Time shall not be increased as a result of this additional surface preparation.

G. Minimum Temperature of Coatings to be Mixed: Each component shall be maintained at a minimum of 75°F prior to mixing. The mixed coatings shall also be maintained at a minimum of 65°F during application. All costs associated with keeping the coating material at the minimum specified temperature shall be included in the Base Bid.

H. Mixing of Coatings: Each component shall be thoroughly mixed on-site with a power agitator to ensure no solids or settled material remains on the bottom of the container before combining the components together. Accurate measuring apparatus shall be used to carefully measure each component by volume into a clean container in accordance with the manufacturer's published product data. The container shall be large enough to hold all components to be mixed, including thinner. The combined material shall be thoroughly mixed with a power agitator to achieve a uniform consistency. Adherence to proper induction times for the combined coating material in accordance with the manufacturer's published product data shall be accomplished by - the CONTRACTOR. No coating shall be applied until the minimum induction time has been reached. Zinc coatings shall be constantly power agitated during mixing and application to prevent the zinc dust or other heavy pigments from settling.

I. Application and Damages: The materials shall be applied in accordance with the manufacturer's published product data and such that the end results are in compliance with these specifications (including all others inferred by reference). However, the CONTRACTOR is advised to consult the manufacturer's published product data concerning the length of hose and difference in elevation of the pump and spray gun when applying a zinc coating. Application equipment (including air and airless sprayers, rollers and brushes) shall be good quality, in good condition and shall be as recommended by the coating manufacturer. Techniques shall be used which will not cause coating droplets, etc. to travel more than 30 ft from the base of the tank. Painting of exterior surfaces shall be performed only when the wind velocity and direction, and temperature and humidity are such that paint damage will not occur to real estate or personal property. Prior to the cleaning or coating of any surface, the CONTRACTOR shall present a written plan for review by the PROJECT REPRESENTATIVE and the ENGINEER concerning how abrasive and/or paint
damage to automobiles and property will be handled, including a process for quick
removal of the abrasive or paint, and who will do the Work. This approval in no way
shall relieve the CONTRACTOR from the responsibility of settling claims for damage
but is intended as an avenue to expedite and minimize said claims.

J. Drying times and ventilation requirements of the manufacturer shall be strictly adhered
to by the CONTRACTOR.

1.04 SEQUENCING AND SCHEDULING

A. Work Schedule: See Division 1- General Requirements.

B. Cleaning Areas of Welding and/or Grinding: See Division 1- General Requirements.

1.05 SUBMITTALS

A. Submit sets to the ENGINEER in accordance with Section 01300 - Submittals

1. Product Data:

a. Written description and catalog cuts describing each type of proposed
abrasive for the interior and exterior surfaces. Include technical data
sheets to substantiate compliance with specifications. The grade and
resulting profile of the abrasive shall also be submitted prior to any
cleaning operations. A letter from the coating manufacturer certifying
that the resulting profile of the abrasive is acceptable for their coating
product shall be submitted.

b. Written description and catalog cuts describing each coating in the
system. Information shall include: product delivery, storage, handling,
application and curing instructions and limitations. Include technical
data sheets to substantiate compliance with specifications.

c. Written description and catalog cuts describing each thinner proposed
for use with each coating system. Also include thinner or solvent
proposed for use in cleaning paint equipment. Include technical data
sheets to substantiate compliance with specifications.

d. Written description and catalog cuts describing the proposed
underwater curing epoxy paint for the interior surfaces at the First
Anniversary Inspection. Include technical data sheets to substantiate
compliance with specifications.

2. Certification:

a. Provide certification signed by supplier of the coating attesting that
coating system proposed meets the specifications.
b. Provide certification from the manufacturer certifying that all coatings, including the final cure zinc coating, will not contain more than 0.025% by weight of lead (or any lead compounds) in the cured coating for each coat applied. Certification shall be submitted for review.

3. **Cleanup Procedures:** Prior to the field cleaning or painting of any surface, the CONTRACTOR shall present a written plan to the OWNER and ENGINEER concerning how paint and/or abrasive damage to automobiles and property will be handled, including a process for quick removal of the paint or abrasive, and who will do the work. This approval in no way shall relieve the CONTRACTOR from the responsibility of settling claims for damage but is intended as an avenue to expedite and minimize said claims.

4. **Containment Procedures:** A brief description and/or sketch of the proposed method for containing the cleaning debris and/or paint overspray/droplets shall be submitted with the Bid. Prior to the field cleaning or painting of any surface, the CONTRACTOR shall present a written plan to the OWNER and ENGINEER for review concerning how spent cleaning debris and/or paint overspray or droplets will be confined to the tank site. Reasonable care shall be exercised by the CONTRACTOR to prevent damage, nuisance, or hazardous conditions to adjacent or nearby property owners. **Any containment system attachments to the tank and tower shall be designed by a Professional Engineer registered in the State of Maryland not to impose excessive loading or permanent deformations on the tank, tower, and tank appurtenances. The CONTRACTOR shall submit the P.E. designed, stamped, and signed details of any containment system attachment details for review prior to installation of a containment system on the tank.**

### 1.06 DELIVERY, STORAGE, AND HANDLING

A. **Requirements:** Deliver, store, handle, apply, and cure materials in accordance with the manufacturer's published product data, including all requirements listed on the Material Safety Data Sheets (MSDS).

B. **Quantity:** The amounts delivered shall provide the proper coverage rates, taking into account normal application loss.

C. **New Materials:** All coating materials and thinners shall be new and furnished for this job and shall be delivered from the coating manufacturer to the job site in the original factory sealed containers which are clearly and properly labeled by the coating manufacturer showing the manufacturer's name, product number, type of paint, batch number, and expiration date.

D. **Storage:** Provide adequate storage facilities. Store coating materials within minimum and maximum ambient temperatures in accordance with the manufacturer's recommendations. Temperature of the coating prior to and during mixing shall be within the range stated in the manufacturers published product data.
E. **Abrasive:** All expendable abrasive shall be new and furnished for this job. All abrasive shall be properly stored on skids or in a covered container. The abrasive shall be covered to protect the abrasive from water and weather. Do not allow abrasive to rest directly in contact with the ground.

F. **MSDS:** Material Safety Data Sheets (MSDS) shall be posted at the job site for each chemical product on the job site, including but not limited to abrasives, coatings, thinners and other solvents, welding materials, flexible sealant material, and disinfecting agents.

1.07 **PROJECT CONDITIONS**

A. **Times for Work:** See Section 01040 – Elevated Tank Rehabilitation Coordination.

B. **Painting Environment:** All temperature and humidity requirements of the coating manufacturer shall be met. In addition, no painting shall be done when: 1) the relative humidity is greater than 85%; or 2) the temperature of the steel is or expected to be less than 5°F above the dew point temperature during the application and until the coating has cured to resist moisture in accordance with the manufacturer's published product data; or 3) the ambient or steel temperature is below 35°F or is expected to drop below 35°F during the initial cure of the coating.

C. **Humidity and Temperature Measuring Equipment:** The CONTRACTOR shall have wet bulb-dry bulb measuring equipment and steel temperature measuring equipment on the job at all times. Readings shall be recorded at the beginning and end of each painting session and at intervals of two hours or less. The CONTRACTOR shall monitor the tank bottom plate temperature during the interior coating curing to verify that minimum steel temperature requirements are satisfied.

D. **Wind Velocities:** Wind velocities during exterior painting shall be compatible for the quality application of the exterior coatings.

E. **Safety and Health:** See Section 01060 - Regulatory Requirements.

F. **Rigging Attachments:** See Section 01060 - Regulatory Requirements.

G. **Containing Cleaning Debris and Overspray:** The CONTRACTOR shall ensure that no spent cleaning/blasting debris, dust, overspray, coating droplets, or emissions of any kind, escape to the atmosphere and travel farther than 30 ft from the base of the tank, or any lesser distance required to avoid contamination of adjacent buildings, work sites and parking lots. The OWNER reserves the right to stop work or to require additional or different containment methods if the CONTRACTOR'S operations create a nuisance beyond the tank site property line in the sole opinion of the OWNER, the ENGINEER, the OWNER'S designated representative, any regulatory agency, or neighbor. All costs of containing cleaning debris and overspray shall be included by the CONTRACTOR in the Base Bid.
H. **Dust Collection:** The CONTRACTOR shall furnish, operate, and maintain adequate dust collection during the Project to achieve adequate air flow within the tank interior. The dust collection system shall at a minimum meet the requirements of a **Type J1 Air Filtration system**, as specified in Section 5.4.5.1 of the SSPC-Guide 6 (CON), Guide for Containing Debris Generated During Paint Removal Operations, dated February 2012. The dust collection shall be operated during all abrasive blast cleaning and after abrasive blast cleaning until the area is clean enough for coating application. The CONTRACTOR shall be responsible for all sizing, design of ductwork, etc., based upon the CONTRACTOR’S operations, number of blasters, duration of blasting, etc. The CONTRACTOR shall also take precautions to avoid a vacuum from developing inside the tank, as even a slight vacuum inside the tank may cause damage to the roof.

I. **Attractive Nuisances and Cleanup:** See Section 01040 - Elevated Tank Rehabilitation Coordination.

1.08 **ENVIRONMENTAL REGULATIONS**

A. See Section 01060 - Regulatory Requirements.

1.09 **FIRST ANNIVERSARY INSPECTION**

A. **Requirements:** A First Anniversary Inspection shall be performed. CONTRACTOR'S Performance Bond or a separate Maintenance Bond shall be in force until after any remedial work is performed. The performance of this inspection and/or any remedial work shall not relieve the CONTRACTOR of any responsibility for defects in materials or workmanship which may or may not be evident during the First Anniversary Inspection.

B. **AWWA D102:** The First Anniversary Inspection as described in Section 5.2 of AWWA D102-14 shall apply.

C. **Inspection:** The CONTRACTOR shall perform the following duties at the First Anniversary Inspection:

1. The CONTRACTOR shall hire an independent inspection firm to complete the inspection, and shall furnish an experienced foreman, laborer, and rigging for the inspection.

2. Interior inspection shall be limited to inspection via remotely operated equipment or divers.

3. The CONTRACTOR shall submit qualifications for all parties who will perform inspection and testing.

4. The CONTRACTOR shall be prepared to perform minor touch-up operations.

5. The CONTRACTOR shall have at least one gallon of each of the exterior primer, intermediate coating, and finish coating at the time of the evaluation along with power cleaning tools and abrasive disks for spot cleaning.
6. The CONTRACTOR shall have at least one quart kit of Aquatapeoxy Paint (manufactured by Raven Lining Systems, Tulsa, OK, telephone 800/324-2810) to touch-up the interior surfaces. If more than one quart kit is needed, as determined by the FIELD OBSERVER, then the specified epoxy coatings shall be used to touch-up the interior surfaces.

7. Costs: All costs associated with the First Anniversary Inspection, including but not limited to, tank wash-out, de-chlorination, disposal, and disinfection, shall be included in the Base Bid price.

8. Repairs: Spot repairs shall be made by the CONTRACTOR before returning the tank back into service. Repairs requiring extensive work and rigging may be delayed until a time mutually agreeable to the OWNER and CONTRACTOR.

9. Disinfection: It is the CONTRACTOR'S responsibility to disinfect the tank in accordance with Section 11220 - Submersible Mixer with Tank Disinfection until two consecutive satisfactory water samples are reported from the OWNER'S selected laboratory.

D. Date of Inspection: Failure of OWNER to establish a First Anniversary Inspection date will not relieve the CONTRACTOR of the responsibility to repair the interior and exterior coating system.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Abrasive: The approved abrasive for cleaning shall meet the following requirements:

1. The abrasive for the surfaces shall be a commercially available, non-metallic, expendable abrasive or a reusable abrasive (such as steel grit).

2. All expendable abrasives shall meet the minimum requirements of SSPC-AB 1, and all abrasives shall meet the requirements of Class A (of SSPC-AB 1) for silica content (crystalline silica less than 1% by weight before blasting). The crystalline silica content shall be determined by the use of infrared spectroscopy or by other analytical procedures, such as wet chemical or x-ray diffraction analysis.

3. The abrasive shall also be of a grit size to produce a 1.5 mil to 2.5 mil profile on exterior surfaces and a 3 mil profile on interior surfaces. If the profile exceeds this range, then the prime coat dry mil thickness shall be increased by the difference between the actual profile and the specified profile to prevent the peaks in the profile from rusting. However, the maximum coating thickness applied shall be in accordance with the coating manufacturer's recommendations.

4. Use of abrasive on the exterior of the tank shall be based not only on its compliance with the technical application of the coatings, but also on its lack of nuisance to surrounding property.
5. The abrasive shall be free from contaminants, such as excessive fine particles, paint, earth, regulated heavy metals, moisture, oil, or chlorides, which can cause premature failure of the coating.

6. The steel grit shall meet the requirements of SSPC-AB 3, Newly Manufactured or Re-Manufactured Steel Abrasives, and be approved for use by the manufacturer of the blasting, media recovery, and separation equipment. The initial quantity of grit shall consist of an artificial working mix determined by the CONTRACTOR to produce an acceptable profile in accordance with these specifications. Any steel grit used on this Project shall be sampled before use by the FIELD OBSERVER and the CONTRACTOR and have the samples sent to a laboratory for atomic absorption testing for total lead. The steel grit shall not be used until the results of the atomic absorption testing are submitted to the OWNER and indicate that the total lead levels are less than 250 ppm (<0.025%).

7. **Blast Media Recovery and Separation System:**

   a. **Equipment Requirements:** The equipment provided for the spent abrasive recovery and media separation shall be a portable commercial recycling abrasive blast machine. The re-used abrasive shall comply with the requirements of SSPC-AB 2, Specification for Cleanliness of Recycled Ferrous Metallic Abrasives. The system shall be capable of recovering the abrasive and returning the spent cleaning debris to a dust separator which shall be an integrated part of the machine. The waste material shall be placed in container drums in accordance with the Removal and Disposal of Cleaning Residue paragraph of Specification 01060, Section 1.01N.

   b. **Equipment Characteristics:** As a minimum, the vacuum system used to recover the spent blasting material shall contain the following:

      1) A double-chambered ASME pressure vessel, which can effectively recycle blast media on a continuous basis, with no interruption, except for air filter back-flushing, media loading to the machine, and removal of collected dust and spent cleaning debris.

      2) A dust filter back-flushing system.

      3) An air drying system consisting of an air-cooled aftercooler, sling separator, and desiccant drier.

B. **Approval of Coatings:** All coatings shall be acceptable to the USEPA and/or other controlling local health and environmental regulatory agencies. All interior coating materials, solvents, and other additives shall comply with ANSI/NSF Standard 61 "Drinking Water System Components - Health Effects." If the manufacturer's product data sheets indicate that the interior coating materials comply with ANSI/NSF Standard 61, then a separate letter from the manufacturer is not required. All coatings to be used shall be listed as to manufacturer and number or description on the Listing of Suppliers, which shall be included with the Bid. The specified coatings are: intended to be
standards of quality. Alternate coatings, materials and manufacturers will only be considered after award of the Contract. If alternate coatings are submitted for review, the submittal shall include the following information:

1. A complete description of the proposed substitute,
2. The material for which it is to be substituted,
3. A letter from the coating manufacturer certifying that the coating meets or exceeds the coatings specified,
4. Price,
5. Performance and test data from the laboratory and field (including QUV/UVB testing for the exterior finish coat),
6. Coverage,
7. Life,
8. Manufacturer's field support capabilities.

C. Lead and Other Heavy Metal Restrictions in Coatings: Coatings which contain more than 0.025% by weight of lead (or any lead compounds), cadmium, or chromium in the cured coating for each coat applied shall not be used.

D. Common Manufacturer: The interior and exterior coatings shall be furnished by the same manufacturer unless specifically stated otherwise in these Specifications.

E. Thinners: Thinners shall be used only in accordance with the manufacturer's instructions. Only thinners recommended and furnished by the coating manufacturer shall be used for this Project.

F. Underwater Epoxy: The approved underwater curing epoxy paint shall be 100% solids material and shall cure underwater. The approved underwater curing epoxy paint shall be acceptable to the USEPA, NSF, and/or other controlling local health and environmental regulatory agencies. The approved material shall not contain lead or any lead compounds.

PART 3 - EXECUTION

3.01 VERIFICATION OF CONDITIONS

A. Before application of the coating materials, verify that specified procedures and products will provide adequate protection of the steel surfaces.

3.02 PROTECTION

A. Furnish and install protective covering over items on the tank and at tank site that are not to be cleaned or painted.
3.03 APPLICATION

A. The sequence to be followed in cleaning and painting shall be such that a minimum of damage to finished coatings will result.

B. Do not apply the primer closer than 6 in. to an uncleaned surface.

C. If the recoat cycle of the primer prevents completely cleaning and priming the tank before applying the intermediate coat, then the CONTRACTOR shall submit, in writing, a schedule for exterior coating application which will avoid damage to the subsequent coats when applied close to uncleaned surfaces.

3.04 TOLERANCES

A. Coating Thickness:

1. The thickness of each type coating is essential to the system's integrity.

2. The addition of mils in a succeeding coat of a different generic type or formulation to make up for thin preceding coat(s) shall not be allowed. If a thicker finish coat is needed to hide the underlying darker color on the exterior of the tank, a thicker coat may be applied, but it shall not exceed the maximum allowable thickness recommended by the coating manufacturer. When undercoats or other conditions show through the final coat, additional coats shall be applied until the coating film is of uniform finish, color, and appearance. Under no circumstances shall the dry film thickness of an individual coat or of the total coating system exceed the coating manufacturer's maximum allowable thickness limit.

3. Dry mil thickness greater than the coating manufacturer's maximum allowable thickness shall be considered unacceptable and shall be removed by the CONTRACTOR at no additional cost to the OWNER at the direction of the FIELD OBSERVER and OWNER.

4. Coating thickness measurement procedures shall be as outlined in SSPC-PA 2.

5. If determined to be in the best interest of the project the FIELD OBSERVER may make dry film thickness measurements in excess of the amounts permitted by SSPC-PA 2.

B. Uniformity: In addition to the minimum and maximum dry film requirements, all sags, runs, dry spray, pinholes, craters, roller nap, or other irregularities shall be removed and repaired.

3.05 OBSERVATION

A. Accessibility for Observation:

1. Notification: The ENGINEER and FIELD OBSERVER shall be notified 7 days, and confirmed 24 hours, prior to the start of any cleaning or painting operations of the steel.
2. **Accessibility for Observation**: All Work shall be made accessible to the ENGINEER and FIELD OBSERVER using the CONTRACTOR'S rigging and equipment. The CONTRACTOR shall include all labor necessary to assist the ENGINEER and FIELD OBSERVER in accessing the work to be observed. The cost of this labor shall be included in the **Base Bid** contract amount.

3. **CONTRACTOR Supervision**: The CONTRACTOR is to supervise the job properly at all times.

4. **Observation**: The OWNER reserves the right to engage full-time observation services, or to perform observations intermittently.

**B. Observation Schedule:**

1. **Notification**: The CONTRACTOR shall notify and make available to the ENGINEER and FIELD OBSERVER for observation all surfaces prior to the application of each coat of paint.

2. **Curing**: The interior wet area coating shall be completely cured, and the solvents shall be adequately released, and the tank shall not be filled with water until observed by the FIELD OBSERVER and the OWNER. The exterior coating on the opposite side of water bearing surfaces shall be completely cured and the tank shall not be filled with water until observed by the FIELD OBSERVER and the OWNER. CONTRACTOR shall perform solvent rub tests, pencil hardness tests, or other industry recognized testing procedures recommended by the coating manufacturer to determine the coatings have cured prior to filling the tank. A letter from the CONTRACTOR certifying their testing results and that the interior wet coating has cured such that it is ready for immersion service shall be submitted to the ENGINEER and OWNER prior to filling the tank. The CONTRACTOR shall monitor the tank bottom plate temperature during the interior coating curing to verify that minimum steel temperature requirements are satisfied.

3. **Holiday Testing**: All interior coatings, including those above the top capacity level, shall be checked with a holiday detector by the CONTRACTOR. Testing shall be done in accordance with Section 5.1.3 of AWWA D102-J 4 and NACE SP0188 in the presence of the FIELD OBSERVER. Any voids indicated shall be repaired by applying more of the finish coat of paint by brush or roller. The areas shall be retested after the appropriate curing time. The coating system must pass the holiday test regardless of the existing coating thickness.

**C. Destructive Testing of Coatings**: If disputes arise concerning the quality of the applied coatings, adhesion tests, Tooke Gage analysis, or some other form of destructive testing may be used to resolve the dispute.

**3.06 CLEANING**

**A. CONTRACTOR Performed Cleanup**: Upon completion of the Work, the job site shall be left clean of all debris, blasting abrasive, or any other items resulting from the operations of the CONTRACTOR.
B. **OWNER Performed Cleanup:** The cost of any cleanup which must be done by the OWNER will be deducted from funds due the CONTRACTOR.

C. **Piping:** Any material found in the inlet/outlet, drain or overflow piping as a result of the CONTRACTOR'S operations at the time the tank is placed back into service shall be removed at the expense of the CONTRACTOR.

D. **Tank Disinfection:** Wash and disinfect tank in accordance with Section 11220 – Submersible Mixer with Tank Disinfection.

END OF SECTION
SECTION 09871

EXTERIOR COATING SYSTEM FOR NEW ITEMS AND AREAS DAMAGED DURING TANK MODIFICATIONS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Exterior shop primers, intermediate, and finish coats for steel water storage tank and accessories.

B. Exterior field primers and finish coats for steel water storage tank and accessories.

C. Specifications for shop priming the exterior surfaces of new items to be installed during the tank modifications are included in this Section.

D. Specifications for recoating exterior areas damaged during the tank modifications of existing steel potable water storage tank and accessories are included in this Section.

E. Surface preparation and painting of all exterior surfaces of new items to be installed, and the surface preparation and painting of all exterior areas damaged as a result of tank modifications and/or repairs are included in this Section.

F. The cost of all surfaces preparation and painting described by this Section shall be included in the Base Bid.

1.02 RELATED SECTIONS

A. Section 01000 – General Requirements, Appendix C – Elevated Tank Rehabilitation Details

B. Section 09800 - General Specifications for Coating Systems

PART 2 - PRODUCTS

2.01 MATERIALS AND MANUFACTURERS

A. Shop Priming: Acceptable coating manufacturers and specifications for the exterior surfaces of the new items to be installed during the tank modifications follow; however, the CONTRACTOR is advised that all manufacturers presented below must certify that the coatings furnished are in compliance with these Specifications.

1. Tnemec Company, Inc., Kansas City, MO  64141
   (shop) Series 94-H20 Hydro-Zinc  2.5 - 3.5 mils

2. Or Approved Equal
B. **Spot Field Coatings:** Acceptable coating manufacturers and specifications for the exterior surfaces damaged during the tank modifications of the steel water storage tank follow; however, the CONTRACTOR is advised that all manufacturers presented below must certify that the coatings furnished are in compliance with these Specifications. The color of the finish coat shall be selected by the Owner such that it closely matches the existing tank exterior color.

1. Tnemec Company, Inc., Kansas City, MO 64141
   - (spot)Series 135 Chembuild 4.0 - 5.0 mils
   - (spot)Series 1075 Endura- Shield 2.0 - 3.0 mils
   - (spot)Series V700 Low VOC Hydroflon 2.0 - 3.0 mils
   - Total System Dry Thickness 8.0 - 11.0 mils

2. Or Approved Equal

C. **Thinners:** Only thinners recommended and furnished by the chosen coating manufacturer shall be used to thin the paint products.

**PART 3 - EXECUTION**

3.01 **SURFACE PREPARATION**

A. All surface preparation shall be done in a workmanlike manner.

B. **Shop Preparation:** Clean all new exterior steel surfaces in the shop to SSPC-SP6, Commercial Blast Cleaning.

C. **Black Light:** When grease or oil is suspected to be on the steel surfaces, the CONTRACTOR shall evaluate the steel by black light to verify any presence of grease or oil on the surface. If present, the grease and/or oil shall be properly removed from the steel surface.

D. **Rough Areas:** These paragraphs apply to rough areas created during the fabrication, transportation, and installation processes. This is separate from the Chipping and Grinding Bid Item and shall be included in the Base Bid.

1. Burrs, weld spatter, sharp edges, comers or rough welds which would cause difficulty in achieving a defect-free coating shall be chipped or ground smooth.

2. It is not the intent to have the welds or scars chipped and/or ground flush. The objective of the chipping and/or grinding is to eliminate sharp edges, comers, and overlaps in order to provide a surface for the application of a uniform thickness coating without voids.

3. These chipped and/or ground areas shall be cleaned to provide the proper surface profile for the paint.

E. **Field Preparation:** All exterior steel surfaces which have been welded, abraded, or otherwise damaged during the work shall be cleaned to SSPC-SP 11, Power Tool Cleaning to Bare Metal. Coating surfaces surrounding the spot cleaned areas shall be sanded or scarified to provide a proper surface profile in the existing coating for the adherence of the spot prime coat.
F. Surface Contamination: The surfaces to be painted shall be free from mud, oil, grease, dust, moisture, halides, or other foreign material which would cause adhesion problems.

G. If field tests by the FIELD OBSERVER find questionable amounts of contamination on the steel surface, or painted surfaces to be topcoated, a representative of the home office of the paint manufacturer may be called to examine the surfaces in question and assist in determining if the surfaces are in accordance with these Specifications and the manufacturer’s recommendations. All costs associated with field examination by the representative of the paint manufacturer shall be included in the Base Bid.

3.02 APPLICATION

A. All painting shall be done in a professional manner.

B. Shop Priming: Within eight (8) hours of the shop cleaning and before the formation of rust, the exterior steel surfaces cleaned in the shop (SSPC-SP6) shall be primed with the specified shop primer, with the exception of a 2 in. wide margin at the edges to be field welded.

C. Field Priming:

1. Not later than during the same day and before the formation of rust, the exterior surfaces cleaned in the field (SSPC-SP11) shall be primed with the specified field primer.

2. Stripe Coat: Special attention shall be given to welds, lapped joints, bolt heads and nuts, threads, comers, member intersections, and other deviations from smooth surfaces. These areas shall be primed by brush with a 10% thinned coat, prior to the complete priming.

D. Spot Field Intermediate Coat: After adequate curing of the spot prime coat, all primed exterior surfaces shall be given an intermediate coat of the specified paint. The color shall be slightly darker than that chosen for the finish coat, being dark enough to visually assure application of the finish coat, and light enough to allow proper hiding. (An intermediate coat lighter than the finish coat shall not be permitted due to the inability to distinguish between the lighter intermediate and the highlights of the finish.) The coating manufacturer shall recommend a darker color for the intermediate coat and this color shall be submitted for review.

E. Spot Field Finish Coat: After adequate curing of the spot field intermediate coat, the spot coated exterior surfaces shall then be given a final coat of the selected paint in a color selected by the Owner to closely match the existing tank exterior finish color.

END OF SECTION
SECTION 09872

EXTERIOR TOPCOATING SYSTEM

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Exterior primers, intermediate, and finish coats for steel water storage tank.

B. Specifications for the top coating of the exterior surfaces of an existing steel potable water storage tank and accessories are included in this Section.

C. Preparation of all exterior surfaces which are to receive coating are included in this Section.

D. Painting of all exterior surfaces which are to receive coating are included in this Section.

E. All exterior surfaces of the tank, including but not limited to, shell, roof, bowl, cylindrical and funnel portions of riser, shell walkway and handrail, ladder and safety cage, flanged access manhole with bolted cover, roof platform, overflow pipe, support legs, struts, braces, tie rods, steel base plates and anchor bolts, and associated appurtenances; and all threads, bolts, nuts, pins, brackets, seams, corners, etc.; shall be scrubbed, pressure washed, spot cleaned and topcoated in accordance with this Section and included in the Base Bid. Note that ladder safety-climbing device shall not be spot cleaned and shall not be topcoated.

F. All areas of exterior coating damaged during the work, including exterior coating opposite welding performed on the interior for metal loss repair and stiffeners replacement, shall still be cleaned and painted in accordance with Section 09871 of these Specifications and included in the Base Bid.

1.02 RELATED SECTIONS

A. Section 09800 - General Specifications for Coating Systems

PART 2 - PRODUCTS

2.01 MATERIALS AND MANUFACTURERS

A. Coatings: Acceptable coating manufacturers and specifications for the exterior surfaces of the steel water storage tank follow; however, the CONTRACTOR is advised that all manufacturers presented below must certify that the coatings furnished are in compliance with these Specifications.

1. Tnemec Company, Inc., Kansas City, MO 64141

<table>
<thead>
<tr>
<th>Coating</th>
<th>System Dry Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>(spot) Series 135 Chembuild</td>
<td>4.0 - 5.0 mils</td>
</tr>
<tr>
<td>(spot) Series 1075 Endura-Shield</td>
<td>2.0 - 3.0 mils</td>
</tr>
<tr>
<td>(full) Series V700 Low VOC Hydroflon</td>
<td>2.0 - 3.0 mils</td>
</tr>
<tr>
<td></td>
<td>8.0 - 11.0 mils</td>
</tr>
</tbody>
</table>
2. Or Approved Equal

B. Thinners: Only thinners recommended and furnished by the chosen coating manufacturer shall be used to thin the paint products.

PART 3 - EXECUTION

3.01 SURFACE PREPARATION

A. All surface preparation shall be done in a workmanlike manner

B. Rough Areas: These paragraphs apply to rough areas created during the repair and repainting processes. This is separate from the Chipping and Grinding Bid Item and shall be included in the Base Bid.

1. Burrs, weld spatter, sharp edges, comers or rough welds which would cause difficulty in achieving a defect-free coating shall be chipped or ground smooth.

2. It is not the intent to have the welds or scars chipped and/or ground flush. The objective of the chipping and/or grinding is to eliminate sharp edges, comers, and overlaps in order to provide a surface for the application of a uniform thickness coating without voids.

3. These chipped and/or ground areas shall be cleaned to provide the proper surface profile for the paint.

C. Scrubbing and Pressure Washing Complete Exterior: The complete exterior of the tank shall be cleaned by applying a suitable emulsifier (detergent or surfactant) solution to the surface, scrubbing the surface with a soft bristled broom to remove chalking and other surface contaminants, and high pressure washing using potable water at 2000 psi minimum. As an alternative to scrubbing with a broom, a zero-degree spinner tip may be used, providing that the dirt and chalking are removed. The cleaning and pressure washing shall continue until all chalk, oil, grease, dirt, loose rust, salts, or other deleterious material which would cause coating failure have been completely removed. Tri-sodium phosphate or other fungicide recommended by the coating manufacturer shall be added to the water to ensure that all living organisms on the tank are eliminated and effectively removed. The detergent or surfactant shall be approved by the coating manufacturer. All residue of the cleaning agent not compatible with the ensuing coats of paints shall be removed. Any runoff or contaminants shall not be allowed to come in contact with any natural drainage ditches or streams.

D. Surface Preparation and Debris Removal: All areas with paint failing by blistering, flaking, peeling, undercutting or other deterioration, and all areas exhibiting corrosion (rust) on the tank exterior, and all areas of coating damaged during the repairs, shall be spot cleaned to SSPC-SP 6, Commercial Blast Cleaning (modified) or to SSPC-SP 11, Power Tool Cleaning to Bare Metal. Coating surfaces surrounding the spot cleaned areas shall be sanded or scarified- to provide a proper surface profile in the existing coating for the adherence of the spot prime coat. All graffiti and all areas with excessive thickness due to runs and sags shall be cleaned to SSPC-SP 7, Brush-Off Blast Cleaning, to remove the paint on top and to expose the underlying original coatings, reducing the
total mil thickness remaining to a maximum of 9 mils. Scotch-Brite nonwoven abrasive disks may also be used to remove rough paint and excessive thickness. The paint and cleaning debris shall be promptly stored in leak-proof covered dumpsters on the site and disposed of in accordance with the Removal and Disposal of Cleaning Residue paragraph of Specification 01060, Section 1.01N. The exterior debris shall be kept separate from the interior paint and cleaning debris.

E. Surface Contamination: The surfaces to be painted shall be free from mud, oil, grease, dust, moisture, halides, or other foreign material which would cause adhesion problems. If field tests by the FIELD OBSERVER find questionable amounts of contamination on the steel surfaces or painted surfaces to be topcoated, a representative of the home office of the paint manufacturer may be called to examine the surfaces in question and assist in determining if the surfaces are in accordance with these Specifications and the manufacturer's recommendations. All costs associated with field examination by the representative of the paint manufacturer shall be included in the Base Bid.

3.02 APPLICATION

A. All painting shall be done in a professional manner.

B. Spot Priming:

1. Not later than during the same day and before the formation of rust, the cleaned exterior surfaces (SSPC-SP6 - modified, SSPC-SP 7, and SSPC-SP 11) shall be primed with the specified primer.

2. Stripe Coat: Special attention shall be given to welds, lapped joints, bolt heads and nuts, threads, corners, member intersections, and other deviations from smooth surfaces. These areas shall be spot primed by brush with Tnemec Series 135 Chembuild, after the initial spot priming.

C. Spot Intermediate Coat: All primed exterior steel tank surfaces shall then be given one spot intermediate coat of paint. The color shall differ from the primer and shall be slightly darker than that chosen for the finish coat, being dark enough to visually assure application of the finish coat, and light enough to allow proper hiding. (An intermediate coat lighter than the finish coat shall not be permitted due to the inability to distinguish between the lighter intermediate and the highlights of the finish). The coating manufacturer shall recommend a darker color for the intermediate coat and this color shall be submitted for review.

D. Topcoat: All exterior surfaces of the tank and all accessories described in Section 1.01E above shall then be given a final coat of the selected paint. The Owner shall select the new tank finish color such that it is a close color match to the existing tank finish color.
SECTION 09873

INTERIOR COATING SYSTEM FOR STEEL STORAGE TANK

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Interior primer and finish coat for steel water storage tank.

B. Sealant for steel water storage tank.

C. Specifications for the coating of the interior surfaces of an existing steel potable water storage tank and accessories are included in this Section.

D. Preparation of all interior surfaces which are to receive coating are included in this Section.

E. Painting of all interior surfaces which are to receive coating are included in this Section.

F. Furnishing and application of underwater curing epoxy paint for use at the time of the First Anniversary Inspection.

G. All interior surfaces of the container, including (but not limited to) the roof, manholes, shell, bowl, riser, overflow inlet, ladders, threads, bolts, nuts, pins, brackets, seams, comers, etc., the inside of the roof vent flange (with the exception of all surfaces of the vent interior and exterior, all screens, and all clog-resistant pallet materials, i.e. polyethylene, teflon, etc. and the ladder safe-climbing device), shall be cleaned and painted in accordance with the paragraphs in this Section. The exterior of the vent attachment flange to the roof shall be cleaned and painted in accordance with Section 09871 - Exterior Coating System. The screens and the clog-resistant pallet materials shall be protected from the application of all coatings.

1.02 RELATED SECTIONS

A. Section 09800 - General Specifications for Coating Systems

PART 2 - PRODUCTS

2.01 MATERIALS AND MANUFACTURERS

A. Compliance with ANSI/NSF Standard 61: The approval of potable water tank interior coatings and sealers shall be based on written certification of compliance with ANSI/NSF Standard 61 and compliance with the requirements of state agencies. Manufacturer's published product data concerning the transportation, storage, mixing, thinning, pot life, application, and curing shall be furnished to ensure that the finished product complies with ANSI/NSF Standard 61.

B. Certification: Manufacturers presented below must certify that their coatings furnished
are in compliance with the Specifications.

C. Thinners: Only thinners recommended and furnished by the chosen coating manufacturer shall be used to thin the paint products.

D. Coatings: The interior surfaces shall be coated with a zinc primer and an approximately 100% solids high-build epoxy coating system. Acceptable coating manufacturers and specifications for the interior surfaces of the steel water storage tank follow.

1. Tnemec Company, Inc., Kansas City, MO 64141
   (1) Primer – Series 94-H20 Hydro-Z 2.5 - 3.5 mils
   (2) Stripe – Series V140 Pota-Pox
   (3) Finish – Series FC22 Epoxoline (White) 25.0 - 35.0 mils
   Total System Dry Thickness 27.5 - 38.5 mils

2. Or Approved Equal

PART 3 - EXECUTION

3.01 SURFACE PREPARATION

A. Cleaning Tank and Debris Removal: Baltimore City, or their representatives, will operate valves to isolate and drain the tank after the Contractor has made provisions to de-chlorinate the water. The CONTRACTOR shall remove all standing water, mud, and debris from the tank prior to starting work. All loose rust, loose paint, and dirt shall be removed from the tank interior prior to the beginning of cleaning operations. This debris shall be promptly stored in leak-proof covered dumpsters/containers on the site and disposed in accordance with these Specifications. This debris shall be kept separate from the exterior paint and cleaning debris. Any water that enters the tank through leaking valves throughout the course of the Project shall be collected and removed from the tank by the CONTRACTOR at no additional cost to the OWNER. The cost for Cleaning Tank and Debris Removal shall be included in the Base Bid.

B. All surface preparation shall be done in a workmanlike manner.

C. Rough Areas: These paragraphs apply to existing rough areas directly impacting the installation of the new center hub, new main roof stiffeners, new roof knuckle stiffeners, new circumferential stiffeners, and new interior container ladder; and also apply to rough areas created during the installation of new center hub, new stiffeners, and new interior container ladder. This is separate from Chipping and Grinding Bid Item and shall be included in the Base Bid.

1. Burrs, weld spatter, sharp edges, corners or rough welds which would cause difficulty in achieving a defect-free coating shall be chipped or ground smooth.

2. It is not the intent to have the welds or scars chipped and/or ground flush. The objective of the chipping and/or grinding is to eliminate sharp edges, comers, and overlaps in order to provide a surface for the application of a uniform thickness coating without voids.
3. These chipped and/or ground areas shall be cleaned to provide the proper surface profile for the paint.

D. **Field Preparation:** The complete interior surfaces of the tank including appurtenances shall be cleaned to SSPC-SP10, Near-White Blast Cleaning (modified). All surfaces shall be cleaned and primed after the repairs are completed. The cost for Field Preparation shall be included in the **Base Bid.**

E. **Surface Contamination:** The surfaces to be painted shall be free from mud, oil, grease, dust, moisture, halides, or other foreign material which would cause adhesion problems. If field tests by the ENGINEER find questionable amounts of contamination on the steel surfaces or painted surfaces to be topcoated, a representative of the home office of the paint manufacturer may be called to examine the surfaces in question and assist in determining if the surfaces are in accordance with these Specifications and the manufacturer's recommendations. All costs associated with field examinations by the representative of the paint manufacturer shall be included in the **Base Bid.**

### 3.02 APPLICATION

A. All painting shall be done in a workmanlike manner.

B. **Seam Sealer:** After cleaning, seam sealer is to be applied to the roof vent intersection, roof manhole, and along the top and bottom of the interior shell stiffener to seal these intersections from moisture. It shall be applied in a workmanlike manner, being beveled at approximately 45°. **The cost of this seam sealing is to be included in the Base Bid, separate from other applications using seam sealer which may be listed in the SPECIFICATIONS FOR REPAIRS AND ADDITIONS TO THE TANK section of these Detailed Technical Specifications and included as a separate bid item.** This material shall be equal to the solventless epoxy seam sealers listed below and recommended by the manufacturer of the interior paint system. At the CONTRACTOR'S option, the seam sealer may be applied after the priming of the surface, providing no rust has formed on any uncoated surfaces (such as crevices between plates).

1. **Tnemec Series 215 Surfacing Epoxy.**
2. **Or Approved Equal**

C. **Priming:**

1. **Prime Coat:** Before the formation of rust and after observation of the surface by the FIELD OBSERVER, all cleaned surfaces shall be primed with the first coat specified.
2. **Stripe Coat:** After the application of the first coat, all seams, all edges, rough areas, deviations from smooth surfaces, pits, bolt heads and nuts, remains of erection lugs and scars, and corners shall be primed by brush and/or roller using Tneme Series V140, or approved equal. The 2.5% thinned material shall be worked sufficiently into all cracks, crevices, and seams. Initial spray application of the stripe coat shall not be permitted.
3. The primer shall not be applied closer than 6 in. to an uncleaned surface.
D. **Finish Coat:** After adequate curing of the prime coat and stripe coat, the primed interior surfaces shall then be cleaned of all dust, overspray, abrasive, and other contaminants which might cause premature coating failure and given one finish coat of the specified 100% solids epoxy coating. If the finish coat is not applied before the recoat window elapses, then the primed surfaces shall be scarified by abrasive blasting or other method recommended by the manufacturer in order for the finish coat to properly bond to the prime coat. All seams, rough areas, deviations from smooth surfaces, pits, remains of erection lugs and scars, and comers shall be coated with the 100% solids epoxy coating using multiple passes and squeegeeing of the product to ensure that all surfaces receive the specified film thickness and that the material is worked sufficiently into all cracks, crevices, seams, all edges, rough areas, deviations from smooth surfaces, pits, and comers. Equipment shall have a letter from the coating manufacturer's technical services stating the equipment is appropriate for the use intended in applying the material. All heating of equipment, mixture ratios, storage requirements, and other requirements as set forth in the product data sheets shall be followed.

E. **Flexible Sealant:** After the curing of the finish coat of paint, Sikaflex-1A flexible polyurethane sealant (or equal allowed in writing by the ENGINEER) shall be applied to the unwelded lapped container roof seams and along the intermittently welded stiffeners. It shall be applied in a workmanlike manner, being beveled at approximately 45°. The color of the sealant shall be white. The sealant shall have the approval for use in potable water from the USEPA, ANSI/NSF, and any applicable local health regulatory agency.

END OF SECTION
SECTION 09900

PAINTING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Related Work Specified Elsewhere:

   1. Sealants and Caulking: Section 07900.
   2. Pre-finishing or shop priming requirements as specified in various other Sections of these Specifications.

B. All color selection, where not indicated or specified, shall be as directed by the County with no extra compensation allowed. Final work shall match the approved samples.

1.02 QUALITY ASSURANCE

A. Applicator Qualifications: Painting applicator shall show evidence of acceptability as a qualified applicator by the manufacturer of products specified herein. Submit such evidence with Submittals as specified herein.

B. Referenced Standards:

   1. Steel Structures Painting Council Surface Preparation Specifications:
      a. SSPC-SP1, Solvent Cleaning.
      b. SSPC-SP2, Hand Tool Cleaning.
      c. SSPC-SP6, Commercial Blast Cleaning.
      d. SSPC-SP8, Pickling.
      e. SSPC-SP10, Near-White Blast Cleaning.

1.03 SUBMITTALS

A. Paint Schedule and Shop Drawings as specified in Section 01000.

B. Samples:

   1. Submit color charts displaying manufacturer’s full range of standard colors for initial selection by Engineer.
   2. Submit sample color chips of standard colors and samples of any intermixes required.
C. Schedule and Product Data: Submit paint schedule in same format as the paint schedule herein, and indicate which of the selected manufacturer’s products are intended for use. Do not perform painting or coating work without Owner’s Representative’s approval of submitted paint schedule.

1. Submit technical data sheets for each coating, giving descriptive data, curing times, mixing, thinning, and application requirements.

2. Provide material analysis, including vehicle type and percentage by weight and by volume of vehicle, resin and pigment.

3. Submit manufacturer’s Safety Data Sheet (SDS) and other safety requirements.

D. Certificates: Paint manufacturer’s direct factory representative shall certify in writing to the Owner’s Representative painting and coating compliance with the following:

1. Factory representative’s initial site inspection of conditions pertinent to painting and coating work with Contractor or his authorized painting representative.

2. Factory representative’s second site inspection at completion of painting and coating work to check proper application and actual mil thickness compliance with these Specifications.

3. Certification issued to Owner’s Representative only following unacceptable painting and coating work being rectified to Owner Representative’s satisfaction.

4. Factory representative shall make his services available to the Owner’s Representative for immediate consultation in regard to the painting and coating work, and shall make above stated inspections in the Owner Representative’s presence.

5. Manufacturer shall certify that the coating materials utilized are “non-lead” (less than 0.06% lead by weight in dried film) as defined in Part 1303 of Consumer Product Safety Act.

6. All paint shall meet the current OTC VOC Phase II Regulations: Industrial Maintenance and Exterior Metal Coating, 250g/l.

E. Operation and Maintenance Data: Upon approval of painting schedule, submit five (5) copies of detailed maintenance manuals, in accordance with requirements of Section 01000, and including the following information:

1. Name, address and telephone number of manufacturer and local distributor.

2. Product name, number and technical data sheet for each type of paint.

3. Detailed procedures for routine maintenance and cleaning.

4. Detailed procedure for light repairs such as dents, scratches and staining.
1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver paint materials to job site in their original unopened containers with labels intact and legible at time of use.

B. Store approved materials at the job site in a suitable and designated area restricted to storage of paint and coating materials and related equipment. Maintain temperature in area of storage between 40 degrees F (4 degrees C) and 110 degrees F (43 degrees C), or as required by manufacturer.

C. Use all means necessary to ensure safe storage and use of paint and coating materials and the prompt and safe disposal of waste. Store paint and coating products protected from weather when such products may be affected by freezing.

1.05 JOB CONDITIONS

A. Field and Shop Coat Compatibility: To ensure satisfactory paint and coating performance, it is a Contract requirement that products applied in the shop and field be mutually compatible.

1. Contractor shall require fabricators and equipment manufacturers to apply shop coats that are compatible with field coats specified herein.

2. Above requirement does not apply to full factory-finished items, that is, items having both primer and final finish coatings, except as specified in the following paragraphs.

3. New equipment with primers not compatible with specified topcoats shall be stripped bare and coated with a compatible primer as recommended by manufacturer. Contractor shall be responsible for verifying compatibility prior to arrival on site and repairs/stripping if required.

B. Painting Factory-Finished Equipment: Equipment, such as motors, pumps and other such items, which when installed become an integral part of a system and which may be delivered fully factory-finished (that is, having finish coatings in addition to the prime coating) shall not require repainting in the field unless:

1. Factory finish is unacceptable to the Owner’s Representative, that is, not having generic type of paint or proper mil thickness to withstand corrosive atmosphere of wastewater facilities; or,

2. Factory finish is damaged.

3. On factory-finished items requiring repainting, first sand existing paint to a dull finish and then repaint with scheduled finish system for the installed location of such factory-finished items.

C. Painting Caulking Compound: Do not apply paint over caulking compound until integral solvents have been released from the compound; usually two weeks for butyl-rubber based caulking and one day for acrylic latex caulking.
D. Color

1. As directed by the Owner’s Representative.

2. Paint equipment not furnished with a factory finish, or not finished with an acceptable factory finish, and piping and conduits the same color as adjacent surface.

3. Final work shall match Owner’s Representative approved samples. Owner’s Representative shall select colors where not indicated or specified with no extra compensation allowed the Contractor for such.

E. Placing Into Service: Do not place painted items into service until paints and coatings are fully cured (dry-hard).

F. Environmental Requirements:

1. Adhere to manufacturer’s data on air and surface temperature limits and relative humidity during application and curing of coatings, or requirements herein:
   a. Air temperature shall not be below 35 degrees F (2 degrees C) or above 110 degrees F (43 degrees C).
   b. Relative humidity shall be no higher than 85%.

2. Do not spray-apply paint when wind velocity is above 15 mph.

3. Schedule coating work to avoid dust and airborne contaminants.

4. Apply exterior finishes during daylight hours only.

5. When painting must be done in confined spaces, or because of unfavorable ambient conditions, longer drying times will be necessary.

6. Provide supplementary ventilation such as fans and blowers in confined or enclosed areas to carry off solvents during the evaporation stage.

G. Protection:

1. Protect paint materials before, during and after application and protect other work and materials with drop cloths or other impervious material.

2. Clean up or otherwise remedy without additional cost damage by paint and coatings to public or private property.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Paint: As specified in the PAINT SCHEDULE included herein.
B. Thinners: Only those thinners recommended for that purpose by the manufacturer of material to be thinned.

2.02 MATERIALS

A. Paint: As specified in the PAINT SCHEDULE included herein.

B. Thinners: Only those thinners recommended for that purpose by the manufacturer of material to be thinned.

PART 3 - EXECUTION

3.01 SURFACE PREPARATION

A. Ferrous Metal:

1. Shop Primed:
   a. Immediately before paint application, clean sand, dust, mud, dirt and other foreign matter from shop coat.
   b. Touch-up damaged or destroyed shop paint.
   c. Surface preparation of surfaces to be touched-up must be as effective as those specified for shop painting.

2. Not Shop Primed and Submerged or Intermittently Submerged in Liquid:
   a. Grind smooth to a rounded contour sharp edges and welds, and remove weld splatter.
   b. Except for insides of pipes sandblast in accordance with SSPC SP-10 or pickle in accordance with SSPC SP-8.
   c. After sandblasting, remove dust and spent sand from surface by brushing or vacuum cleaning.
   d. Apply prime coat before surface starts to rust.
   e. Do not allow sandblasted surface to stand overnight before coating.

3. Not Shop Primed and Non-Submerged:
   a. Grind smooth to a rounded contour sharp edges and welds, and remove weld splatter.
   b. Sandblast in accordance with SSPC SP-6.
   c. After sandblasting, remove dust and spent sand from surface by brushing or vacuum cleaning.
d. Apply prime coat before surface starts to rust.

e. Do not allow sandblasted surface to stand overnight before coating.

B. Galvanized Metal Including Pipes and Conduits:
1. Solvent clean in accordance with SSPC SP-1.
2. Check for presence of oils and passivation compounds using a copper sulfate test. If present, remove with abrasion or solvent cleaning.
3. Remove white rust by hand or power tool cleaning in accordance with SSPC SP-2 or SP-3.
4. Allow to dry before application of paint.

C. Copper Pipe:
1. Solvent clean in accordance with SSPC SP-1.
2. Do not paint copper pipes.

D. Shop Bituminous Coated Pipe:
1. Non-Submerged: Commercial sandblast per SSPC SP-6.
2. Submerged: Sandblast near white per SSPC SP-10.

E. Existing Concrete
1. Remove all existing coatings, contaminants, laitance, and weak concrete using impact or power tool methods per ASTM D4259. Staining over existing paint will not be permitted.
2. After removal of all existing paint, clean bare concrete surfaces free of dirt, oil, grease, dust, etc. using a cleaner recommended by the new concrete stain manufacturer. Rinse surfaces and allow them to dry thoroughly.
3. Repair all cracked, damaged, and spalled concrete in accordance with the International Concrete Repair Institute (ICRI) Guideline No. 03732.
4. Prepare a surface profile in accordance with the new stain manufacturer’s recommendations. Apply new stain only on clean and dry concrete surfaces.

F. New Concrete:
1. Remove oil, grease, dirt, etc. by steam cleaning or scrubbing with a strong commercial type detergent and flushing with water.
2. Neutralize and flush clean chemical contamination.
3. Fill exposed aggregate or deep pits and air holes with cement grout and trowel to a uniform surface texture.

4. Perform work only on cured, clean and dry concrete surfaces.

G. Masonry:

1. Surface preparation performed as work of Division 4 — MASONRY. Proceeding with paint application denotes acceptance of surface.

2. Perform work only on cured, dry and dust free masonry surfaces.

H. Pipe Insulation:

1. Clean free of dirt, dust or other foreign matter.

I. Mechanical and Electrical Systems:

1. Clean free of dust, mud, dirt, sand and other foreign matter.

2. Solvent clean or otherwise degrease surfaces; exercise care not to damage surfaces.

3. Do not paint factory painted surfaces of mechanical and electrical components in such systems; does not include galvanized surfaces.

4. Do not paint light fixtures.

J. Wood:

1. For existing painted surfaces, remove loose and peeling paint, de-gloss surface if recommended by the paint manufacturer, sand smooth, and clean.

2. Scrape and clean knots, and apply coat of knot sealer before applying primer.

3. Sand surfaces that will be exposed to view, and dust them off.

4. Prime edges, ends, faces, undersides, and backsides of all wood.

5. After priming, fill holes and imperfections in the finished surfaces with putty or plastic wood filler. Sand smooth when dried.

K. Structural Steel:

1. Structural steel shall be galvanized per Specification 05120. Galvanized structural steel shall not be painted.

2. Existing structural steel which is painted shall be painted in accordance with the schedule within this specification. Surface preparation, including cleaning, drying, and de-glossing, shall be in accordance with the coating manufacturer’s requirements.
3.02 APPLICATION

A. General:

1. Strictly follow paint manufacturer’s label instructions for mixing, thinning, proper spreading rate and drying time. In no case shall film thickness be less than manufacturer’s recommendations nor shall area coverage per gallon exceed manufacturer’s recommendations.

2. If material has thickened or must be diluted for application, the coating shall be built up to the same film thickness achieved with undiluted material. Do not use thinner to extend coverage of the paint.

3. Regardless of the surface, it shall be the painter’s responsibility to achieve a protective and decorative finish either by decreasing the coverage or by applying additional coats of paint.

B. Method of Application:

1. Workmanship: In general, finished surface regardless of method of paint application shall show no evidence of improper application according to accepted trade practice. Do not use paint rollers having nap exceeding 3/8 inch.

2. Multi-coat Application:
   a. Succeeding coats of paint shall show visual difference from preceding coats. Each coat shall have a uniform appearance and be tinted to the final coat. The final coat shall present solid hiding with edges of paint adjoining other paint or materials made clean and sharp without overlap. Wipe or otherwise render undercoats dust free just prior to application of succeeding coatings.
   b. Do not apply additional coats of paint until the film to be recoated is sufficiently cured to receive the next coat.
   c. If the time limit is exceeded for coatings that have a maximum recoat time, consult paint manufacturer before proceeding with next coat.

C. Painting Exposed/Concealed Surfaces:

1. It is a requirement of this specification that all exposed interior surfaces be painted except as specified herein and elsewhere in the Specifications.

2. Exterior surfaces painted only as scheduled.

3. In interior exposed areas of structures, paint mechanical and electrical systems, including pipe, duct and conduit system, except for full factory finished items as defined previously.
4. In interior concealed areas no painting is required including mechanical and electrical systems therein, except that pipe identification is required on piping in concealed but accessible areas.

5. Paint above stated exposed mechanical and electrical systems the same color as adjacent wall and/or ceiling color. Paint materials as scheduled herein.

6. Do not paint exposed aluminum surfaces or rubber components.

D. Pipe Line Identification:

1. After finish painting, mark non-submerged piping with an applicable color band bearing the stenciled name of its contents. Identify piping at valves and fittings, piping on both sides of walls and floors where pipes pass through same and on long pipe runs approximately every 30 feet or closer when directed.

2. Also adjacent to the color band, stencil the pipe size and an arrow indicating direction of flow in the pipe. Color pipe size identification and flow arrow the same as the lettering.

3. Place legend pipe size and flow arrow in location so that it can be easily read from the floor.

4. Where pipes are adjacent to each other, arrange legends neatly in line.

5. Use block style lettering with letter size and color band width in accordance with the following table:

<table>
<thead>
<tr>
<th>Pipe Outside Diameter</th>
<th>Color Band Width</th>
<th>Letter Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>¾” to 1 ⅛”</td>
<td>8”</td>
<td>½”</td>
</tr>
<tr>
<td>1-1/2” to 2”</td>
<td>8”</td>
<td>¾”</td>
</tr>
<tr>
<td>2-1/2” to 6”</td>
<td>12”</td>
<td>1-1/4”</td>
</tr>
<tr>
<td>8” to 10”</td>
<td>24”</td>
<td>2-1/2”</td>
</tr>
<tr>
<td>Over 10”</td>
<td>32”</td>
<td>3-1/2”</td>
</tr>
</tbody>
</table>

6. Identify pipelines less than ¾” outside diameter with brass or aluminum tags.

7. Schedule for pipeline identification as follows:

<table>
<thead>
<tr>
<th>Service</th>
<th>Band Color</th>
<th>Lettering Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drain</td>
<td>OSHA Safety Black</td>
<td>White</td>
</tr>
<tr>
<td>Fuel Oil</td>
<td>OSHA Safety Yellow</td>
<td>Black</td>
</tr>
<tr>
<td>Potable Water</td>
<td>Light Blue</td>
<td>White</td>
</tr>
<tr>
<td>Wastewater</td>
<td>Light Gray ANSI Z55.1</td>
<td>Black</td>
</tr>
</tbody>
</table>
E. Pump and Motor Identification:

1. Use a 3-1/2" block style lettering to paint equipment identification numbers on pumps and motors as applicable or as directed by the engineer. Lettering color shall be black.

3.03 CLEANING

A. Upon completion of work, remove paint and coating spots, oil and grease stains from floors, walls, fixtures, hardware and equipment, leaving their finishes in a satisfactory condition. Remove materials and debris from the site of work, and leave in a clean condition so far as this work is concerned.

B. Keep site free from accumulation of paint containers, solvents, and thinner and used cleaning cloths and legally dispose of same off premises daily.

3.04 PAINT SCHEDULE

A. General: The paint systems specified are acceptable options. The following paint systems are intended to include items to be painted at the job site. Any item not specifically named herein but obviously required to be painted, shall be painted in accordance with the system selected by the Owner’s Representative, or otherwise painted as directed by the Owner’s Representative.

B. Schedule: Refer to Finish Paint Schedule Table that follows. The entire pumping station and everything therein, whether specifically listed in the Finish Paint Schedule Table or not, shall be painted to match existing colors unless directed otherwise by the Owner’s Representative.

FINISH PAINT SCHEDULE TABLE

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Items to be Painted</th>
<th>TNEMEC</th>
<th>CARBOLINE</th>
<th>FINISH COLOR (Remarks)</th>
</tr>
</thead>
</table>
| 1        | Misc. Ferrous Metals: Vents, drainpipes, structural steel, misc. metal fabrications, roof supports, metal piping, valve handwheels, extension stems, pump shafting, etc. | • One Coat: Series 27 WB Typoxy @ 3.0-3.5 mils DFT.  
• Two Coats: Series V69 Hi-Build Epoxoline II @ 6.0-8.0 mils DFT/coat. | • One Coat: Carboguard 635VOC @ 4.0-6.0 mils DFT.  
• Two Coats: Carboguard 690 @ 6.0-8.0 mils DFT/coat. | Aluminum or Gray (Do not paint ductwork).  
Valve handwheels, extension stems, and pump shafting shall be OSHA Safety Red.  
Crane beams shall be Safety Yellow. |
| 2        | Electrical Conduit (Non-metallic and PVC coated conduit shall not be painted) | • One Coat: Series 1026 Enduratone @ 2.0-2.5 mils DFT.  
• Two Coats: Series 1029 Enduratone @ 2.0-2.5 mils DFT/coat. | • One Coat: Carbocrylic/Sanitile 120 @ 2.0 mils DFT.  
• Two Coats: Carbocrylic 3359 @ 2.0-3.0 mils DFT/coat. | Black |
<table>
<thead>
<tr>
<th>Item No.</th>
<th>Items to be Painted</th>
<th>TNEMEC</th>
<th>CARBOLINE</th>
<th>FINISH COLOR (Remarks)</th>
</tr>
</thead>
</table>
| 3       | Water Piping (steel only, copper piping shall not be painted) | • One Coat: Series 94H2O Hydro-Zinc @ 2.5-3.5 mils DFT.  
• Two Coats: Series V69 Hi-Build Epoxoline II @ 4.0-6.0 mils DFT/coat. | • One Coat: Carbozinc 859 @ 3.0-5.0 mils DFT.  
• Two Coats: Carboguard 891VOC @ 4.0-6.0 mils DFT/coat. | Light Blue |
|         | A. New or unpainted Concrete Masonry Units (Interior Only) | • One Coat: Series 130 Environfill @ 70-80 ft²/gal.  
• Two Coats: Series V69 Hi-Build Epoxoline II @ 4.0-6.0 mils DFT/coat. | • One Coat: Sanitile 100 Filler @ 12 mils DFT.  
• Two Coats: Sanitile 255 @ 2.0-3.0 mils DFT/coat. | White |
| 4       | B. Existing Painted Concrete Masonry Units (Interior Only) | • One Coat: Series 151-1051 Elasto-Grip FC @ 0.7-1.5 mils DFT.  
• Two Coats: Series V69 Hi-Build Epoxoline II @ 4.0-6.0 mils DFT/coat. | • One Coat: Sanitile 120 @ 1.0-2.0 mils DFT.  
• Two Coats: Sanitile 255 @ 2.0-3.0 mils DFT/coat. | White |
|         | C. Existing Painted Concrete Masonry Units (Exterior) | • One Coat: Series 151-1051 Elasto-Grip FC @ 0.7-1.5 mils DFT.  
• Two Coats: Series 156 @ 4.0-8.0 mils DFT/coat. | • One Coat: Sanitile 120 @ 2.0-3.0 mils DFT.  
• Two Coats: Carbocrylic 3359 @ 2.0-3.0 mils DFT/coat. | White |
|         | D. New or unpainted Concrete Masonry Units (Exterior) | • One Coat: Series 156 Enviro Crete @ 4.0-6.0 mils DFT.  
• One Coat: Series 156 Enviro Crete @ 4.0-6.0 mils DFT. | • One Coat: Sanitile 100 @ 2.0-3.0 mils DFT.  
• Two Coats: Carbocrylic 3359 @ 2.0-3.0 mils DFT/coat. | White |
| 5       | A. Concrete Surfaces: walls, ceilings, drywell, valve vault, exposed exterior surfaces, etc. | • Two Coats: Series 617 WB Conformal Stain @ 150-200 ft²/gal per coat. | • See Note 1. | White |
|         | B. Concrete Surfaces: floors and equipment bases | • See Note 2 | • See Note 2. | If floors are new or unpainted: Clear  
If existing floors are painted: Grey |
### Item No. | Items to Be Painted | TNEMEC | CARBOLINE | FINISH COLOR (Remarks)
--- | --- | --- | --- | ---
6 | A. Pumps, Motors, Force Main, Ventilation Fans, Heaters, etc. (Ferrous Metals) | • Three Coats: Series V69 Hi-Build Epoxoline II @ 6.0-8.0 mils DFT/coat. | • One Coat: Carboguard 890 @ 4.0-6.0 mils DFT.  
• Two Coats: Carboguard 690 @ 6.0-8.0 mils DFT/coat. | Gray

B. Pump Suction & Discharge Piping, | • One Coat: Series 27 WB Tyoxy @ 3.0-3.5 mils DFT.  
• Two Coats: Series V69 Hi-Build Epoxoline II @ 6.0-8.0 mils DFT/coat. | • One Coat: Carboguard 890 @ 4.0-6.0 mils DFT.  
• Two Coats: Carboguard 690 @ 6.0-8.0 mils DFT/coat. | Blue

7 | Galvanized Piping/Steel | • Two Coats: Series V69 Hi-Build Epoxoline II @ 6.0-8.0 mils DFT/coat. | • One Coat: Rustbond @ 1.0-2.0 mils DFT.  
• Two Coats: Carboguard 690 @ 6.0-8.0 mils DFT/coat. | Gray

8 | Wood | • One Coat: Series 151-1051 Elasto-Grip @ 0.7-1.5 mils DFT.  
• Two Coats: Series 1029 @ 2.0-2.5 mils DFT. | • One Coat: Carbocrylic/Sanitile 120 @ 2.0 mils DFT.  
• Two Coats: Carbocrylic 3359 @ 2.0-3.0 mils DFT. | White

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Table Notes:

1. Two coats Sherwin Williams H & C Colortop Water-Based Solid Color Concrete Stain @ 150-250 ft²/gal per coat may be used for this item.

2. If floors are new or unpainted, concrete floors and equipment bases shall receive two coats Sherwin Williams H & C Colortop Solvent-Based Solid Color Concrete Sealer 250 @ 150-200 ft²/gal per coat. If existing floors are painted Concrete Sealer shall be Solid Color Solvent Based applied at the same rate as above. H & C Shark Grip Slip Resistant Additive shall be added to the second coat @ 3.2 ounces/gal.

3. Listed DFT mils per coat applies for spray-on application. Application of paint by roller or brush shall be in accordance with manufacturer's requirements. Additional coats required by the manufacturer to achieve overall listed DFT shall be completed by the Contractor.

END OF SECTION
SECTION 10520
FIRE-PROTECTION SPECIALTIES

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section includes all labor, materials, equipment, and incidentals required to provide and install wall-mounted portable fire extinguishers, as specified herein.

1.02 SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.01 FIRE EXTINGUISHER

A. Fire extinguisher shall be wall-mounted, steel cylinder, nitrogen pressurized, dry chemical, multi-purpose type, with 5lbs. capacity minimum for Class ABC fires; J.L. Industries Cosmic 5E Multi-Purpose Dry Chemical, or approved equal.

B. All fire fighting devices must comply with the provisions of the Occupational Safety and Health Act of 1974 (OSHA), Part 1926. Fire extinguisher shall be FM and UL-approved.

C. Fire extinguishers shall be furnished with an approved type wall mounting bracket, designed to mount fire extinguisher provided.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install fire fighting extinguisher in accordance with manufacturer’s written instructions. Coordinate all built-in items with masonry work.

B. Mounting height to top of bracket shall be 4’-8”.

END OF SECTION
PART 1 – GENERAL

1.01 SUMMARY

A. This section covers submersible tank mixing systems up to 0.5 HP in size intended for continuous use while submersed in potable water storage tanks. Each mixer shall have the ability to function continuously on a year-round basis regardless of drain and fill cycles. Each mixer shall consist of a water-filled submersible motor, an impeller, mounting tripod, float switch, and a non-submersible control center that houses all control electronics.

1. The Contractor shall furnish a PWM400V3 PAX Water Mixer with a PCC405V3 PAX Control Center, or approved equal. Submersible mixing system shall be installed together with all controls, wiring, and accessories necessary for a complete, reliable, and operable system.

2. The Contractor shall provide new 1-inch minimum PVC-coated rigid galvanized steel (RGS) conduit from existing power panel (adjacent to altitude valve vault) to new equipment mounting pad at tank column leg. All conduit shall be provided in accordance with Division 16 requirements. Conduit shall be direct buried per the requirements of the Contract Drawings, and in no case shall the bury depth be less than 30-inches below grade. Conduit shall be routed around southern edge of altitude valve vault over to nearest tank column leg. Penetration into existing power panel shall be made in accordance with NEC requirements to ensure a waterproof connection. The Contractor also shall provide new 20-AMP GFCI circuit breaker in existing power panel.

3. The Contractor shall provide a pad-mounted safety disconnect switch adjacent to the mixer control center. Provide concrete pad with equipment rack to mount safety disconnect switch and mixer control center.

4. The Contractor shall provide one tank penetration to be located at the base of the center vent. The Contractor also shall provide new 1-inch minimum PVC-coated threaded RGS conduit from the mixer control center up along the tank column leg and up the outside of the steel tank shell to the point of tank penetration. Penetration through the walkway at the tank beltline shall be kept to a minimum.

5. The Contractor shall supply a certified electrician to perform all electrical connections from the existing power panel to the mixer control center and from the control center to the water mixer.

6. The existing Sparks Elevated Tank will be drained and out of service as part of the tank rehabilitation work. Tank interior rehabilitation, including inspection, shall be completed prior to submersible mixer installation.
B. This section also covers requirements for the Contractor to furnish labor, materials, equipment, and services necessary for and incidental to the execution and completion of disinfection in accordance with Owner, Baltimore City, and AWWA standards.

1. The Contractor shall: thoroughly clean all interior tank surfaces and appurtenances, complete installation of the submersible mixer, provide digital color photographs of the mixer as installed, and seal the tank for disinfection and service.

2. The Contractor shall disinfect the tank in accordance with Owner, Baltimore City, and AWWA requirements.

1.02 APPLICABLE SPECIFICATIONS, CODES, AND STANDARDS


B. Code of Maryland Regulation (COMAR) 09.20.01.03, Limit on Lead Content

C. Code of Maryland Regulation (COMAR) 26.04.01.33, Direct and Indirect Additives

D. Occupational Safety and Health Administration, OSHA

E. American Water Works Association (AWWA) Standard B300, latest edition


G. NSF/ANSI Standard 60

H. NSF/ANSI Standard 61

I. Underwriters Laboratories Inc., UL508

J. Total Coliform Rule (40 CFR 141.21(f))

1.03 SUBMITTALS

A. Submit documents in accordance with Specification 01000.

B. NSF Certification

1. Copies of the NSF-60 certified listing for all chemicals used in tank disinfection

2. Copies of the NSF-61 certified listing for all material being placed inside the tank interior, including the motor and power cable

C. Shop drawings including, but not limited to, the following:

1. Submersible mixer and mixer control center dimensional drawings.

2. Mixer and mixer control center wiring diagrams.
3. Disconnect switch.

4. Detail of tank penetration including method of sealing.

5. Concrete pad with struts and equipment rack for mounting disconnect switch and control center.

D. Outline of plan for cleaning and disinfecting tank interior, including disposal of all waste products

E. Operation and Maintenance Manuals shall be obtained from the equipment manufacturer indicating the following:

1. General equipment specifications and data sheets, including dimensions and weight

2. Installation, start-up, storage, and operation instructions

3. Maintenance instructions and factory-recommended maintenance schedule

4. Point-to-point wiring diagrams

5. List of equipment or tooling necessary for diagnostics, trouble-shooting, repair, or general maintenance

6. Contact information for warranty service

7. Color photographs of the equipment as installed and ready for service

1.04 QUALITY ASSURANCE

A. Mixing System

1. Each mixing system, according to standard engineering practices at the factory testing facilities, shall be tested prior to deployment.

2. Mixing system and control center shall be provided by the mixing system manufacturer.

B. Tank Disinfection

1. After the tank is fitted for disinfection and held full for 24 hours, the Contractor shall obtain one sample of water from the top of the tank and one sample of water from the bottom of the tank and shall submit the samples to the Engineer for chlorine residual analyses.

2. After completion of chlorine residual testing, the Contractor shall obtain samples of water from the top of the tank and from the bottom of the tank and shall submit the samples to the Engineer for total coliform (bacteriological) analyses.
3. The Engineer will deliver the chlorine residual and bacteriological samples to the Baltimore City Water Quality Laboratory located at the Ashburton Water Filtration Plant.

4. Concurrent with bacteriological testing, the Contractor shall obtain water samples and shall submit samples to the Engineer for analysis of Volatile Organic Compounds (VOCs) and for analysis of turbidity.

C. COMAR

1. All materials that contact drinking water shall comply with the Limit on Lead Content, COMAR 09.20.01.03.

2. In accordance with COMAR 26.04.01.33, Direct and Indirect Additives, the Contractor shall be limited to incorporating into this Contract only products (any materials that come into contact with water intended for use in the public water supply) which meet the applicable American National Standards Institute/NSF International (ANSI/NSF) standards for direct or indirect water additives. The products may be certified by an organization accredited by ANSI for such testing (i.e., International Association of Plumbing and Mechanical Officials Research and Testing, Ontario, CA; Underwriters Laboratory, Northbrook, IL; and Water Quality Association, Lisle, IL).

D. Wastewater Disposal Plan

1. Develop a plan for safe disposal of chlorinated wastewater. Submit plan to Engineer for review and approval at least two (2) weeks in advance of disinfection/testing activities. Do not perform disinfection/testing prior to receipt of approval from the Engineer.

2. Include in the disposal plan provisions for neutralizing chlorine and any other contaminants to levels acceptable to the Maryland Department of the Environment (MDE).

3. There are no sanitary sewer lines on site.

1.05 WARRANTY

A. For the period of time beginning with Substantial Completion and ending with the time periods listed below, the submersible mixer, control center, and all interconnections shall be warranted to be free from defects in material and workmanship, including all parts, freight, and factor or authorized service facility labor.

1. Seven (7) years on all supplied parts

2. One (1) year for labor.
PART 2 – PRODUCTS

2.01 PERFORMANCE

A. Mixing system shall mix completely reservoir according to the following minimum performance requirements. These requirements shall be measured and validated after installation by a manufacturer’s representative using readily available tools such as temperature probes and total chlorine grab samplers.

1. Temperature Uniformity – for tanks up to 4,000,000 gallons in volume:
   All temperatures shall converge to within 1.0°F within 24 hours after mixer is installed and activated.

2. Disinfectant Residual Uniformity – for tanks up to 4,000,000 gallons in volume:
   Disinfectant residual within top five feet (5’) of tank and bottom five feet (5’) of tank shall converge to within 0.20 ppm within 24 hours after mixer is installed and activated. During continuous operation of the mixer, under normal disinfectant dosing parameters, disinfectant residual shall converge to within 0.20 ppm at least once every 24 hours.

2.02 GENERAL

A. Mixing system shall consist of an impeller mounted on a submersible motor and supported approximately three (3) feet in height from the tank floor in order for it to launch a jet of water from the bottom of the tank up toward the surface of the water. Mixer control and operation shall be independent of tank drain and fill cycles to ensure constant mixing. Wet side of mixer shall weigh less than 75 pounds and dry side shall weigh less than 56 pounds. Both wet side and dry side shall be able to be hoisted, installed, and/or removed by on-site personnel without additional equipment needed so that there is no crush hazard or entanglement hazard present and that the weight of the mixer on the tank floor does not cause damage to the interior coating.

B. Mixing system active components shall be elevated to a minimum of 18 inches above the tank floor to avoid disturbing accumulated tank sediment or entraining particles that may cause accelerated wear of moving parts.

C. Mixers using submersible pump with slit, “water sheet” or horizontal motor mounting designs are not acceptable.

D. Power source for Mixer shall be 230VAC three-phase grid power to allow unit to continue 24/7 operation where necessary.

2.03 CONSTRUCTION

A. Components – wet side shall be NSF/ANSI Standard 61 certified. Equipment entering tank shall not adhere to, scratch or otherwise cause damage to internal tank coating or put undue stress on the materials of the tank construction. Equipment shall fit through a standard hatch of size 12”x12” or larger.
Each submersible mixer shall consist of the following components regardless of the power source selected:

1. Impeller:
   a. AISI Type 316 Stainless Steel.
   b. Balanced to within 0.5 gram-inches
   c. Passivated per ASTM A380 to minimize corrosion.
   d. Not more than 8 inches in overall height.
   e. Not more than 4.7 inches in diameter.
   f. Not more than 2.4 lbs. in weight.
   g. Shall not create cavitation at any rotational speed up to 2500 RPM.

2. Motor:
   a. AISI Type 304 Stainless Steel body.
   b. Chlorine/Chloramine resistant rubber seals.
   c. Fully submersible.
   d. Low power (0.5 HP maximum).
   e. Water-filled motor.
   f. Water-lubricated motor.

3. Mounting:
   a. AISI Type 316 Stainless Steel.
   b. Three (3) detachable legs or pedestal mount.
   c. NSF/ANSI Standard 61 certified EPDM rubber, non-skid, non-scratch feet or insulating pad.
   d. Attachments secure motor cable away from impeller.
   e. Overall weight of wet-side unit shall not exceed 75 pounds to avoid damaging tank floor.
   f. Overall height of unit shall not exceed 5 feet.
B. Components – dry side – each control center shall accept 120VAC single phase service and convert to 230VAC three-phase service for the mixer power and consist of the following components. All control panels shall be in accordance with Specification 17200.

1. Enclosure:
   a. Lockable
   b. Weather Resistant
   c. Overall weight of control center not to exceed 50 pounds.
   d. Green and red LED indicator lights show motor status.
   e. Enclosure shall be in accordance with Specification 17200.

2. Motor Controller/VFD:
   a. Rated to 1.0 HP
   b. Operating temperature range: -4°F to 129°F
   c. Manual speed control
   d. Thermal shut-off protection built-in
   e. Current overload protection built-in
   f. SCADA outputs included:
      1) Digital Output signal indicating motor running
      2) Digital Output signal indicating fault
      3) Digital Input/Output signal allowing remote motor on/off
      4) RS-485 or Dry Contact connections

3. GFCI Protection
   a. 120VAC, single-phase, with a 300mA trip level GFCI included inside control center.

4. Branch Circuit Protection

5. Sine Filter
   a. Dry-side mixer components shall include sine filter to prolong motor life and reduce noise level.
2.04 CONTROLS
A. Each unit shall be equipped with all necessary controls, inter-wired, to provide the following minimum functions:
   1. On/Off switch to control power to mixer
   2. Automatically-activated motor shut-off if water level drops below motor height in tank
   3. Sine filter
   4. Any other controls shown on electrical and instrumentation drawings

2.05 ACCEPTABLE MANUFACTURERS
A. PAX Water Technologies (Richmond, CA) or pre-approved alternate.
B. Alternates shall follow the procedures set forth in Specification 01000, Section 1.18, Equal or Approved Equal.
C. Alternates must be able to demonstrate data meeting blend time performance output and be approved (in writing) by the Engineer at least ten (10) days prior to bid opening.

2.06 SAFETY DISCONNECT SWITCH
A. Provide heavy duty safety switch, 2-wire (2 blades and fuseholders), rated for 240 VAC, 30 Amp, in NEMA 4X enclosure; model H221DS by Square D or approved equal. Provide solid neutral assembly, copper only neutral kit, inside safety switch; model SNO3C by Square D or approved equal. Provide standard Class H fuses in initial installation and furnish one set of fuses to Owner as a spare set.

2.07 DISINFECTION MATERIALS
A. Materials for tank disinfection shall be as listed in Section 3: Forms of Chlorine for Disinfection of AWWA C652.

PART 3 – EXECUTION

3.01 MIXER INSTALLATION
A. The Contractor shall furnish services of a factory-trained installation contractor or crew having experience with installation procedures and operation and maintenance requirements for the type of equipment installed under these specifications. Mixer shall be installed through existing roof hatch or through existing center vent. If center vent is utilized for installation, Contractor shall remove vent, properly secure or store vent, and re-install vent at the end of Mixer installation.
B. Tank penetration for cable entry shall be through the base of the center vent. Contractor shall submit for approval by the Engineer a detailed sketch showing the proposed penetration and method of sealing.
1. Fitting shall prevent moisture intrusion into tank and ideally will be horizontally oriented.

2. Fitting shall be a 1-inch diameter fitting to allow cable to pass through.

3. Strain relief for power cable shall be part of the Contractor-supplied fitting for tanks more than 30 feet in depth.

C. Installation of the in-tank (wet side) components shall be performed by personnel with confined space training while the tank is drained and empty.

D. Installation of the outside-of-tank (dry side) components shall be performed by the Contractor according to the manual provided.

E. The mixer shall be installed in accordance with approved procedures submitted and as shown, unless otherwise approved in writing from the factory.

F. Control Center and Disconnect Switch

1. The Contractor shall provide a concrete pad, Mix No. 3, of sufficient size to mount the control center and disconnect switch near the tank column leg.

2. Control center and disconnect switch shall be strut-mounted; the base of the control center shall be 36 inches above the existing grade. Install control center in accordance with the manufacturer’s recommendations. Install disconnect switch in accordance with local electrical codes.

3.02 TANK DISINFECTION

A. After completion of the mixer installation and the delivery of the inspection report, the tank shall be disinfected before being placed into service. The detailed procedures to be followed for disinfection shall be in accordance with AWWA C652, Disinfection of Water Storage Facilities.

B. The Contractor shall first clear the tank of all equipment, tools, scaffolding and debris and broom clean the floor in accordance with Section 2 of AWWA C652. All interior surfaces, including roof, shall be thoroughly washed with water to remove dirt, dust and other contaminants. Note: There are no fire hydrants on the tank site nor are there any fire hydrants adjacent to the tank site. The Contractor shall submit a plan for approval showing how he intends to provide water for washing the tank interior.

C. Following cleaning of the tank, disinfection shall be performed in accordance with Section 4.3 Chlorination Method 2 from Section 4 – Alternative Methods of Chlorination of AWWA C652, except that separate drain piping shall not be required to have available chlorine of not less than 10 mg/L when filled with water. Following this initial disinfection, perform the following:

1. Properly dispose of all chlorinated water either by hauling to an adjacent sewer or dechlorinating and sending to drain.

2. Fill the tank to 50-percent capacity with system water and isolate the tank. Initial chlorine residual should be approximately 0.70 ppm.

3. Turn on the submersible mixer and visually inspect for proper operation.
4. With the mixer in service, add approximately 16.7 pounds of calcium hypochlorite (with 65-percent available chlorine) distributed through the roof hatch. Fill the tank to overflow and isolate for a full 24 hours; leave mixer in operation.

5. Obtain samples for chlorine residual. Chlorine residual should be approximately 2.0 ppm.

D. The Contractor shall perform all disinfection operations, including furnishing all chlorination equipment and chemicals.

E. After the tank has been filled and held for 24 hours, the Contractor shall obtain water samples and shall submit the samples to the Engineer for analysis for total coliform per Method MMO-MUG. Two (2) or more successive bacteriological passing tests, from samples drawn a minimum of 24 hours apart, shall constitute a passing test. If the test for coliform is positive, the tank shall be drained and the disinfection and testing procedures repeated until two (2) consecutive samples are negative.

F. Concurrent with bacteriological testing, the Contractor shall obtain water samples and shall submit samples to the Engineer for analysis of Volatile Organic Compounds (VOCs) and for analysis of turbidity.

G. Bacteriological, VOC, and turbidity testing shall be performed by the Baltimore City Water Quality Lab, located at Ashburton Water Filtration Plant. Results of the bacteriological samples shall be submitted to MDE Water Supply Program. Authorization shall be provided once all testing is found acceptable by MDE Water Supply Program and the Ashburton Water Filtration Plant.

H. Baltimore City personnel shall operate all valves.

I. The stored tank water shall comply with current State and USEPA standards for organic, inorganic, and biological contaminants as influenced by the operations of the Contractor. One tank of water for the disinfection shall be furnished by the Owner at no charge to the Contractor. Additional water shall be furnished at current municipal water rates charged by the Owner and shall be paid for by the Contractor.

3.03 TRAINING

A. PAX Water Technologies staff (or their factory certified representatives) shall instruct designated maintenance personnel in the safe and proper operation of the PAX Water Mixer. This training shall reference the operations manual provided with equipment and shall show how to check for proper functioning of the equipment, including procedures to verify mixer performance by testing for temperature uniformity and disinfectant residual uniformity. Training shall be a minimum of one 4-hour session provided on site at a time approved in advance by the Engineer.

END OF SECTION
SECTION 11300

CENTRIFUGAL WATER PUMPS

PART 1 - GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, equipment, and services necessary for and incidental to furnish, install, test, and place in operation three (3) centrifugal pump, horizontal single stage, double suction, single or double volute, axially split pumping units, complete with motors, baseplates, couplings and guards, as shown on the Contract Drawings and as specified herein for replacement of Pumps A, B, and C. General orientation of the units and other physical characteristics shall be as shown on the Contract drawings.

B. The physical size and weight of the pumps furnished must be capable of being installed in the existing pumping station, as shown on the drawings. The Contractor’s attention is directed to the fact that there are limitations as to the size and weight of pump that will be able to be installed given the existing structure, crane and hoist system in the pumping station. No additional compensation will be paid for installation of the pumps. Contractor shall be responsible for any damage that may occur to pumps, existing structure, existing equipment and any other equipment during the course of installation and shall be responsible for repair or replacement to the satisfaction of the Engineer and at no additional cost to the Owner.

1.02 SUBMITTALS

A. Submit in accordance with Section 01000.

B. Only complete submittal packages including mechanical, electrical, structural, controls and instrumentation equipment shall be reviewed by the Engineer. Partial submittal packages shall be returned to the Contractor without review.

C. Shop Drawings:

1. Submit for pumps, motors and supports.

2. Required information:

   a. General:

      1) Dimensions.

      2) Details of construction and installation.

   b. Motor data:

      1) Manufacturer.
Sparks Water Pumping Station & Elevated Tank Improvements
J.O. 231-203-0035-0514

2) Model.
3) Rated horsepower.
4) Efficiency.
5) Service factor.
6) Current and load data.
7) Bearing type.
8) Bearing calculations.
9) Temperature rise rating.
10) Detail of shaft coupling.
11) Maximum vibration limits of pump and motor.
12) Maximum temperature limits of pump and motor bearings.
13) Motor performance curves.
14) Sound pressure levels.
15) Limitation of number of starts of motor units.
16) Weight.

c. Pump data:
1) Manufacturer.
2) Model.
3) Certified performance curves with operating points plotted on curves.
4) Rated capacities.
5) Furnished specialties and accessories.
6) Materials of construction.
7) Pump orientation.
8) Bearing types and lubrication equipment information.
9) Seal types.
10) Weight.
D. Operation and Maintenance Manuals:

1. Submit for all pumping equipment.

2. Required information:
   a. Equipment function, normal operating characteristics and limiting conditions.
   b. Assembly, installation, alignment, adjustment and checking instructions.
   c. Operating instructions for start-up, routine and normal operating, regulation and control, and shutdown and emergency conditions.
   d. Lubrication and maintenance instructions.
   e. Guide to “troubleshooting”.
   f. Parts lists and predicted life of parts subject to wear.
   g. Outline, cross-sections, assembly drawings, engineering data and wiring diagrams.
   h. Test data and performance curves.

E. Equipment Certification Form: At the time of submitting shop drawings, submit the manufacturer’s warranty and equipment certification attesting that the manufacturer has examined the Contract Drawings and specifications and that the equipment provided will meet the performance criteria and conform to the specification requirements. Equipment operation warranty shall be provided after successful installation.

F. Manufacturer Certificates: The Contractor shall furnish the Engineer with Manufacturer’s Certificates as specified under Section 01780.

1.03 QUALITY ASSURANCE

A. Design and construct the pumps in accordance with standards of the Hydraulic Institute. The efficiency of the pumps, when operating under conditions of the specified capacities and heads, shall be as near peak efficiency as practicable.

B. Obtain pumping equipment, motors, and appurtenances from a single pump supplier whose responsibility it is to ensure that the pumping equipment is properly coordinated and operated in accordance with these Specifications.

C. Design and construct mechanical and electrical equipment in accordance with ANSI, HI, and NEMA Standards, latest editions.

D. Submit shop drawings certified for construction by the pump manufacturer which includes location of electrical connections; wiring diagrams; anchor bolt layout; details indicating construction and materials of construction; diameter of shafting; gear and bearing ratings; installation drawings showing each pump, suction and discharge piping and fittings, specials, supports, concrete pads, clearances, and dimensions to install the pump in the spaces indicated on the Contract drawings.
E. Qualifications:

1. Fabrication and installation personnel:
   a. Trained and experienced in the fabrication and installation of the materials and equipment.
   b. Knowledgeable of the design and the reviewed Shop Drawings.

1.04 VIBRATION LIMITS

A. The amplitude of vibration of any centrifugal pumping unit, when operating at any of the speeds specified herein shall not exceed the requirements set forth in the latest revision of the Hydraulics Institute Standards.

B. The amplitude of vibration for all other pumping units shall not exceed the requirements of the pump manufacturer’s standard.

1.05 NAME PLATES

A. Each pump shall be provided with a stainless-steel nameplate, riveted or bolted to the unit with stainless steel hardware.

B. Nameplates shall contain the manufacturer’s name, equipment size (i.e., HP, impeller diameter, speed, flow and head, etc.) and type, serial number, and other pertinent data specified herein.

1.06 DELIVERY, STORAGE AND HANDLING

A. Preparation for Shipment: All pieces shall be delivered in the largest sizes practical for ease of installation within the existing building and ease of minimal field assembly by the Contractor. Individual pieces shall be permanently tagged with welded erection marks or stainless-steel tags cross-referenced with information on the manufacturer's erection and assembly drawings. All field connections shall be designed for all static, live and erection loads.

B. Drive units, mechanical and electrical components shall be protected from the weather and suitably packaged to facilitate handling and storage. Special lubricating and rust preventative oils shall be provided to prevent internal corrosion of gear assemblies. All mechanical equipment shall be kept thoroughly dry at all times and shall be stored indoors. All equipment stored on the job shall be protected and maintained in accordance with the manufacturer's recommendations. When requested by the Engineer, Contractor shall provide written certification from manufacturer that the equipment is being properly stored.

C. Pumps shall be stored on site under cover in accordance with the requirements of Specification Section 01000.
D. Rejected material and replacements:
   1. Reject damaged, deteriorated or contaminated material and immediately remove from the Site.
   2. Replace rejected materials with new materials at no additional cost to the County.

1.07 FIELD SERVICES AND WARRANTY

A. Provide services of a manufacturer’s representative for not less than two (2) days on site for installation inspection and field testing for each pump.

B. The Engineer may elect to rearrange the configuration of the days of site support at his sole discretion. Site visits not used by the manufacturer during the construction period shall be made available to the County/Engineer during the warranty and operations period, not to exceed two years from the date of conditional acceptance by the County.

C. Each site visit shall be confirmed in writing by a daily log signed by the Engineer and the Manufacturer’s representative. Failure of the Manufacturer’s representative to obtain a signature from the Engineer will result in the disqualification of the site visit and will not be attributed to the completion of the total specified number of site visits.

D. Manufacturer’s Warranty: Shall be for a period of five (5) years, with no hour limitation, non-prorated, from the date of final acceptance. The warranty shall cover pumps and motors against defects in materials and workmanship, including all parts and factory or authorized service facility labor.

1.08 SPARE PARTS

The following spare parts shall be furnished as listed per furnished water pumping unit and motor, and shall be delivered by the Contractor to the site:

A. Pump Spare Parts Per Pump:
   1. One (1) Impeller.
   2. Two (2) Impeller Wear Rings.
   3. Two (2) Casing Wear Rings.
   4. Two (2) complete sets of Inboard and Outboard Bearings.
   5. Mechanical Seal Repair Kit, one (1) set per seal. Include split rotary and stationary faces, springs, elastomers, gaskets and fasteners.
   6. Two (2) Pump Gaskets and O-ring set.
   7. One (1) geared coupling.
   8. Twelve (12) month’s supply of lubricating oil or grease. (Contractor supplied).
B. Motor Spare Parts Per Motor:

1. Two (2) sets of Motor Bearings.

2. Two (2) complete Motor RTD’s sets.

3. One (1) motor protection relay

1.09 MAINTENANCE TOOLS

The Contractor shall furnish with the pumping units all special tools, spanner, wrenches, etc. that may be required to assemble, dismantle, repair or adjust the pumps and motors including one set of the following:

A. Jigs, fixtures, etc. necessary for the removal of the rotor, bearings and other assemblies.

B. Motor shaft turning lever.

C. Coupling adjusting nut turning level for the coupling.

PART 2 - PRODUCTS

2.01 HORIZONTAL SPLIT CASE CENTRIFUGAL PUMPS

A. The pumps shall operate at the specified capacities and heads, and over the range of operating conditions specified without cavitation, noise, and vibration that exceed the specified limits.

B. The pump curve shall pass through the design points, as specified herein. The NPSH required by the pump shall not exceed the NPSH available when the pump is operating at full speed at the minimum operating head.

C. The pumps specified in this section shall be designed and constructed to meet or exceed the following requirements:

1. Pumps A and B

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Suction size, minimum:</td>
<td>8-inch</td>
</tr>
<tr>
<td>b. Discharge size, minimum:</td>
<td>6-inch</td>
</tr>
<tr>
<td>c. Full Load Amps, maximum</td>
<td>38 amps</td>
</tr>
<tr>
<td>d. Power (NOL), maximum at any point on the curve</td>
<td>30 HP</td>
</tr>
<tr>
<td>e. Head, minimum at pump runout</td>
<td>25 ft</td>
</tr>
<tr>
<td>f. Speed, maximum</td>
<td>1,800 rpm</td>
</tr>
<tr>
<td>g. Design Capacity</td>
<td>1,250 gpm</td>
</tr>
</tbody>
</table>
h. Design TDH | 60 ft
---|---
i. Minimum pump efficiency at design point | 80%
j. Minimum pump shut-off head | 83 ft

2. Pump C

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
</table>
a. Suction size, minimum: | 12-inch |
b. Discharge size, minimum: | 10-inch |
c. Full Load Amps, maximum | 69 amps |
d. Power (NOL), maximum at any point on the curve | 60 HP |
e. Head, minimum at pump runout | 39 ft |
f. Speed, maximum | 1,800 rpm |
g. Design Capacity | 3,000 gpm |
h. Design TDH | 60 ft |
i. Minimum pump efficiency at design point | 84% |
j. Minimum pump shut-off head | 82 ft |

D. Pump Construction:

1. Major pump components shall be of gray cast iron, ASTM A-48, Class 40 or 30B with smooth surfaces devoid of porosity or other irregularities. All exposed nuts and bolts shall be AISI type 316 stainless steel construction. All metal surfaces coming into contact with the pumped media (other than the stainless-steel components) shall be protected by a factory applied NSF 61 spray coating of acrylic dispersion zinc phosphate primer or approved equal. The exterior of the pump shall be coated with polyester resin, powder coat epoxy, or approved equal.

2. Flanges shall be ANSI 125 lb.

E. Impeller: The impeller shall be made of type 316 stainless steel and be enclosed double suction type. The impeller shall be machined and polished to perform with maximum efficiency. Each impeller shall be dynamically balanced to ISO-1940; Grade 2.5 in order to minimize vibration and improve bearing life. The impellers shall be keyed to the shaft and secured at the hub between the shaft sleeves extending through the stuffing box with shaft nuts external to the stuffing box.
F. The stuffing box may be cast separate and sealed with O-Rings at the casing or cast solid with the upper and lower casing halves. A separate cast stuffing box design shall employ mounted bearing housings, with a full register fit. The stuffing box shall be suitable for use with mechanical seals. Pumps shall be furnished with split mechanical seal, packing system is not acceptable.

G. Volute/Casing: The casing shall be of close-grained cast iron equivalent to ASTM A-48 and hydrotested to 1.5 times the casing working pressure. The upper half casing shall have means of being lifted by the use of cast holes, lugs, eye bolts, etc. The casing shall be supplied with all necessary vents, drains and gage connections. Furnish stainless steel wear rings. The casing ring shall be designed to provide a smooth water flow onto the impeller eye. The impeller ring shall be locked with a positive means to prevent rotation. Impeller and casing wear rings shall be of dissimilar hardness and positively secured to the impeller with set screws.

H. Shafts: Each shaft shall be of 316 stainless steel material and adequately designed to meet the maximum torque required at any normal start-up condition or operating point in the system. Maximum deflection shall not exceed .002” at the stuffing box. Each pump shaft shall have a polished finish and have accurately machined shoulders to accommodate bearings, seals and impeller.

I. Shaft Sleeves: Sleeves shall be replaceable type 316 stainless steel key driven and sealed with an O-Ring to prevent leakage between shaft sleeves and pump shaft. Sleeves which are threaded on to the pump shaft are not acceptable. On mechanical seal pumps, a spacer sleeve with adjacent shaft sleeve nuts shall be supplied, allowing for split type mechanical seals to be mounted directly on the shaft sleeve.

J. Rotating Assembly: The impeller, shaft and rotor shall be dynamically balanced such that undue vibration or other unsatisfactory characteristics will not result when the pump is in operation.

K. Bearings: The bearings arrangement shall be selected to suit the pump speed and rating for the given application. The manufacturer shall provide grease lubricated anti-friction bearings. Motor bearings shall come from the factory pre-greased and shall be capable of being greased in the field. Bearings shall be lubricated with Polyrex EM or similar lithium complex grease. Bearings shall be of sufficient size and properly spaced to transfer all radial and axial loads to the pump housing and minimize shaft deflection. L-10 bearing life shall be a minimum of 100,000 hours per AFMBMA at the best efficiency point.

L. Pump Temperature Monitoring: Temperature shall be monitored at each pump bearing, and in an area representative of the local ambient temperature. Temperature shall be monitored in these areas via 120 ohm 3-wire nickel resistance temperature detectors (RTDs). Design of the RTD must meet control system requirements and shall be integrated into the associated motor protection relay (Multilin) unit.
M. Baseplates: The pump and motor shall be mounted on an extended fabricated steel baseplate with provision to collect leakage and of sufficient size and rigidity to support the unit and prevent harmful vibration. The steel base shall be anchored to the level surface of a concrete pad with suitably sized Type 316 stainless steel anchor bolts. Bent metal or formed bases are not acceptable. Burning or cutting of the baseplate in the field shall be cause for rejection of the entire pumping unit.

N. Motor:

1. The motor housing shall be gray cast iron, ASTM A48 Class 40.

2. The service factor (as defined by NEMA) shall be a minimum of 1.15. The motor shall be capable of handling an input voltage variation of +/- 10% from nominal. Maximum allowable temperature rise shall be 90 deg. C at rated horsepower (HP).

3. Motor bearing temperature shall be monitored via 120 ohm 3-wire nickel resistance temperature detectors (RTDs). An RTD shall be provided for each bearing. Design of the RTD must meet control system requirements and shall be integrated into the associated motor protection (Multilin) unit.

4. Motor stator/winding temperature shall be monitored via 120 ohm 3-wire nickel resistance temperature detectors (RTDs). Two RTDs shall be provided for each phase, for six total RTDs for motor stator/winding temperature monitoring. Design of the RTD must meet control system requirements and shall be integrated into the associated motor protection (Multilin) unit.

5. Each pump shall be directly connected to its driver by means of a geared coupling by TD Wood’s or equal. Couplings and disc shall be 300 series stainless steel construction. All metal coupling shall be suitably sized to transmit the required driving torque and to accommodate unavoidable shaft misalignment.

6. Motors shall have NEMA B, Class F insulation, premium efficient, TEFC enclosure. Motors shall be 460-volt, 3 phase, 60 hertz.

7. Motors shall be NEMA MG-1 inverter duty rated for use with variable frequency drives (VFDs) and reduced voltage solid-state soft starters (RVSS).

8. The motor shall be non-overloaded at any point in the design operating range of the pump, including run-out and shut-off. The total capacity of the motor (name plate rating), shall not be exceeded while the pump is operating at any point on the characteristic curve. The service factor shall not be used as part of the motor rating.

9. Motor space heater shall be provided to prevent condensation. Motor heaters shall shutdown when motor is on and then turn on when motor is off. Motor heaters shall powered separately via 120V circuit.

10. Motors shall be capable of no less than 2 cold starts and 1 hot start per hour.
11. The motor specified in this section shall be designed and constructed to meet the following performance requirements:

Pumps A and B:

<table>
<thead>
<tr>
<th>Load</th>
<th>Max. HP</th>
<th>Max. Amperes</th>
<th>RPM</th>
<th>% Uncorrected Power Factor</th>
<th>% Min. Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Load</td>
<td>0</td>
<td>11.9</td>
<td>1775</td>
<td>5.4</td>
<td>0.0</td>
</tr>
<tr>
<td>1/4</td>
<td>7.5</td>
<td>14.4</td>
<td>1775</td>
<td>63.8</td>
<td>91.1</td>
</tr>
<tr>
<td>2/4</td>
<td>15</td>
<td>20.1</td>
<td>1775</td>
<td>81.3</td>
<td>94.1</td>
</tr>
<tr>
<td>3/4</td>
<td>22.5</td>
<td>27.2</td>
<td>1775</td>
<td>86.5</td>
<td>94.3</td>
</tr>
<tr>
<td>4/4</td>
<td>30</td>
<td>35.0</td>
<td>1775</td>
<td>88.1</td>
<td>93.6</td>
</tr>
</tbody>
</table>

Pump C:

<table>
<thead>
<tr>
<th>Load</th>
<th>Max. HP</th>
<th>Max. Amperes</th>
<th>RPM</th>
<th>% Uncorrected Power Factor</th>
<th>% Min. Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Load</td>
<td>0</td>
<td>22.7</td>
<td>1775</td>
<td>4.4</td>
<td>0.0</td>
</tr>
<tr>
<td>1/4</td>
<td>15</td>
<td>247.9</td>
<td>1775</td>
<td>60.6</td>
<td>92.2</td>
</tr>
<tr>
<td>2/4</td>
<td>30</td>
<td>40.0</td>
<td>1775</td>
<td>79.2</td>
<td>94.8</td>
</tr>
<tr>
<td>3/4</td>
<td>45</td>
<td>54.0</td>
<td>1775</td>
<td>85.2</td>
<td>95.2</td>
</tr>
<tr>
<td>4/4</td>
<td>60</td>
<td>71.0</td>
<td>1775</td>
<td>87.1</td>
<td>94.4</td>
</tr>
</tbody>
</table>

* Refer to contract drawings electrical single line diagram for power factor after correction.

O. Controls: Local pump controls shall be provided. Pumps shall be capable of being controlled remotely via the Pump Control Panel. Refer to electrical and instrumentation drawings for pump control requirements.

1. "Local-Off-Remote" door mounted selector switch shall be provided within the control panel for operating the pump manually when in "Local", pump disable when in "OFF", and normal operation when in the "Remote" position. The selector switch shall not disable the alarms under any condition.

2. Provide indicating lights for pump running, off, and lockout. Indicating lights for open, close, and 4-way solenoid energized indication for the associated cone valve shall also be provided.
3. Emergency stop push buttons shall be provided and mounted in accessible location next to the pump and on the face of the enclosed controller. The E-stop push buttons shall be wired to shut down the pump when depressed.

4. Motor runtime meter and indicator and start counter shall be provided.

5. Interior mounted switch shall be provided to select between soft starter and across the line bypass operation.

6. Lockout relay device shall be GE model HEA hand reset.

7. Multilin Motor / Pump Protection Relay Model SR 469 by G.E. shall be provided for pump and motor protection and integration of the provided pump, motor, and ambient resistance temperature detectors.

P. Mechanical seal:

1. Pump shall be furnished with single split mechanical seals, A.W. Chesterton 442, or Approved Equal. Split mechanical seal shall have rotary and stationary seal faces of reaction bonded silicon carbide (RSC), Aflas ball and socket O-rings, 316 stainless steel metal parts and Eligiloy springs. Seals shall be designed specifically for water applications. Seal water piping shall be Type K copper or brass. Seals shall be furnished with appropriate flush connections using standard NPT ports flush and drain. Application shall be warranted for the same by the pump and seal manufacturer.

Q. Pump Manufacturers:

1. Patterson Pumps are provided as the basis of design. Any modifications required for provision of another pump model are the sole responsibility of the Contractor and will not entitle the Contractor to any additional cost or time.
   a. Pumps A and B: 8x6 MJ-A
   b. Pump C: 12x10 MAD-A

2. ITT – Goulds Pumps
   a. Pumps A and B: Model 3410 M; 6x8
   b. Pump C: Model 3410 L; 10x12

3. Or Approved Equal. Refer to Specification 01000 Section 1.18 for approved equal requirements.

R. Motor Manufacturers:

1. Continental

2. US Electric
3. General Electric
4. Siemens-Allis
5. WEG
6. Reliance/Baldor

PART 3 - EXECUTION

3.01 INSTALLATION

A. The Contractor is notified that existing pumping equipment is required to be removed from service prior to the installation of the new pumping equipment. Coordination with the County and City shall be required.

B. Installation of the pumping systems shall be in complete compliance with applicable requirements of the latest edition of ANSI/HI and the manufacturer’s recommendations.

C. The Contractor shall coordinate sequencing of mechanical/electrical equipment as existing pumping capacity must remain available for the duration of the project. Refer to specification section 01000 for pumping capacity requirements and allowable shutdown duration.

3.02 STARTUP SERVICE AND TRAINING

A. The manufacturer shall furnish the service of a qualified, factory-trained service representative who shall inspect the complete equipment installation under the supervision of the Pump Control System Supplier to insure that it is installed in accordance with the manufacturer’s recommendations, make all adjustments necessary to place the system in trouble-free operation, and instruct the operating personnel in the proper maintenance and operation of the equipment furnished. Refer to Specification 01735 for training requirements. Start-up and training shall occur on separate days.

B. The County reserves the right to videotape and archive all startup and training instruction provided by the manufacturer or authorized representative.

C. After the pumps have been completely installed and wired, the manufacturer’s service representative shall provide all tools and test equipment to perform the following:

1. Megger stator and power cables.
2. Check seal lubrication.
3. Check for proper rotation.
4. Check power supply voltage.
5. Measure motor operating load and no-load current.
6. Check level control operation and sequence.
7. Make all adjustments, as necessary.

D. After each pumping unit has been run for approximately 3 days, the respective coupling shall be checked for proper alignment. If the alignment is correct, the pump and motor shall be dowelled to the baseplate.

E. Furnish a written startup report providing all measurements and readings, confirming all checks and inspections, indicating all adjustments made, and certifying that the installation and operation is in compliance with the specifications and the pump manufacturer’s recommendations. The manufacturer’s representative shall provide all tools and test equipment required to perform testing. Should the manufacturer’s representative fail to provide the necessary testing equipment, the startup will be rescheduled at the Contractor’s expense. The Contractor will not be entitled to additional time or money due to the need to reschedule testing.

F. All startup services pertaining to instrumentation and control shall be under the supervision of the Pump Control System Supplier under Division 17.

3.03 TESTING

A. Factory

1. Each pump shall be performed on a Hydraulic Institute (HI) compliant test stand in a facility located in one of the contiguous 48 United States. Each pump shall be tested in accordance with the latest HI Standards and shall include the following:

a. Impeller, motor rating, and electrical connections shall be checked for compliance with this specification.

b. Prior to testing, each pump shall be run to establish correct rotation.

c. Each pump shall be run with water.

d. Pumps shall be tested with motors supplied under the Contract.

e. Pumps shall be tested at design speed.

f. Bearing and stator/winding temperature readings shall be taken with RTD’s.

g. Tabulated data used to develop performance curves shall be provided.

h. NPSH requirements shall be included on performance curves.

i. Factory testing shall be conducted within the 48 contiguous states and shall be performed at no additional cost.

j. The owner requires 30 days advance notice of the factory tests.

k. Pumps shall be tested on the same day or on consecutive days.
2. Furnish a writing quality assurance record for each pump, confirming the above inspections/testing, at the time of the shipment.

3. Each pump supplied shall be tested in accordance with the latest HI Standards at the factory to determine head versus capacity, pump and motor efficiency, and horsepower draw required. Performance curves shall be based on a minimum of seven evenly spaced test points, including shutoff (or as near to it as possible), ¼, ½, ¾, 4/4, and two additional points. All test points shall be performed and provided in accordance with HI Acceptance Grade IU. No negative tolerances will be allowed for any test parameter.

4. At a minimum, performance curves shall be provided for pump motor speeds of 100% and for the speed required to achieve the specified design flow and head criteria listed above. The curve associated with the speed to obtain the specified flow rate will be used when determining acceptance. At a minimum, the following shall be tested at provided for each supplied pump:
   a. Pump head and efficiency versus capacity.
   b. Motor power, efficiency, and horsepower draw versus capacity.
   c. Pump Net Positive Suction Head Required (NPSHR) versus capacity.

5. The owner reserves the right to witness the factory test at the Owner’s expense. Should the performance of the witness test result in the pumps needing to be retested, the Contractor shall be responsible for all costs and time associated with retesting, including travel expenses (travel, lodging, and meals) for the Owner and/or his representative to attend the re-testing.

6. Furnish eight (8) copies of certified performance curves and test reports for each pump prior to shipment. All data shall be reported in Standard English units.

B. Field

1. Field tests shall be run for the purpose of accepting the pumps for mechanical integrity. Contractor shall submit a proposed test procedure to the County and Engineer for approval. Procedure shall also indicate which valves need to be isolated/operated by the City. Contractor shall provide all necessary instrumentation and services of a testing company for testing pump motors and vibration.

2. The pump shall be exercised for not less than one hour per pump. Demonstrate that pump, motor, and vibration does not exceed ANSI/HI limits and bearing temperatures do not exceed the manufacturer’s recommendations.

3. The Contractor shall retain an independent testing firm, to be approved by the Engineer, to perform a vibration test on each pump while it is operating under load. Vibration measurements shall be taken on the pump bearing housing using a spectrum analyzer/plotter which produces a plot of amplitude versus frequency. Submit to the Engineer a certified plot of amplitude versus frequency for horizontal, vertical, and axial vibrations.
4. The independent testing firm shall establish a vibration base line map for each pump to be used later as a reference during preventative maintenance check.

5. If any equipment fails the vibration tests, such equipment shall either be replaced, or adjustments made until vibration falls within the specified limits. Replacement, adjustments, and retesting shall be performed entirely at Contractor's expense.

6. Contractor shall notify the Engineer a minimum of seven (7) calendar days prior to the start of the scheduled vibration testing so that Engineer may be present during the testing.

END OF SECTION
SECTION 13200

STEEL WATER STORAGE TANK REHABILITATION

PART 1 - GENERAL

1.01 REFERENCES

A. American Water Works Association (AWWA) Standard
   1. DI00-11, Standard for Welded Steel Tanks for Water Storage
   2. C151/A21.51-91, ANSI Standard for Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids

B. American Welding Society (AWS)
   1. Publication D1.1, Structural Welding Code, Steel

C. American Petroleum Institute (API)

D. American Society for Testing and Materials (ASTM)
   1. A36, Structural Steel
   2. A53, Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
   3. A325, Type 3, High-strength Bolts for Structural Steel Joints
   4. A516, Pressure Vessel Plates, Carbon Steel, for Moderate- and Lower-Temperature Service
   5. A537, Pressure Vessel Plates, Heat-Treated, Carbon-Manganese-Silicon Steel
   6. A563, Type C3 and DH3, Carbon and Alloy Steel Nuts
   7. A573, Structural Carbon Steel Plates of Improved Toughness
   8. A580, Stainless and Heat-Resisting Steel Wire
   9. A588, High-Strength Low-Alloy Structural Steel · With 50 ksi (345 MPa) Minimum Yield Point to 4 in. (100 mm) Thick
10. A633, Normalized High-Strength Low-Alloy Structural Steel
11. A662, Pressure Vessel Plates, Carbon-Manganese, for Moderate- and Lower-Temperature Service
12. A678, Quenched and Tempered Carbon Steel Plates for Structural Applications
13. F436, Hardened Steel Washers
14. F593, Stainless Steel Bolts, Hex Cap Screws, & Studs
15. F594, Stainless Steel Nuts

E. American Society of Civil Engineers (ASCE)
   1. ANSI/ASCE 7-05, Minimum Design Loads for Buildings and Other Structures

F. American National Standards Institute (ANSI)

G. Occupational Safety and Health Administration (OSHA)
   1. Regulation 1910.23, Ladders
   2. Regulation 1910.28, Duty to have fall protection and falling object protection
   3. Regulation 1910.29, Fall protection systems and falling object protection-criteria and practices
   4. Regulation 1926.1053, Ladders

H. International Conference of Building Officials (ICBC)
   1. International Building Code (IBC)

I. NACE International (NACE) Standard {formerly National Association of Corrosion Engineers}
   1. Standard RPO 1 78-91, Standard Recommended Practice - Fabrication Details, Surface Finish Requirements, and Proper Design Considerations for Tanks and Vessels to be Lined for Immersion Service
   2. Visual Comparator - Surface Finishing of Welds (Complements NACE Standard RP0178)

J. Specification 01000, Appendix E – Interior Evaluation of the 1,000,000 Gallon Steel Elevated Water Tank.

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1.02 PROJECT CONDITIONS

A. **Submittals:** Submittals shall be submitted for review prior to performing any Work in accordance with Section 01300 - Submittals.

B. **Repair Standards:** See Section 01060

C. **Painting Standards:** See Section 01060

D. **Welder's Certification:** All welders and welding operators shall be certified to the procedures and processes required to accomplish the Work. Welder's certification papers shall be furnished to the Engineer for review prior to the commencement of welding on the tank.

1.03 DEFINITIONS

A. Where encountered, the following terms shall refer to the following:

1. **FIELD OBSERVER** – Representative of Tank Industry Consultants (TIC), or approved equal.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. All structural steel components shall be fabricated from new ASTM A 36 material.

B. All new steel pipe attached to the tank shall be ASTM A 53.

C. All steel plates, shapes, and bars shall be fabricated from new ASTM A 36 material. All steel plates and shapes shall be free from any laminations which bring questions as to the structural integrity of the member. Laminations exposed on the surface or edges of the steel shall be repaired or the member replaced. The CONTRACTOR shall be responsible for ultrasonically or otherwise investigating the extent of sub-surface laminations to the satisfaction of the ENGINEER. Members found to have internal laminations shall be replaced in a timely manner at the expense of the CONTRACTOR.

D. All screen material shall be made of Type 316, stainless steel wire conforming to ASTM A 580.

E. All stainless steel bolts and nuts shall conform to ASTM F 593 and F 594.

E. All interior bolts and nuts below the high water line shall be of silicon bronze or 316 stainless steel material. All bolts used for the roof structure shall be coated with Inorganic Coatings IC 531 high ratio inorganic zinc coating.

F. All aluminum used in the aluminum clog-resistant vent shall be fabricated from the following materials:

1. **Structural Shapes:** All aluminum structural shapes of the vent shall be alloy 6061- T6.
2. **Plates and Sheets:** All aluminum plates and sheets shall be mill finished alloy 3003-H16, 3004, 6061-T6 or 5052-H32 and shall be a minimum nominal thickness of 0.050 in.

3. **Bolts and Fasteners:** All bolts and fasteners shall be Series 304 stainless steel, 2024-T4 aluminum, or anodized 7075-T73 aluminum. Only stainless steel fasteners shall be used to attach aluminum to steel.

**PART 3 - EXECUTION**

**3.01 REPAIRS AND ADDITIONS**

**A. Construction Drawing Submittals:** Construction Drawings (or other information) of all fabricated and new items shall be submitted to the ENGINEER for review in accordance with Section 01000. Reference detail drawings within Specification 01000, Appendix C. Drawings submitted shall at a minimum include the following:

1. Details of the new interior container ladder if different than that shown in Drawing LR.

2. Catalog cuts, installation, operation and maintenance instructions for the new interior container ladder safe-climbing device.

3. Details of the antenna mounting bracket if different than that shown in Drawing AB.

4. Details of the new aluminum roof vent and steel exhaust fan flange if different than that shown in Drawing CRV, Sheets 1-4.

5. Details of the new 30 in. diameter roof manhole if different than that shown in Drawing RM.

6. Details of interior rigging openings if different than that shown in Drawing RO.

**B. Man-Hours:** For unit price work paid for per single man-hour, only time worked performing the specified action, i.e. welding or grinding, and only the time of the person performing the specified action shall be recorded as man-hours to be paid under the unit price item. Costs for all equipment, supplies, normal rigging and associated time required, supervision, Competent Person, overhead, insurance, and profit shall be included in the **Base Bid** (Bid Item 2) or distributed within the unit price bid for contingent Bid Item 7, contingent Bid Item 9, or contingent Bid Item 12 based upon man-hours used in actual performance of the specified action.

**C. Initial Abrasive Blast Cleaning for Evaluation of Metal Loss:** All areas of apparent metal loss shall be initially abrasive blast cleaned for evaluation of metal loss by the FIELD OBSERVER. The cost of this initial abrasive blast cleaning shall be included in the **Base Bid** (Bid Item 2).
D. **Cleaning and Painting of Areas of Coating Damaged During Work:** All areas of exterior coating damaged during the work, including exterior coating opposite welding performed on the interior for metal loss repair and stiffeners replacement, shall be cleaned and painted in accordance with Section 09871 of these Specifications. The cost of this cleaning and painting shall be included in the **Base Bid** (Bid Item 2).

E. **Rehabilitation Welding:** After the initial abrasive blast cleaning, any pits defined for pit welding by the FIELD OBSERVER shall be repaired by welding. All areas of apparent seam deterioration shall be initially abrasive cleaned, and any seam corrosion or undercut defined by the FIELD OBSERVER shall be repaired by arc-gouging or grinding the deteriorated weld seam (if determined necessary by the FIELD OBSERVER) and welding. Any areas of extensive metal loss or holes in the roof or bowl identified by the CONTRACTOR and agreed to by the FIELD OBSERVER shall be repaired by welding a patch plate, the same thickness as the roof or bowl, over the area. Edges of the holes shall be ground smooth prior to installation of the patch plate. No patch plate shall be smaller than 6 in. in diameter. Edges of the patch plate shall lap no less than 2 in. from the edge of a hole. Comers on the patch plate shall be rounded to 2 in. radius minimum or the plates shall be circular. All exposed edges of the patch plates shall be ground to 1/16 in. radius minimum. The plates shall be installed in accordance with API 653. Patch plates shall be a minimum of 3 in. from existing weld seams, or if an existing weld seam must be overlapped the patch plate shall be rectangular with radiused combers and extend a minimum of 6 in. beyond the existing weld seam. The patch plates shall be welded all around with continuous fillet welds. Note the roof or bowl is likely to be thin in the areas of the patch plates, and as such attachment welds and the weld procedures (e.g., electrode size and heat input) shall account for this likelihood.

   a. The cost of grinding holes, furnishing and installing patch plates, including material cost, and welding shall be included in the **Base Bid** (Bid Item 2) for furnishing and installation of new center hub, new main roof stiffeners, new roof knuckle stiffeners, new circumferential stiffeners, new interior container ladder, new roof manhole, new vent flange, and new antenna mounting bracket.

   b. The cost of grinding holes, furnishing and installing patch plates, including material cost, and welding shall be included in the price for contingent Bid Item 7 for all other work not described by Paragraph 3.01.E.a above but identified, ordered, and accepted by the Engineer.

F. **Pit Filling and Surfacing:** After the specified surface preparation, any pits, rough areas or seams defined for pit filling or surfacing by the Engineer shall be filled with solventless polyamide epoxy seam sealer of the type recommended by the supplier of the interior paint system. The epoxy seam sealer shall be applied neatly and smoothly to the steel surfaces and any rough areas of the seam sealer shall be sanded smooth prior to the application of the coating system.

   a. The cost for pit filling and surfacing shall be included in the **Base Bid** (Bid Item 2) for furnishing and installation of new center hub, new main roof stiffeners, new roof knuckle stiffeners, new circumferential stiffeners, new interior container ladder, new roof manhole, new vent flange, and new antenna mounting bracket.
b. The cost for pit filling and surfacing shall be included in the price for contingent Bid Item 8 for all other work not described by Paragraph 3.01.F.a above but identified, ordered, and accepted by the Engineer.

Costs for all labor, equipment, supplies, rigging, and other associated costs for application of the solventless polyamide epoxy seam sealer shall be included in the Base Bid or included within the unit price bid for contingent Bid Item 8.

G. **Interior Chipping and/or Grinding:** Any irregular surfaces defined by the Engineer, including but not limited to surface protrusions, burrs, fitting scars, sharp edges or corners, weld spatter, weld overlap and rough weld beads shall be removed from all interior surfaces of the tank, including appurtenances, by chipping and/or grinding these irregular surfaces to a smooth curve. The protruding parts of lugs or brackets shall be removed and ground flush. The objective of chipping and/or grinding is to eliminate irregular surfaces to provide a surface that is sufficiently smooth for the application of a uniform thickness coating without voids and free from defects. This chipping and/or grinding is also intended to make it easier for the interior coating to pass the holiday test.

1. The cost for chipping and/or grinding shall be included in the **Base Bid** (Bid Item 2) for furnishing and installation of new center hub, new main roof stiffeners, new roof knuckle stiffeners, new circumferential stiffeners, new interior container ladder, new roof manhole, and new vent flange.

2. The cost for chipping and/or grinding shall be included in the price for contingent Bid Item 9 for all other work not described by Paragraph 3.01.G.a above but identified, ordered, and accepted by the Engineer.

H. **Legal Disposal of Removed Steel or Appurtenances:** Any existing steel plate, members, or appurtenances of the tank and/or tower specified to be removed or replaced shall be removed and legally disposed of by the CONTRACTOR. Any steel plate, members, or appurtenances that are coated with a lead-based coating shall not be disposed of but shall be recycled. Documentation demonstrating that the material was properly recycled shall be provided to the OWNER.

I. **Center Hub Replacement:** The hub at the center of the interior roof shall be replaced in kind. The existing center hub is constructed from an approximately 6 in. x 6 in. angle and is approximately 10 ft in diameter. The size of the center hub shall be verified by the CONTRACTOR prior to ordering material and fabrication. The sequence and performance of this work shall be such that the structural integrity of the roof is not compromised.

J. **Main Roof Stiffeners Replacement:** The thirty (30) main roof stiffeners shall be completely replaced in kind. Each existing main roof stiffener is an approximately 5 in. x 3 in. x 3/8 in. angle. CONTRACTOR shall verify dimensions prior to ordering material and fabrication. Stiffeners shall be rolled to match the contour of the container and existing stiffener. The sequence and performance of this repair shall be such that the structural integrity of the roof is not compromised.
K. **Roof Knuckle Stiffeners Replacement:** The twenty (20) roof knuckle stiffeners shall be completely replaced in kind. Each existing roof knuckle stiffener is an approximately 3 in. x 2 in. x 1/4 in. angle. CONTRACTOR shall verify dimensions prior to ordering material and fabrication. Stiffeners shall be rolled to match the contour of the container and existing stiffener. The sequence and performance of this repair shall be such that the structural integrity of the roof is not compromised.

L. **Circumferential Stiffener Sections Replacement:** The circumferential stiffeners around the roof knuckle and around the shell shall be replaced in kind. The existing circumferential stiffeners are approximately 6 in. x 6 in. x 1/2 in. angle. CONTRACTOR shall verify dimensions prior to ordering material and fabrication. Stiffeners shall be rolled to match the contour of the container and existing stiffeners. The sequence and performance of this repair shall be such that the structural integrity of the container is not compromised.

M. **Seal Welding Stiffeners:** All intersections of member sections and intersections of members with the roof for the center hub, main roof stiffeners, roof knuckle stiffeners, and circumferential stiffeners shall be seal welded with continuous structural welds all around. The cost for seal welding at stiffeners and at the center hub shall be included in the **Base Bid** (Bid Item 2).

N. **PAX Impeller Mixer:** CONTRACTOR shall have PAX Water Technologies (telephone 866/729-6493) furnish and install a new impeller mixer per the requirements of Specification 11220 – Submersible Mixer, including but not limited to control panel, disconnect switch, all conduit and wiring, and control pad for mounting panel. CONTRACTOR shall install any penetrations for the power cord into the tank and mounting brackets for the control box prior to cleaning and painting operations. All penetrations shall be above the top capacity level. The mixer shall be installed after the finish coat has cured. The mixer shall be NSF61 certified. The connection to power shall be provided by the CONTRACTOR, and the proper operation of the mixer shall be verified by the CONTRACTOR and PAX Water Technologies. PAX Water Technologies shall provide the OWNER with a written seven (7) year warranty, which shall begin upon receipt of verification that the installed mixer is operating properly. A physical inspection of the mixer shall be conducted at the First Anniversary.

O. **New Interior Container Ladder:** The existing interior container ladder and all associated brackets shall be completely removed and remains ground flush. A new ladder and brackets conforming to OSHA 1910.23, OSHA 1926.1053, AWWA D100-11, and Drawing LR shall be furnished and installed. Adequate clearance for the climber in accordance with OSHA 1910.23 Ladders (ANSI A14.3, Safety Code for Fixed Ladders) shall be provided. The ladders shall be secured to the adjacent structure with steel bar brackets welded to the structure with complete structural welds. **Any necessary temporary protective devices for compliance with Federal OSHA requirements, all state and local safety regulations, and safe working practices shall be furnished and maintained by the CONTRACTOR.** The approved interior container ladder shall extend from the roof manhole to the bowl.
P. Interior Container Ladder Safe-Climbing Device: The existing ladder safe-climbing device shall be removed before cleaning and painting operations begin. After the interior finish coat of paint has cured, new solid extruded aluminum safe-climbing device shall be furnished and installed. The rail shall deflect less than 1/8 in. when subjected to the weight of a 250 pound person leaning back on the ladder, supported only by the device and the rail. The equipment shall be similar to that present on the exterior roof ladder and shall be furnished by French Creek Production, Inc., Franklin, Pennsylvania, telephone 814-437-1808, (upset extruded aluminum TS safety rail system), or an equal allowed in writing by the ENGINEER. The CONTRACTOR shall submit catalog cuts, and installation, operation and maintenance instructions to the ENGINEER for written approval prior to construction. Any necessary temporary protective devices for compliance with Federal OSHA requirements, all state and local safety regulations, and safe working practices shall be furnished and maintained by the CONTRACTOR. The new ladder safe-climbing device shall be installed on the interior container ladder starting 36 in. above the bottom of the ladder in the bowl and extending to the top of the ladder at the roof manhole.

Q. New Antenna Mounting Bracket: The existing antenna mounted to the roof vent shall be relocated to a new antenna mounting bracket installed on the roof. The construction and installation of the new antenna mounting bracket shall be in accordance with Drawing AB. New clamps shall be furnished and installed to secure the existing antenna to the new antenna mounting bracket. All electrical work shall be in accordance with the National Electric Code and all other governing specifications.

R. Aluminum Roof Vent and Steel Exhaust Fan Flange: The present roof vent shall be removed, and the present vent opening modified to 24 in. diameter. A new 24 in. diameter combination aluminum clog-resistant screened vent assembly and 24 in. diameter steel exhaust flange shall be installed in this opening. A 1/4 in. thick cover plate shall be utilized to fill any void in the roof plate adjacent to the new roof vent neck. The 1/4 in. cover plate shall lap over the existing roof plates at least 1-1/2 in. but not more than 3 in. and be welded with 1/4 in. continuous fillet welds on the outside and inside. The new 24 in. diameter combination aluminum clog-resistant screened vent assembly and 24 in. diameter steel exhaust flange shall conform to the dimensions and installation details shown in Drawing CRV, Sheets 1-4. The aluminum vent shall be removable from the steel manhole/ exhaust flange to provide a second means of access during cleaning and painting operations. The vent screen shall be supported to not produce a gap greater than 0.10 in. The vent shall have a minimum of 450 square inches of free vent area. The bolts and nuts utilized in the tank vent shall be of stainless steel or silicon-bronze material. The vent shall be designed to prevent clogging over and have provision for release of or prevention of any subsequent vacuum or pressure formed in the tank, prior to structural damage or deformation of the tank. The vent screens and pallets shall be designed to return to their original design locations without human effort after the release of any pressure or vacuum and the screens shall continue to provide screening of the vent during subsequent tank operation. The vent screens shall be 24 mesh, non-corrodible screens. The vent cap shall be designed with a vertical overhang to prevent the entrance of wind driven debris and precipitation. The new exhaust flange assembly shall be welded with 3/16 in. fillet welds around its circumference on the outside and inside of the tank. The exhaust flange neck shall be welded to an annular eight bolt flange with continuous 1/4 in. fillet welds on the exterior and interior surfaces. Rough edges and weld spatter shall be ground smooth.
prior to cleaning to properly receive paint.

S. **New 30 in. Diameter Roof Manhole:** The existing roof hatch and neck shall be replaced with a new 30 in. diameter roof manhole. The manhole, and its installation, shall be per Drawing RM. A 1/4 in. thick cover plate shall be utilized to fill any void in the roof plate adjacent to the new manhole neck. The 1/4 in. cover plate shall lap over the existing roof plates at least 1-1/2 in. but not more than 3 in. and be welded with 1/4 in. continuous fillet welds on the outside and inside. Manhole shall comply with the Recommended Standard for Water Works Article 7.0.8.1.a.

T. **Locks and Chain for Flanged and Bolted Roof Manhole:** Two 1/2 in. diameter holes shall be drilled through the existing flanged and bolted roof manhole. The center of the holes shall be 5/8 in. from the edge of the cover. The 2 holes shall be located 180° apart and between the existing bolt holes. A stainless steel chain shall be welded to the manhole cover and to the manhole neck to prevent the cover from falling off the roof when the cover is removed from the manhole.

U. **Flanged and Bolted Roof Manhole Bolts:** The CONTRACTOR shall remove and legally dispose the existing bolts and nuts from the flanged and bolted roof manhole. Eight (8) new 3/4 in. diameter galvanized steel bolts and nuts shall be furnished and installed in the existing flanged and bolted manhole. CONTRACTOR shall verify bolt size prior to ordering. In addition, galvanized steel washers shall be furnished and installed between the bolt and the manhole, and between the nut and the manhole.

V. **Interior Rigging Openings:** Threaded outlets may be installed in the roof of the tank by the CONTRACTOR for interior rigging. The number and locations of the threaded outlets desired to be installed by the CONTRACTOR shall be submitted to the ENGINEER and OWNER. The threaded outlets shall miss the roof stiffeners and shall be located above the top capacity level. The threaded outlets shall be Phoenix #132 heavy tank flat flange (manufactured by Phoenix Forging Company, 1-800-444-3674) as shown in Drawing RO. The flanges shall be welded on the outside of the tank with continuous fillet welds and sealed on the interior with the flexible polyurethane sealant specified in Section 09873 - Interior Coating System for Steel Storage Tank. Malleable iron pipe plugs (hot-dipped galvanized with the threads wiped) shall be furnished and installed after the completion of the painting. The threads on the plugs shall be covered with teflon tape or teflon paste prior to threading into the couplings. The furnishing and installation of any threaded outlets required for interior rigging shall be included in the **Base Bid** (Bid Item 2).

W. **Manhole Gaskets:** After the completion of the application and curing of the interior paint, a new 1/4 in. thick gasket shall be furnished and installed in the existing approximately 24 in. diameter flanged and bolted roof manhole, and a new 3/8 in. thick gasket shall be furnished and installed in the existing single-crab riser manhole. The gasket shall be made from commercial grade neoprene, meeting ASTM D2000-86E, Type BC, with a 70A durometer rating, and black color.

X. **Locking Manholes and Tower Ladder Grate:** The roof manholes entering the container and the tower ladder grate shall be locked at the completion of the Work, using padlocks furnished by the OWNER.
3.02 UNANTICIPATED ADDITIONAL WORK

A. It is felt that these specifications adequately describe the Work to be performed. If during the Work, it is found that additional Work is required, and it is authorized in writing by the ENGINEER and OWNER, this Work shall be paid for per single man-hour, including all welding, equipment, normal rigging, labor, supplies, overhead, insurance, and profit. The number of unanticipated additional work man-hours shall be paid for by the unit price for contingent Bid Item 12 as described in Specifications 01000 and 01020.

END OF SECTION
SECTION 15050

BASIC MECHANICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Section Includes: Requirements for basic mechanical materials and methods to Division 15 and other sections with mechanical equipment requirements, unless otherwise specified.

B. Mechanical Systems shall be complete, including all miscellaneous materials, and ready for operation in accordance with the Contract Documents.

1.02 QUALITY ASSURANCE

A. Materials and Equipment: Standard products of manufacturers regularly engaged in production of such materials and equipment, unless otherwise indicated.

1. Design: Manufacturer’s latest standard design conforming to these Specifications.

2. When two or more units of same class of equipment are required, use products of same manufacturer.

B. Where materials and equipment are specified to meet requirements of standards or organizations such as Underwriters Laboratories (UL), American Society for Mechanical Engineers (ASME), etc. that use a label or listing as a method of indicating compliance, such label or listing shall be attached to the material or equipment when delivered to the job site.

C. Each major component of equipment shall have the manufacturer’s name, address, and model number on a metal nameplate attached to the item of equipment.

D. Qualifications:

1. Welders: AWS-certified.

2. Structural and Miscellaneous Fabricated Steel Used in Equipment: Except where otherwise specified, conform to AISC standards.

   a. Structural members: Design for appropriate shock and vibratory loads.

   b. Steel partially or totally submerged during operation of equipment: Unless otherwise specified, at least 1/4 inch thick.

3. Materials and Workmanship: Conform to standards of SMACNA.
1.03 SUBMITTALS

A. Product Data: Submit data for materials other than manufacturers’ standard products following Section 01000.

B. Shop Drawings: Include descriptive and published details concerning performance, capacity, and noise ratings for each piece of equipment.

1. Electrical Motor-driven Equipment: Schematic drawing showing coordination with electrical system and furnish:
   a. Rated horsepower.
   b. Full load current requirements.

2. Electric Motors 3/4 Horsepower and Larger: Furnish information on:
   a. Locked rotor current.
   b. Power factor at full and 3/4 load.
   c. Efficiency at full load and rated operation condition.
   d. Type of bearings.
   e. Lubrication requirements.
   f. Net weight.
   g. Catalog data for materials other than equipment that are manufacturer's standard products.

3. Scaled mechanical layout drawings showing:
   a. Dimensioned plan views and elevations of mechanical equipment.
   b. Equipment mounting and foundations, including anchoring details.
   c. Piping including support detail.
   d. Components, including space requirements, coordination with building features, and other work.

C. Quality Assurance/Control Submittals

1. Manufacturers’ Instructions:
   a. General: Manufacturer's instructions and recommendations for installation, handling and storage, and cleaning and maintenance of equipment and materials during storage and before initial energizing.
b. Operation and maintenance manuals for each mechanical system and specific pieces of equipment listed in and following Section 01000.

D. Certificates:

1. General: Manufacturer’s certificates for material and equipment listed in and following Section 01000.
   a. Pipe, fittings, and valves 8-inch and smaller in diameter.
   b. Pipe, fittings, and valves larger than 8-inch diameter: Follow individual specification sections for submittal requirements.

2. Welding: Evidence that each welder is certified for type of welding required following AWS.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Packing, Shipping, Handling, and Unloading:

1. Materials and Equipment: Boxed, crated, or otherwise completely enclosed and protected during shipment, handling, and storage, and clearly labeled with manufacturer's name, brand, or model designation, type or grade, and color.

2. Packing Lists and Bills: Complete packing lists and bills included with each shipment.

3. Tagging and Marking: Each item of equipment tagged or marked with same identification number or mark shown on packing lists and bills of material.

B. Storage and Protection:

1. General: Protect materials and equipment from exposure to elements and keep dry. Handle and store to prevent damage, following manufacturers’ recommendations.
   a. Protect insulation, controls, and electrical equipment from moisture and water damage.
   b. Store pumps, motors, electrical, and other equipment with antifriction or sleeve bearings in weather tight areas maintained above 60 degrees F.

2. Space Heaters Furnished in Equipment: Connected during storage and operated continuously.

3. Protect equipment and material from rust, pitting, decay, or other deleterious affects from storage and handling.
   a. Repair or replace material and equipment showing such effects or damage, as directed by Engineer.
1.05  PROJECT CONDITIONS

A.  General: Drawings indicate extent and general arrangement of equipment and piping.
   1.  Fit equipment into space allotted and allow adequate clearance for entry, installation, replacement, servicing, and maintenance.
   2.  Verify actual and final arrangement, location, grades, and elevations of equipment, appurtenances and piping before ordering material and equipment.
   3.  If adjustments and modifications are necessary, submit to Engineer details of such adjustments and modifications for approval.
   4.  Make no adjustments or modifications without Engineer's written approval.

B.  Coordinate Work so equipment may be moved into place without altering building components, other equipment, or installations.
   1.  Provide drops, rises, or offsets required for proper installation, whether or not shown on Drawings.

1.06  SAFETY REQUIREMENTS

A.  Enclose or provide guards for belts, pulleys, chains, gears, and other rotating parts to protect operating personnel.
B.  Guard or cover high-temperature equipment and piping with insulation to protect personnel and prevent fire hazards.
C.  Provide items such as catwalks, ladders, and guardrails, where required, for safe operation and maintenance of equipment.
D.  Provide safe working space around equipment.

1.07  SEQUENCING AND SCHEDULING

A.  Coordinate sequencing and scheduling of mechanical work with building construction and other related parts of Work, including verification that structures, piping, wiring, conduits, and equipment components are compatible.

1.08  MAINTENANCE MATERIALS

A.  Spare Parts and Extra Materials: Specified in specific Specification Section for equipment or materials.
   1.  Pack into wooden boxes parts listed to be furnished, and label with:
      a.  Manufacturer’s name, address, and telephone number.
      b.  Local representative's name, address, and telephone number.
c. Names of equipment parts are for and list of parts contained therein.

2. Pack extra material in strong cartons, labeled with manufacturer's name, material name, type, color, and location material was installed.

3. Store maintenance material in a location directed by the County and City.

1.09 MANUFACTURER'S SERVICES

A. Field Representatives: By manufacturers of furnished equipment during installation, start-up, tests, and to instruct the City on operation and maintenance of equipment.

B. Availability: Factory-trained service and operating personnel to observe, instruct, guide, and direct Contractor's handling, installation, start-up, and adjustment procedures of equipment.

C. Manufacturer's Services:

1. Manufacturer shall supervise equipment start-up.

2. Inspect that equipment has been installed following manufacturer's instructions before energizing or operating it.

3. Before and during required tests, operate and adjust equipment following Contract Documents.

4. When required in specification sections for equipment, instruct City personnel in operation and maintenance of equipment at times and locations approved by Engineer.

PART 2 - PRODUCTS

2.01 GENERAL

A. In design and supply of equipment, ensure interchangeability of parts and items for equipment, piping, motors, and other appurtenances.

B. Factory assemble, coat, and paint mechanical equipment as much as practicable before shipping and handling with factory-applied prime coat.

C. Nameplate: Attach to each major component of equipment metal nameplate showing manufacturer's name, address, and equipment model number.

2.02 EQUIPMENT BASES

A. Concrete Bases: Unless otherwise indicated, concrete bases shall be a minimum of 4-inches high, and not less than 4-inches larger in both directions than supported unit.

B. Cast Iron or Welded Steel Baseplates: Support each unit and its drive assembly on a single baseplate.
2.03 ANCHOR BOLTS

A. Anchor Bolts, Nuts, and Washers: Stainless steel, Type 304.
   1. Unless otherwise indicated, size anchor bolts to largest diameter that will pass through bolt holes of equipment base.
   2. Length of Bolts: To permit minimum 1-inch of grout beneath base plate and minimum of 6-inches anchorage into structural concrete.

B. Template or Setting Drawing for Anchor Bolts, Nuts, and Washers: Furnish sufficiently in advance to permit anchor bolts to be set either before or during structural concrete placement.

2.04 SUPPORTS AND BRACES

A. Provide supports and braces fabricated to meet manufacturer’s requirements and/or as indicated on the Contract Drawings.

2.05 DRIVE UNITS

A. Nominal Input Horsepower Rating of Gears or Speed Reducers: At least equal to nameplate horsepower of drive motor.

B. Drive Units: Designed for 24-hour continuous service.

C. Motor and Drive Gears: Rated AGMA Class II and bearing AGMA nameplate.

D. Gear Reducers: Totally enclosed, oil lubricated, with antifriction bearings throughout.
   1. Worm Gear Reducers: Service factor of at least 1.20.
   2. Shaft-mounted Gear Reducers: Rated AGMA Class II.
   3. Other Helical, Spiral Bevel, and Combination Bevel-helical Gear Reducers: Service factor of at least 1.50.
   4. Gear Reducer Nameplate: AGMA.

E. V-belt Drive: Service factor of at least 1.60 at maximum speed, with sliding base or other suitable tension adjustment mechanism.

F. Variable Speed Drives: Service factor of at least 1.75 at maximum speed, unless specified otherwise.

2.06 COUPLING, BEARINGS, JOURNALS, AND KEYS

A. Couplings: Where specified or required between motor and its driven equipment, use flexible standard self-aligning forged steel coupling.
1. Fix and key 1 hub of coupling to driven equipment shaft with other hub fixed and keyed to abutting drive shaft.

2. Place moisture and dust-proof all metal coupling as close as possible to driven equipment and motor bearings so units are arranged in compact manner.

B. Bearings: Ball or roller type, with both inner and outer races and balls or rollers made from heat-treated steel, and pressure-grease lubricated, except those specifically requiring lubrication.

1. Rollers: Proper size to carry maximum loads without flaking, spallings, or crushing.

2. Balls: Evenly spaced and held in position by continuous spacing or retainer glands.

C. Journals and Bearings: Sized and of proportions to create least wear and overheating under all conditions.

1. Easy Removal and Adjustment: Where required, provisions shall be made for easy removal and adjustments.

2. Journal Lining: When required, lined with babbitt metal hammered into grooves and bored in place.

D. Keys, Nuts, and Other Parts: Secure parts, which may work loose with locking devices.

2.07 FLANGES, JACKING SCREWS, AND EYE BOLTS

A. Flange Boltholes: Drilled with flanges spot-faced on back and stud holes not drilled through.

B. Jacking Screws: For covers, where required.

C. Eye Bolts for Lifting Covers and Equipment: When manual lifting would be difficult, or where required.

2.08 BOLTS, NUTS, AND WASHERS

A. Bolts, Nuts, and Washers:

1. Nuts: Cold pressed.

2. Bolts, Nuts, and Threads: American Standard sizes except those used for flanged pipe, valves, fittings, and equipment connections or otherwise noted.

2.09 SAFETY GUARDS

A. General: Cover belt and chain drives, fan blades, couplings, shafts, and other moving and rotating parts on all sides by safety guard following OSHA requirements.

B. Fabrication: Galvanized or aluminum-clad sheet steel or 1/2-inch mesh galvanized expanded metal, 16 gauge or heavier.
C. Design: For easy installation and removal, with necessary supports and accessories including bolts.
   1. Outdoor Guards:
      a. Design Safety guards in outdoor locations to prevent entrance of rain and dripping water.
      b. Safety guards: Follow OSHA requirements.

D. Supports and Accessories, Including Bolts: Galvanized or painted following Section 09900, as required.

2.10 ACCESS DOORS AND PANELS ON MECHANICAL EQUIPMENT

A. Provide access doors and panels for easy access to mechanical components that require periodic maintenance and lubrication.

2.11 LUBRICATION

A. Equipment Lubrication System: Designed for weekly adjustment during continuous operation.
   1. Lubrication Facilities, Oil Drains, and Fill Openings: Accessible from normal operating area or platform.
   2. Drain Ports: Allow for collection of waste oil in containers from operating area or platform without removing unit from its installed position.

B. Pressure Grease Fittings: Zerk Hydraulic or Alemite type.
   1. Location: Accessible for lubricating with grease gun.
   2. Hydraulic Grease Guns: Two, each suitable for use with type of grease fittings on equipment.

2.12 SHOP PAINTING

A. Prepare surfaces and shop coat equipment, supports, piping and appurtenances as specified in Section 09900 and as shown on Drawings, except connecting ends and where it would hinder installation, using shop primer compatible with field coat.

B. Field paint these points after installation.

2.13 SPECIAL TOOLS AND ACCESSORIES

A. Where required for adjusting, maintaining, or repairing equipment, including special devices for lifting and handling, such special tools and accessories shall be provided complete with the equipment.
2.14 ELECTRICAL SERVICE

A. All mechanical equipment requiring electrical power to operate shall be rated for electrical service as shown on the Contract Drawings, and shall have sufficient length of cable and all other appurtenances necessary to provide an operational and full functional unit.

B. If the electrical service is not shown on the Contract Drawings, the Contractor is still responsible for providing such services as required by the equipment manufacturer at no additional cost to the County.

PART 3 - EXECUTION

3.01 EXAMINATION AND PREPARATION

A. Inspect area and surfaces to receive mechanical equipment piping and appurtenances, and verify readiness for installation.

B. Before installation, repair defects and damaged area, and adjust surfaces and areas for proper installation.

C. Field measure and verify adequacy of areas to be occupied by mechanical equipment and appurtenances following approved Contractor's Drawings.

D. If adjustment is required, obtain Engineer’s approval and adjust as approved.

3.02 INSTALLATION

A. General:

1. Install equipment and appurtenances following Manufacturer's instructions.

2. Provide complete final connections to equipment, including pipe, electricity, and controls.

B. Isolation Valves and Accessory Fittings: Whether shown or not, install on each side of equipment to allow it to be removed and isolated for servicing.

1. Install manual vents at high points in piping and fitted for hose adapters at low points in fluid piping.

2. Rises and Drops: As required by field conditions.

3.03 FOUNDATIONS, BASES, AND SUPPORTS

A. General: Support equipment, electrical conduits, and piping by providing compatible frames, braces, hangers, and anchors.

B. Floor-Mounted Equipment: Unless otherwise shown on Drawings, place floor mounted equipment on reinforced concrete pads minimum of 4-inches high.
C. Horizontal and Vertical Pumps Mounted on Baseplates or Pedestals: Install following Hydraulic Institute Standards and pump manufacturer's recommendations.

1. Leveling of Baseplate or Pedestal: Use shims and/or wedges and anchor raised vibratory absorption concrete pad with anchor bolts set in pipe sleeves.

2. Grouting: Fill space between baseplate or pedestal and concrete pad, and void between anchor bolt and pipe sleeve with quick setting and non-shrink grout.

3. Tighten Bolts: After grout has hardened, tighten anchor bolts to equipment manufacturer's recommendations and cut off bolts not more than 1-inch nor less than ½-inch above anchor bolt nut.

D. Vibration Isolators: Install between equipment base and raised concrete pads on other vibrating/rotating mechanical floor-mounted equipment like fans.

E. Non-vibratory Equipment Suspended Inside Buildings: Brace and support for rigid installation.

1. Supports and Hangers: Attach to bearing walls, roof, and floor supports, or framing members.

2. Cross Bracing: As required to develop rigid installation.

F. Suspended Vibratory Equipment: Braced, supported, and provided with cushioning and anti-vibratory material as shown on Drawings and recommended by equipment Manufacturer.

3.04 ACCESS PANELS AND DOORS FOR CONCEALED EQUIPMENT

A. Access Panels or Hinged Doors: Provide where necessary for maintenance and servicing of concealed equipment, piping and fans.

3.05 LUBRICATION

A. Lubricate following manufacturer's instructions for initial operation; relubricate following testing and before final acceptance, if directed.

3.06 ADJUSTMENT AND INITIAL OPERATION OF EQUIPMENT

A. Clean: Before systems and equipment are initially started, clean piping and equipment.

1. Moving Parts: Check for freedom of movement, alignment, and adjustment.

B. Manufacturer's Equipment Service: Make adjustments required and recommended by Manufacturer's representative and as required herein, before equipment is energized and operated.
3.07 SURFACE TOUCH-UP/FIELD PAINTING
   A. Clean field-installed bolts, nuts, washers, and support systems and paint or coat using materials identical to original shop coat and/or surrounding area.
   B. Touch-up other surfaces where shop coats have been damaged, using paint, coatings, and film thickness identical to original shop coats.
   C. Field Paint: Specified in Section 09900 and shown on Drawings.

3.08 CLEANING AND PROTECTION
   A. Clean equipment and surrounding area inside and out.
   B. Protect equipment during and after installation from construction dust and debris.
   C. Provide temporary protection as required until equipment is in operation or until receipt of Certificate of Substantial Completion.

3.09 FIELD QUALITY CONTROL
   A. Demonstrate and test operation of systems and equipment for specified requirements, in Engineer’s presence, following requirements of Section 01000 and as specified for equipment in specific sections.
   B. Make adjustments and replace defective equipment and parts, as required.

3.10 OPERATION INSTRUCTIONS
   A. After systems have met field quality control requirements, and before issuance of Certificate of Substantial Completion, furnish manufacturer's services for operation and maintenance, as specified for equipment in specific sections.

END OF SECTION
SECTION 15060

PIPE HANGERS AND SUPPORTS

PART 1 - GENERAL

1.01  SUMMARY

A.  The Contractor shall furnish and install all materials, equipment and appurtenances necessary for the complete and satisfactory installation of all piping systems as shown on the Contract Drawings and as required for a complete installation as specified herein.

B.  This Section includes, but is not necessarily limited to, the furnishing and installation of all pipe hanging and support systems as indicated on the Drawings, as specified herein, and as necessary for the proper and complete performance of the Work.

1.02  REFERENCES

A.  Except as herein specified or as indicated on the Drawings, the work of this Section shall comply with the following:

1.  ASME – American Society of Mechanical Engineers – B31.1 – Power Piping.


1.03  PERFORMANCE REQUIREMENTS

A.  Design channel support systems for piping to support multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.

B.  Design heavy-duty steel trapezes for piping to support multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.

C.  Design seismic-restraint hangers and supports for piping and equipment.

D.  Design and obtain approval from authorities having jurisdiction for seismic-restraint hangers and supports for piping and equipment.

1.04  SUBMITTALS

A.  Submit in accordance with Section 01000.

B.  Product Data:  For each type of pipe hanger, channel support system component, and thermal-hanger shield insert indicated.

C.  Shop Drawings:  Signed and sealed by a qualified professional engineer for multiple piping supports and trapeze hangers.  Include design calculations and indicate size and characteristics of components and fabrication details.
D.  Welding certificates.

1.05 QUALITY ASSURANCE

A.  Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code-Steel."

B.  Engineering Responsibility: Design and preparation of Shop Drawings and calculations for each multiple pipe support and seismic restraint by a qualified professional engineer.

1.06 DELIVERY, STORAGE AND HANDLING

A.  Receiving and storage:

1.  All materials shall be delivered in original, unbroken, brand marked containers or wrapping as applicable.

2.  Handle and store materials:

   a.  In a manner which will prevent:

      1)  Deterioration or damage.

      2)  Contamination with foreign matter.

      3)  Damage by weather or elements.

   b.  In accordance with Manufacturer’s directions.

B.  Rejected material and replacements:

1.  Reject damaged, deteriorated or contaminated material and immediately remove from the Site.

2.  Replace rejected materials with new materials at no additional cost to the County.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A.  In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

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 manufacturers specified.

B.  Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.
2.02 MANUFACTURED UNITS

A. Pipe Hangers, Supports, and Components: MSS SP-58, factory-fabricated components.

1. Manufacturers:
   a. AAA Technology and Specialties Co., Inc.
   b. Cooper B-Line, Inc.
   c. Carpenter & Patterson, Inc.
   d. Globe Pipe Hanger Products, Inc.
   e. Anvil International Corp.
   f. ERICO International Corp.
   g. National Pipe Hanger Corp.
   h. PHD Manufacturing, Inc.
   i. PHS Industries, Inc.
   j. Piping Technology & Products, Inc.
   k. Or approved equal.

2. Galvanized, Metallic Coatings: For piping and equipment that will not have field-applied finish.

3. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.

B. Channel Support Systems: MFMA-2, factory-fabricated components for field assembly.

1. Manufacturers:
   a. Cooper B-Line, Inc.
   b. Anvil International Corp.
   c. ERICO International Corp.
   d. National Pipe Hanger Corp.
   e. Unistrut Corp.
   f. Wesanco, Inc.
   g. Or approved equal.
2. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.

3. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.

C. Thermal-Hanger Shield Inserts: 100-psi minimum compressive-strength insulation, encased in sheet metal shield.

1. Manufacturers:
   a. Carpenter & Patterson, Inc.
   b. ERICO International Corp.
   c. PHS Industries, Inc.
   d. Piping Technology and Products, Inc.
   e. Rilco Manufacturing Co., Inc.
   f. Value Engineered Products, Inc.
   g. Or approved equal.

2. Material for Cold Piping: ASTM C 552, Type I cellular glass or water-repellent-treated, ASTM C 533, Type I calcium silicate with vapor barrier.

3. Material for Hot Piping: ASTM C 552, Type I cellular glass or water-repellent-treated, ASTM C 533, Type I calcium silicate.

4. For Trapeze or Clamped System: Insert and shield cover entire circumference of pipe.

5. For Clevis or Band Hanger: Insert and shield cover lower 180 degrees of pipe.

6. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.03 MISCELLANEOUS MATERIALS

A. Powder-Actuated Drive-Pin Fasteners: Powder-actuated-type, drive-pin attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.

C. Structural Steel: ASTM A36/A36M, steel plates, shapes, and bars, black and galvanized.
D. Grout:  ASTM C 1107, Grade B, factory-mixed and -packaged, nonshrink and nonmetallic, dry, hydraulic-cement grout.

1. Characteristics: Post hardening and volume adjusting; recommended for both interior and exterior applications.


3. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.01 APPLICATIONS

A. Specific hanger requirements are specified in Sections specifying equipment and systems.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Specification Sections.

C. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

1. Adjustable Steel Clevis Hangers (MSS Type 1): For suspension of non-insulated or insulated stationary pipes, NPS 1/2 to NPS 30.

2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 deg F pipes, NPS 4 to NPS 16, requiring up to 4 inches of insulation.

3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24, requiring clamp flexibility and up to 4 inches of insulation.

4. Adjustable Steel Band Hangers (MSS Type 7): For suspension of non-insulated stationary pipes, NPS 1/2 to NPS 8.

5. U-Bolts (MSS Type 24): For support of heavy pipe, NPS 1/2 to NPS 30.

6. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 36, with steel pipe base stanchion support and cast-iron floor flange.

7. Single Pipe Rolls (MSS Type 41): For suspension of pipes, NPS 1 to NPS 30, from 2 rods if longitudinal movement caused by expansion and contraction might occur.

8. Complete Pipe Rolls (MSS Type 44): For support of pipes, NPS 2 to NPS 42, if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.

D. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.

2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20, if longer ends are required for riser clamps.

E. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6-inches for heavy loads.

2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.

F. Building Attachments: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.

2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar joist construction to attach to top flange of structural shape.

3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.

4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.

5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.

6. C-Clamps (MSS Type 23): For structural shapes.

7. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
   a. Light (MSS Type 31): 750 lb.
   b. Medium (MSS Type 32): 1500 lb.
   c. Heavy (MSS Type 33): 3000 lb.

8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.

9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

G. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.

2. Protection Shields (MSS Type 40): Of length recommended by manufacturer to prevent crushing insulation.

3. Thermal-Hanger Shield Inserts: For supporting insulated pipe, 360-degree insert of high-density, 100-psi minimum compressive-strength, water-repellent-treated calcium silicate or cellular-glass pipe insulation, same thickness as adjoining insulation with vapor barrier and encased in 360-degree sheet metal shield.

H. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.

2. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.

3. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from base support.

3.02 INSTALLATION

A. Pipe Hanger and Support Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Channel Support System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled channel systems. Field assemble and install according to manufacturer's written instructions.

C. Heavy-Duty Steel Trapeze Installation: Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated, heavy-duty trapezes. Support pipes of various sizes together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers. Field fabricate from ASTM A36/A36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.

D. Install building attachments within concrete slabs or attach to structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, and expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

E. Install powder-actuated drive-pin fasteners in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
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F. Install mechanical-anchor fasteners in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

G. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

I. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

J. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9, "Building Services Piping," is not exceeded.

K. Insulated Piping: Comply with the following:

1. Attach clamps and spacers to piping.
   a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
   b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
   c. Do not exceed pipe stress limits according to ASME B31.9.

2. Install MSS SP-58, Type 39 protection saddles, if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

3. Install MSS SP-58, Type 40 protective shields on cold piping with vapor barrier. Shields shall span arc of 180 degrees.

4. Shield Dimensions for Pipe: Not less than the following:
   a. NPS 1/4 to NPS 3-1/2: 12-inches long and 0.048-inch thick.
   b. NPS 4: 12-inches long and 0.06-inch thick.
   c. NPS 5 and NPS 6: 18-inches long and 0.06-inch thick.
   d. NPS 8 to NPS 14: 24-inches long and 0.075-inch thick.
   e. NPS 16 to NPS 24: 24-inches long and 0.105-inch thick.

5. Pipes NPS 8 and Larger: Include wood inserts.

6. Insert Material: Length at least as long as protective shield.
7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.03 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure above or to support equipment above floor. Place grout under supports for equipment and make smooth bearing surface.

3.04 METAL FABRICATION

A. Cut, drill, and fit miscellaneous metal fabrications for heavy-duty steel trapezes and equipment supports. Fit exposed connections together to form hairline joints. Field-weld connections that cannot be shop-welded because of shipping size limitations. Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.

4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.05 ADJUSTING

A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

3.06 PAINTING

A. Touching Up: 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. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils. See Section 09900 for paint materials and application requirements.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION
PART 1 - GENERAL

1.01 DESCRIPTION

A. The Contractor shall furnish and install all materials, equipment and appurtenances necessary for the complete and satisfactory installation of all piping systems within and under structures except as noted, as shown on the drawings and as required for a complete installation as specified herein.

1.02 SUBMITTALS

A. Submit in accordance with requirements of Section 01000.

B. Shop Drawings and Product Data:

1. The drawings developed by the Engineer are diagrammatic in nature and may not indicate all necessary bends, offsets and fittings. The Contractor shall, prior to developing shop drawings for field piping installation, inspect each area of work for site conformance with the Contract Documents. Submission of the shop drawings for field piping systems shall be verification that the Contractor has inspected the work areas and that the shop drawings indicate all field/site conditions which may impact the installation and performance of the work. Field or site conditions which impact the installation or performance of the work shall be indicated on the shop drawings. Failure of the Contractor to indicate these field or site conditions during the shop drawing phase which impact installation shall be cause for disallowing claims associated with these field or site conditions.

2. Submit detailed certified dimensional shop drawings and manufacturer's product data for materials and equipment.

3. Submit for approval prior to installation, complete piping field installation shop drawings for piping systems. Shop drawings shall include plan and section view including elevation, dimensions from fixed structures, valve and instrument locations.

4. Submit Layout drawings for all piping, including sizes, types, and locations. The drawings shall also indicate location of all fittings, wall and floor penetrations, valves, and pipe supports. Layout drawings for the discharge piping shall be coordinated with shop drawings for the centrifugal water pumps specified in Section 11300.

C. Show complete information concerning materials of construction, fabrication, protective coatings, installation and anchoring requirements, fasteners and other details.
1.03 CERTIFICATION OF WELDERS

A. All shop and field welding under this Contract for steel/stainless steel piping and other piping systems shall be done by experienced operators who are skilled and have experience in the method and materials used. All welders shall be qualified as specified in the ASME Code for Unfired Pressure Vessels, Paragraph U-70.

B. For field welding, the Contractor shall submit to the Engineer for his review and approval a certified statement, from an approved testing agency for each welder he proposes to use for welded piping. Each certified statement shall indicate that the welder has, within six months from proposed employment on this project, been successfully qualified under the requirements of Section IX of the ASME Boiler Construction Code. All certificates and qualifications shall be at the Contractor's expense. The Engineer will return the certified statements to the Contractor for retention on job in the Contractor's field office. Any work installed by an individual who has not been qualified by the Testing agency and approved by the Engineer shall be removed by the Contractor and shall be replaced with work installed by qualified and approved welders at the Contractor's expense.

PART 2 – PRODUCTS

2.01 GENERAL NOTES

A. The Contractor shall verify all dimensions of valves, special castings and fittings, pipe equipment, etc., so that all of the pipe work performed will fit together properly and will conform to the arrangement as shown on the drawings. In selecting laying lengths of fittings, the Contractor shall be guided by the dimensions of equipment to which connections are made and by the indicated dimensions on the drawings. All pipe and specials shall be accurate to the dimensions shown. Flanges shall be at right angles to the axis of the opening, and openings shall be at the exact angle specified.

B. All piping shall be tested as specified hereinafter. Disinfection of piping, where required, shall be performed in accordance with applicable City and County requirements.

C. All piping shall be subject to inspection and approval by the Engineer upon delivery, and no broken cracked, misshaped or otherwise damaged or unsatisfactory piping will be accepted. The Contractor shall give the Engineer 48 hours advance notice for any piping deliveries to the job site. Included in the notice will be the area where the pipe will be stored on site.

D. It is to be noted that in the relatively small piping systems, the drawings do not necessarily show all fittings, offsets, unions, hangers, supports, etc. All such items shall be furnished and installed, however, as required for complete and satisfactory installation of the equipment shown.

E. Flanges may be cast integrally with the pipe, or screwed on type flanges may be used. Pipe compound of the manufacturer's recommendation shall be used at each threaded joint or flanges.
F. All piping that is located outside of the station interior, including but not limited to exterior piping, buried piping, piping within vaults or other buried structures shall be provided with stainless steel hardware.

G. All stainless steel hardware shall be provided with anti-galling compound.

2.02 GENERAL NOTES – PIPE AND FITTINGS

A. All pipe and fittings shall be new, of the sizes indicated on the Contract drawings or specified herein, and shall be as specified in the schedule herein. Where the pipe schedule permits more than one type of pipe material to be used, details of the pipe at structures or vaults are shown on the drawings for only one of the pipe materials specified. If the Contractor elects to use the pipe material that is not detailed, it shall be his responsibility to design, and submit shop drawings for approval, indicating all pipe details required for the project. The Contractor shall not be entitled to any extra compensation for such design, shop drawings and their approval, or revisions to the arrangements and details shown on the drawings necessary to accommodate the use of pipe materials not detailed. All such designs prepared by the Contractor shall be as required and approved by the Engineer. Fittings provided for connection to existing piping shall be compatible with the existing piping and with the new piping.

B. Piping systems that are encountered which are not listed on the schedule herein shall be constructed of the same type of pipe specified for similar systems which are listed, as directed by the Engineer.

C. It shall be the Contractor's responsibility to verify dimensions of all pipes, valves, special castings and fittings so that all of the pipe work performed will fit together properly and will conform to the arrangements shown on the Drawings.

D. The Contractor shall furnish and install all necessary fittings and special pieces required for closures, bends, branches, and connections to other pipes. All fittings and specials shall be designed and constructed to meet the same pressure classification as that of the adjoining pipe, and shall conform to the standard details of the manufacturer.

E. All pipe, fittings, couplings, dismantling joints and any associated appurtenances shall be NSF61 certified.

2.03 PIPING

A. Ductile Iron Pipe – Exposed/ Interior

1. Pipe Flanged; ANSI A21.51, Class 54
Grooved; ANSI/AWWA C606, Class 56

2. Lining Lined with double thickness cement and seal coated; AWWA C104

3. Flanges ANSI A21.51/ASME B16.1, Class 125

4. Nuts and Bolts ANSI B18.2.1 and B18.2.2
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5. Grooved Couplings Victaulic Style 31
6. Grooved Fittings Victaulic ANSI A21.10
7. Flexible Couplings Dresser Style 38, Rockwell Type 411, Victaulic Depend-O-Lok; harnessed
8. Flange Adapters EBAA Iron Megaflange 2100, or approved equal

10. Gaskets Rubber, 1/8” thick, AWWA C207
11. Protective Coatings Furnished with a suitable shop primer and finish coated in accordance with Section 09900. Shop primer shall be approved by the finish coat paint manufacturer.

B. Ductile Iron Pipe – Buried
1. Pipe Mechanical Joint; ANSI A21.51, Class 54
2. Lining Double thickness cement-mortar lined; AWWA C104
3. Mechanical Joints ANSI A21.10
4. Restraints EBAA Iron Megalug Series 1100, or approved equal
5. Protective Coatings Coat buried piping and fittings with one mil thickness of asphaltic coating per AWWA C151, C110, and C153, as applicable.

C. PVC Drain Pipe
1. Pipe SDR 35, ASTM F 794, PVC profile, gravity sewer pipe with push-on joints ASTM 3212.
2. Fittings ASTM D3034
3. Joints Push-on Joints ASTM 3212

D. Interior PVC Pipe and Fittings
1. PVC pipes shall be unplasticized polyvinyl chloride normal impact type, conforming to ASTM Specifications D-1784 and D-1785 for Class 12454-B. Pipes shall be Schedule 80 as manufactured by the B.F. Goodrich Company, Grinnell Company, Inc., International Pipe and Ceramics Corporation, or
approved equal, and each length shall be clearly labeled with the manufacturer's name, PVC Type, Schedule and Size. Pipe shall be extruded and seamless. Welded sets will not be permitted.

2. Fittings shall be PVC normal impact type and shall be as manufactured by Celanese Piping Systems, Inc., or approved equal. All fittings shall be solid molded. Welded seams shall not be permitted. Fittings shall comply with ASTM D2467, unless indicated otherwise.

3. Generally, all PVC pipe and fittings shall have socket type joints with solvent cement. Joints shall be made in accordance with the manufacturer's instructions. Where specifically noted on the Contract Drawings, or where required for connections to equipment for special reasons, pipe and fittings shall have threaded ends where less than 2-inches, or flanged joints for 2-inches or larger.

4. Bolts and nuts shall be type 316 stainless steel for flanged joints. Gaskets for flanged joints shall be Viton.

5. Threaded joints shall be made using the pipe manufacturer's recommended threaded lubricant joint compound. Flanges may be the socket type, and shall be complete with rubber gaskets and galvanized steel bolts and nuts. Solvent used for sodium hypochlorite applications shall be a medium bodied solvent suitable for use with sodium hypochlorite. Glue shall contain solvent and PVC material with no additional additives.

6. PVC piping systems scheduled to be used for potable (domestic hot and cold) water service shall be disinfected in accordance with AWWA standards. Piping scheduled for potable (domestic hot) water service shall be schedule 80 CPVC.

7. The County reserves the right to direct the Contractor to have tests conducted on PVC pipe and fittings. These tests, if required, shall be conducted at the manufacturer's plant and shall be at the Contractor's expense. Tests shall be sufficiently complete to prove conformance with the requirements of Commercial Standard CS-256-63, and the following additional quality requirements shall be similarly met:
   a. A parallel plate flattening test to the extent that face to face contact of the interior wall surface is made. The formation of cracks shall be considered failure.
   b. Immersion in a mixture of 15% by volume of dimethyl formanide in anhydrous acetone for twenty (20) minutes. The specimen shall exhibit no visible flaking upon completion of the test.
   c. Fittings and couplings shall meet burst pressure requirements of Table 6 of ASTM Specification D1785 for pipe when tested with end plugs inserted to a distance no more than 1/3 of the socket depth.

8. Mechanical Couplings shall be harnessed with Dresser STAR Anchor Restraint System, restrained Victaulic Depend-O-Lock® FxF type, or approved equal, with number and size of tie rods as required by the manufacturer for the diameter and pressure rating of the pipe on which they are to be installed.
9. Wall castings and sleeves in walls for pipes 4 inches and larger shall match the pressure class of the adjacent pipe. Wall castings and sleeves shall be of sufficient lengths, shapes and sizes necessary and shall be complete with integral water stop flanges. The ductile iron wall castings and wall sleeves shall conform to ANSI A21.10. Annular space between pipe and wall sleeves shall be sealed with mechanical seals to fill the space and form a watertight seal.

10. Watertight sleeve seals shall be PSI-Thunderline Link-Seal EPDM modular sealing elements with composite pressure plates and type 316 stainless steel connecting bolts and nuts.

2.04 PRESSURE SENSORS AND PRESSURE GAUGES

A. Pressure sensors shall be installed for sensing the discharge pressure of each pump. Refer to Specification Section 17300 for detailed requirements.

B. Pressure gauges shall be installed on both the pump suction and discharge piping. Refer to Specification Section 17300 for detailed requirements.

PART 3 - EXECUTION

3.01 PIPE INSTALLATION AND PIPE SCHEDULE

A. Pipe and fittings shall be as indicated on the drawings and as listed in the following schedule, which schedule is intended to serve as a general guide and is not necessarily a complete listing of every piping system. Systems which may not be listed shall be comprised of the same kind of pipe and fittings as in similar systems which are listed, or as directed by the Engineer.

<table>
<thead>
<tr>
<th>SERVICE</th>
<th>PIPE/FITTING</th>
<th>JOINT TYPES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>Ductile Iron</td>
<td>Flanged</td>
</tr>
<tr>
<td>Water (buried)</td>
<td>Ductile Iron</td>
<td>Restrained</td>
</tr>
<tr>
<td>Sewer (buried)</td>
<td>Ductile Iron</td>
<td>Restrained</td>
</tr>
<tr>
<td>Sewer</td>
<td>Buried PVC</td>
<td>Push-on Joints</td>
</tr>
<tr>
<td>Sewer</td>
<td>Interior PVC</td>
<td>Solvent Cemented</td>
</tr>
<tr>
<td>Sodium Hypochlorite</td>
<td>Interior PVC</td>
<td>Solvent Cemented</td>
</tr>
</tbody>
</table>

C. Install PVC drain piping according to ASTM D2321 and ASTM F1668.

D. Join PVC drain piping according to ASTM D2321 and ASTM F891 for solvent cemented joints.
3.02 MAINTENANCE OF UTILITIES
   A. To minimize the disruption of station services, new utilities shall be installed and accepted, prior to the abandonment of the existing utilities.

3.03 EXPANSION
   A. The installation of all pipes shall be such as to allow for expansion using expansion joints, as shown on the Drawings or as may be necessary to prevent undue strain on piping.

3.04 TESTING OF PIPES
   A. The Engineer shall be furnished written advance notification of all tests and all tests shall be conducted to his entire satisfaction. All tests shall be made prior to insulating pipe.
   B. All defects revealed by the tests shall be corrected without cost to the County. Tests and repairs shall be continued until test requirements met. Repairs to the various systems shall be made with new materials. No caulking of threaded joints, cracks, or holes will be acceptable. When it is necessary to replace pieces of pipe, the replacement shall be of the same material and thickness as the defective piece. Tests shall be repeated after defects disclosed thereby have been made good.
   C. All piping shall be adequately braced and supported during the tests so that no movement, displacement or damage shall result from the application of the test pressure. Relief devices in the various systems shall be capped or plugged during the tests.
   D. All equipment used in testing shall be provided by the Contractor, shall be subject to the approval of the Engineer, and shall be such as to properly develop, maintain and measure hydrostatic test pressures and leakage rates. Where devices such as meters, recorders, charts, plugs, caps, blind flanges, corporation stops or bulkheads are required to develop, maintain and measure test pressures, these devices shall be furnished and installed by the Contractor.
   E. Discharge and force main piping systems shall be hydrostatically tested in accordance with AWWA C600 to 1-1/2 times working pressure, but not less than 150 psi.
   F. Leakage shall be performed in accordance with Baltimore County’s Standard Specifications for Construction and Materials.
   G. Provide all necessary piping between the reach being tested and the water supply, together with all required materials and equipment. Dispose of test water in accordance with applicable regulatory standards.
   H. Provide dished heads, blind flange or bulk heads as necessary to isolate and test pipe.

3.05 AS-BUILT SHOP DRAWINGS
   A. The Contractor shall provide the Engineer with four sets of prints of As-Built Shop Drawings for each piping system showing all equipment and valve. Drawings shall show numbers and/or letters for all equipment and for each valve.

END OF SECTION
SECTION 15110

VALVES

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Contractor shall furnish and install all materials, equipment and appurtenances necessary for the complete and satisfactory installation of all piping systems as shown on the Contract Drawings and as required for a complete installation as specified herein.

1.02 SUBMITTALS

A. Shop Drawings and Product Data:

1. The drawings developed by the Engineer are diagrammatic in nature and may not indicate all necessary bends, offsets and fittings. The Contractor shall, prior to developing shop drawings for field piping installation, inspect each area of work for site conformance with the Contract Documents. Submission of the shop drawings for field piping systems shall be verification that the Contractor has inspected the work areas and that the shop drawings indicate all field/site conditions which may impact the installation and performance of the work. Field or site conditions which impact the installation or performance of the work shall be indicated on the shop drawings. Failure of the Contractor to indicate these field or site conditions during the shop drawing phase which impact installation shall be cause for disallowing claims associated with these field or site conditions.

2. Submit detailed certified dimensional shop drawings and manufacturer's product data for materials and equipment, including wiring and control diagrams.

3. Catalog data for all valves and appurtenances, including operators.

4. Shop drawings for all valves and appurtenances.

5. Manufacturer’s installation recommendations.

6. Shop drawings shall include plan and section view including elevation, dimensions from fixed structures, valve and instrument locations. For piping 2-inches in diameter and less, the Contractor shall only provide such Shop Drawings for approval when changes are made to the Drawings.

7. Layout drawings for valves to assure no conflict with other piping and equipment. These drawings shall be coordinated with layout drawings for domestic water pump piping specified in Section 15100 and for centrifugal water pumps specified in Section 11300.

B. Show complete information concerning materials of construction, fabrication, protective coatings, installation and anchoring requirements, fasteners and other details.
Sparks Water Pumping Station & Elevated Tank Improvements
J.O. 231-203-0035-0514

C. Maintenance Data and Operating Instructions:

1. Submit an Operation and Maintenance Manual for the equipment furnished including a detailed description of the function of each principal component, procedures for operation, instructions for overhaul and maintenance.

2. Include lubrication schedule, safety precautions, test procedures, electrical schematics, and parts lists.

D. Equipment Warranty and Certification Form: In addition to submitting shop drawings for the valves, the Contractor shall obtain and submit to the Engineer and Owner certification from the valve manufacturer that the valve meets the requirements intended application and contract specifications. The certification shall be provided by way of the Equipment Operation Warranty and Certification Forms. The Contractor shall provide Equipment Warranty and Certification Forms as detailed within Specification 01780 for all valves four inches (4") in diameter or greater.

1.03 QUALITY ASSURANCE

A. The valve manufacturer shall be regularly engaged in the design, manufacture, and maintenance of the valves for water service and shall have furnished valves of the same general design, type and comparable size specified herein, which have been used and proved satisfactory under similar test, service, and operating conditions for at least ten (10) years. The manufacturer shall furnish satisfactory evidence of adequate facilities for furnishing parts for repairs and for maintenance of valves furnished.

1.04 WARRANTY

A. The Contractor shall submit to the Owner a written manufacturer’s warranty covering equipment defects and workmanship, and shall be responsible for repairing or replacing at his own expense, including labor and shipping, all parts defective in material or workmanship for a period of two years from the date of final acceptance.

PART 2 - PRODUCTS

2.01 GENERAL NOTES

A. The Contractor shall verify all dimensions of valves, special castings and fittings, pipe equipment, etc., so that all of the pipe work performed will fit together properly and will conform to the arrangement as shown on the drawings. In selecting laying lengths of fittings, the Contractor shall be guided by the dimensions of equipment to which connections are made and by the indicated dimensions on the drawings. All pipe and specials shall be accurate to the dimensions shown. Hubs, spigots, and flanges shall be at right angles to the axis of the opening, and openings shall be at the exact angle specified.

B. NSF Compliance: All potable water service valves shall be NSF 61 certified.

2.02 GENERAL NOTES - VALVES

A. Valves specified herein shall have the type of ends specified or as indicated on the drawings or as required by equipment connections.
B. Non-rising stem valves shall be equipped with needle-and-slot type valve position indicators.

C. Unless otherwise shown on the Drawings or specified, all valves on horizontal pipes with centerline 6 feet or closer to the floor shall have their stems in the vertical up position. Unless otherwise shown on the Drawings or specified, valves on horizontal pipes higher than 6 feet from the floor may have their stems either vertical up or horizontal (to best suit geared or nongeared valves) and shall be provided with galvanized operating levers and chains, or chain wheels and chains, extending to within 4 feet of the floor. Orientation of stems described above may be altered if approved by the Engineer to better suit space conditions with the exception that no valves shall be installed with stems in the vertical down position.

D. All valves on vertical pipes shall have their stems oriented to give maximum operational clearance or shall be oriented as directed by the Engineer. Valves in vertical pipes located higher than 4 feet above the floor shall include galvanized levers and chains, or chain wheels and chains, extending to within 4 feet of the floor.

E. Each piece of equipment or appliance shall be separately valved so that supply and return services can be shut off and the piece of equipment or appliance removed if desired, without disturbing the piping systems. Valves shall be located so as to be easily accessible to the plant personnel. Valves shall be installed whether shown on the drawings or not.

F. All valves 2-inches and under which will be used for throttling services shall be globe type except as shown or specified otherwise. Gate valves shall be used for cutoff or stop service except as shown or specified otherwise.

G. All valve flanges shall be coordinated with any adjoining pipe and equipment flanges to ensure bolt hole pattern compatibility.

H. Where extension stems are required, they shall be doweled or otherwise securely attached to the valve stem.

I. The valve and valve operator shall be the responsibility of the valve manufacturer. All valves 4 inches in diameter or greater shall be clockwise turning to open.

2.03 UNDERGROUND VALVES AND ACCESSORIES

A. General

1. Valves shall be of the sizes shown on the Drawings and shall have the types of ends specified or ends compatible with the pipes in which they are installed.

2. Valves located below grade shall be installed in vaults in accordance with the latest Baltimore County Standard Details for Construction.

3. Valves located in vaults or other buried structures shall be complete with extension stems to grade and valve boxes.

4. All valves of any one classification shall be of the same manufacturer.
5. All valves shall open right, clockwise.

B. Valve Boxes

1. The Contractor shall furnish and install valve boxes where indicated on the Contract Drawings and specified herein.

2. All valve boxes shall be placed so as not to transmit shock or stress to the valve and shall be centered and plumb over the operating nut of the valve. The boxes shall be fitted together securely and set so that the cover is flush with the slab or finished floor which it is installed.

3. Boxes shall be as manufactured by Bingham and Taylor, East Jordan Iron Works (EJ), or Neenah Foundry Company. Valve boxes shall be of domestic manufacture.

4. Extension shafts shall be rigidly attached to all buried valve operating nuts such that the operating nut is located six inches below the top slab.

5. Valve boxes shall be set plumb, flush to the top slab, and centered with the bodies directly over the valves so that traffic loads are not transmitted to the valve.

6. Valve boxes shall be provided with valve position indicators as manufactured by Valcom or approved equal. Adapters shall be provided as necessary to accommodate the valve position indicators specified.

2.04 FLOOR BOXES

A. Floor boxes shall be installed in the existing concrete slab, as shown on the Contract Drawings, to provide support for valve extension stems of the non-rising stem type and to provide a cover for the operating nut on the extension stem. Valve boxes or street boxes, with valve position indicator adapter, shall be used as necessary to accommodate the valve position indicators specified.

B. The floor boxes shall have a bronze bushing and be designed for the concrete slab thickness in which they are to be installed with the top of the floor box flush with the top of the concrete slab or installed with a floor box top extension so that top is flush with finish grade, as shown on the Contract Drawings.

2.05 CONE VALVES

A. General

1. Valves shall be high tensile ductile iron, full ported valves and shall be complete with water hydraulic actuator and accessories as specified herein.

2. They shall be suitable for operation at a minimum flow of

   a. Pumps A and B: 1,250 gpm at 212 ft.
b. Pump C: 3,000 gpm at 211 ft.

3. The manufacturer shall have a minimum of five (5) years in the design and manufacture of cone valves.

4. Flanges shall be ANSI B16.1, Class 125 or ASME B16.42, Class 150.

B. Operation

1. Operation of the cone valves shall employ an axial motion to lift the valve plug from its seat, followed by a 90-degree rotary motion of the plug to open the valve and axial motion to reseat in the open position. Closing movement of valve plug shall be in reverse order.

2. The plug shall be the principal moving element within the valve body. Plug shall have full unobstructed waterway equal to diameter of body and adjacent piping.

3. Valve body shall have full unobstructed circular inlet and outlet equal to nominal diameter of specified size of valve and adjacent piping.

4. Valve head shall be so designed that it will totally enclose the large diameter of valve body and support valve operating mechanisms.

C. Valve Construction

1. The valve body shall be of ASTM A536 Grade 65-45-12 ductile iron and shall be provided with seat rings of Monel metal electrically fused to the body waterway and sufficiently raised above the internal surface of the body to assure free operation. The valve shall be complete with ANSI B16.1, Class 125 or ASME B16.42, Class 150 flanges.

2. The valve plug shall be of ASTM A536 Grade 65-45-12 ductile iron and fully skirted with integral cast trunnions. It shall have two sets of Monel seat rings electrically fused to the plug waterway and sufficiently raised above the extended surface of the plug to assure free operation. Trunnion bearings on the plug shall be stainless steel and shall mate with bronze bearings in the body and head. The maximum allowable bearing pressure shall be 3,000 psi.

3. The head shall be of ASTM A536 Grade 65-45-12 ductile iron and shall make a registered connection with the valve body to assure proper bearing alignment. It shall be designed to support the cone valve mechanism and operating forces.

4. The mechanism shaft shall be ASTM A564 Type 630 stainless steel with 125,000 psi minimum yield strength and shall be pinned to the plug. The packing shall be graphited braided Teflon with a bronze adjustable packing gland.

D. Mechanism Construction

1. The operating mechanism shall be totally enclosed in a ductile iron housing with an integrally cast mounting bracket or fabricated A36 housing and bracket to assure proper alignment. The housing shall be designed for either right- or left-hand operator mounting. The mechanism cover shall be ductile iron and make a registered connection to the mechanism housing.
2. The cover shall be bronze bushed where the valve shaft extends through it. The bronze lift nut shall be contained completely within the mechanism housing with provision for external lubrication.

3. The crosshead shall be of bronze B584 Cualy 862 and shall travel on stainless steel guide rods.

4. Two aluminum covered access holes shall be provided for access to the lube fittings on the crosshead.

5. An indicator plate shall be provided on the mechanism cover and an indicator attached to outer end of valve shaft, which will indicate position of plug opening with respect to opening in body. A bushing shall be included where the shaft extends through the mechanism cover.

E. Hydraulic Cylinder

1. The actuators shall be water hydraulic cylinder manufactured in strict accordance with AWWA specifications C541 Section 4.4.4 (Water Hydraulic Cylinders).

2. Piston rods shall be chrome-plated stainless steel having an 8-microinch finish or smoother. Cylinder pistons shall be bronze or stainless steel. Heads and caps shall be bronze or stainless steel. Cylinder barrels shall be bronze or stainless steel. Piston-rod bushings shall be bronze. Hydraulic cylinders shall be supplied by Miller Fluid Power, Chicago Fluid Power or approved equal. If PRV’s are required for hydraulic cylinder supply, they shall be provided by the contractor at no additional cost to the owner. The piston shall be provided with U-cups to give an oil and watertight fit within the cylinder. The cylinder shall be designed and constructed to operate over pressures at the cone valve water supply corporations, ranging from 54psi minimum to 92 psi maximum.

F. Control Sequencing

1. The pump check controls shall be supplied, mounted and tested by the valve manufacturer. They shall consist of a 4-way solenoid valve with manual override, speed control valves, open/close limit switches, pump shutdown limit switch (95% closed) and a pressure switch positioned on the upstream side of the valve. The four-way solenoid valve shall be single solenoid, power drive each way, pilot-controlled type with manual operator similar to ASCO Bulletin 8344 with manual override or equal. Solenoid enclosure shall be watertight. Normal Operation Flow control valves shall be Parker F-1600-B or Manatrol F-1600B. Emergency close flow control valve (NV) shall be Parker N-1600-B or approved equal. 3-way ball valve shall be Watts B6780SS with SS ball and stem or approved equal. 2-way ball valve shall be Kitz No 68m with SS ball and stem or approved equal. Gate valves shall be Nibco Company No. 431 or equal. Emergency, rapid closure, solenoid actuated globe valves for power failure or system malfunction induced power cut-off shall be ASCO Bulletin 8210 or equal with watertight enclosure. Strainer shall be all bronze with cleanout, SS screen mesh, Kitz or equal. Strainer shall be provided with appropriate filter and filter element to remove dirt and scale particles to no larger than 0.8mils.
2. When the pump reaches the designated pressure, the pressure switch is activated, energizing the solenoid control valve (SV-1) causing the cone valve to open at a predetermined rate. To shut down pump operation, the solenoid control valve (SV-1) is de-energized causing the cone valve to close. When the cone valve is approximately 95% closed, the pump shutdown limit switch shall be activated shutting down the pump. Opening shall be 120 seconds and closing 120 seconds. Speeds shall be independently field adjustable from 45 seconds to 240 seconds.

3. When the pump control switch is turned to the running position, the pump starts, and an adjustable pressure switch mounted on the valve shall energize the solenoid pilot valve (SV-1) to cause the cone valve to open at a predetermined rate. Rate of opening shall be manually adjustable for complete valve travel.

4. For normal stop, when the pump control switch is turned to STOP, the solenoid pilot valve (SV-1) shall be de-energized causing the main valve to close at a predetermined rate, while pump continues to run. Rate of closing shall be manually adjustable for complete valve travel.

5. Emergency Operation: When power failure occurs, both bypass solenoid valves (SV-2 and SV-3) and solenoid actuated four-way valve (SV-1) are deenergized. The bypass ball valves (BV-1 and BV-2) are in “AUTO” position. The four-way valve (SV-1) ball valves (BV-3 and BV-4) are in “OPEN” position. The four-way valve (SV-1) is positioned to close the cone valve and the bypass solenoid valves (SV-2 and SV-3) open, permitting operating fluid to flow to the top of the cylinder piston and from the bottom of the cylinder piston while bypassing the four way valve (SV-1) effecting rapid closure of the cone valve. Emergency closing speed shall be set to 30 seconds. Speeds shall be independently field adjustable from 20 seconds to 60 seconds. Upon complete closure of the cone valve, a 0-360 seconds adjustable time delay switch, set for 120 seconds shall prevent the motor from restarting during reverse rotation.

6. A schematic control arrangement for the cone valve is shown on the contract drawings and no deviation will be permitted without prior approval of the Engineer.

G. Limit Switches

1. Three (3) limit switches shall be mounted on the body of each cone valve actuator where recommended by the cone valve/controller manufacturer. The limit switches shall be actuated by a cam, located on the shaft of the cone valve actuator. Where the cone valve is in the full closed position, the first limit switch (LS1) shall close, energizing a relay which will set up the pump control circuitry for its next start command and will deenergize the “valve open” indicating light. When the cone valve reaches the fully open position, the second limit switch (LS2) shall close, energizing a relay which will interrupt the incomplete sequencing timing for pump operation and will deenergize the “valve closed” indicating light. When the valve reaches the 95% closed position, the third limit switch (LS3) shall break the control circuit to the motor thereby shutting down the pump unit and deenergizing the two (2) rapid-close two-way actuated globe valves.
2. The limit switches shall be heavy duty, UL listed, NEMA Type 4, 15 amps (min) NO/NC contacts at 120 volts AC, roller lever type, NAMCO EA 7000 Series or approved equal.

H. Pressure Switches

1. Pressure switches shall be mounted on the piping between the water pumps and the cone valves as shown on contract drawings. The pressure switches shall sense pump discharge water pressure and make contact to organize the four-way solenoid valve on the cone valve control system.

2. Pressure switches shall be fully adjustable, Type G industrial, diaphragm with NEMA Type 4 enclosure with 1/4-inch NPT pressure connection. The switches shall have an adjustable range up to 250 psi. Contacts shall be single pole, double throw, 10 amps NO/NC, Square D Class 9012, Model GAW-26 or approved equal.

I. Spare Parts

The following spare parts shall be furnished for each Cone valve unit, and shall be delivered by the Contractor to the site:

1. One (1) four-way solenoid valve.
2. Two (2) two-way solenoid valve.
3. Two (2) flow control valve.
4. One (1) pressure switch.
5. Two (2) Limit switches.
6. Five (5) strainer screen.

J. Manufacturers

1. American Cone Valve.
2. Or Approved Equal.

2.06 PLUG VALVES

A. Plug valves shall be a non-lubricated, eccentric, resilient-faced plug type and shall have flanges faced and drilled in accordance with the ANSI B16.1, Class 125 standard.

B. Valve bodies shall be of ASTM A126, Class B cast iron in compliance with AWWA C517-16, Section 5.1. All exposed nuts, bolts, springs and washers shall be zinc plated. Port areas of plug valves shall be rectangular and at least 100% of full pipe area.
C. Plug: The plug shall be of one-piece construction and shall be capable of withstanding the full pressure rating of the valve in either direction without the use of structural ribs that extend beyond the profile of the plug.

D. Seats: Valves shall be furnished with corrosion resistant seats of a non-ferrous metal in accordance with AWWA Standard C-507-91, Section 3, Paragraph 3.2.3.4 and 3.2.3.5. The valve seat shall not be bolted or clamped. Seats shall be 1/8” thick welded overlay of not less than 95% pure nickel. Seat shall be at least 1/2” wide, 1/8” thick through entire width and raised. The raised surface shall be completely covered with nickel to ensure that the resilient plug face contacts only the nickel seat.

E. Bearings: Valves shall be furnished with replaceable, sleeve type bearings conforming to AWWA C-504 in upper and lower journals. Bearings shall be oil impregnated type 316 stainless steel. Thrust bearings shall be provided in the upper and lower bearing journals to isolate the bearing and seal area from grit and line media. Thrust bearing shall be PTFE or 316 stainless steel.

F. Shaft seals: Valve shaft packing seals shall comply with AWWA Standard C517-16, Section 3.7 and shall be of Buna-N. Plug shaft seal shall be adjustable and completely replaceable without any disassembly of valve or removal of the operator or actuator from the valve. Nowhere in the valve or actuators shall the valve shaft be exposed to iron on iron contact. The plug shaft seal must be capable of being allowed to drain away from the valve and shall not be allowed to enter the operator.

G. Valve pressure ratings shall be as follows and shall be established by hydrostatic tests as specified by ANSI Standard B16.1-1967. Pressure ratings shall be 175 psi for valves 3-inch through 12-inch and 150 psi for valves in sizes 14 through 36-inch. Valve shall provide drip tight shut off to the full pressure rating with the pressure applied to the valve in either direction. Provide certified hydrostatic shell test and seat test report.

H. Valves shall be provided with valve position indicators which can be read from the floor level.

I. Operators: All actuator components shall be designed to withstand, without damage, a pull of 200 lb for handwheel and chainwheel and 300 ft-lb for operating nuts.

J. Orientation shall be as described below and shown on the Contract Drawings. The approval of the Engineer is required for installation orientations.

1. Plug valves shall be installed with the axis of the plug horizontal and the plug rotates to the top position when open. The plug seat shall be so oriented such that the static line pressure will push the plug into the seat of the valve when the valve is closed.

2. Plug valves shall be installed with the axis of the plug vertical and the plug rotates to the side position when open. The plug seat shall be so oriented such that the static line pressure will push the plug into the seat of the valve when the valve is closed.

3. The approval of the Engineer is required for any other installation orientation.
K. Valves that are closed regularly or for an extended period of time shall be installed such that the plug seat is oriented such that the static line pressure, or force main pressure when the valve is closed, is against the face of the plug. Pump suction and discharge isolation valves shall have their seats on the pump side.

L. Valve interior and exterior shall be factory epoxy coated in accordance with the manufacturer’s recommendations.

M. Valve shall be manufactured by

1. DeZurik
2. Val-Matic
3. Or approved equal.

2.07 BALL VALVES

A. Metal-Body Ball Valves

1. Metal body ball valves be shall MSS SP-110, full port, ANSI 150 flanged, split body type with manual actuators, lead free, NSF/ANSI 61 rated and having a working pressure up to 600 psig. Size shall be as shown on the drawings.

2. Body and end piece shall be bronze alloy. Ball and stem shall be 316 stainless-steel. Seat, thrust washer and stem packing shall be PTFE. End connections shall be solder joint or threaded. Handle shall be steel with plastic coating.

3. Sizes ¼” to 3” ball valves shall be NIBCO INC. 585-66-LF or approved equal.

2.08 PRESSURE RELIEF VALVE

A. Main Valve

1. Valves shall be a hydraulically operated globe (angle) valve. The inner valve assembly shall be top, and bottom guided by means of replaceable bearing bushings or bearing mounted in the valve cover and an integral bearing in the valve seat. The inner valve assembly shall be the only moving part and shall be securely mounted on a 316 stainless steel stem. The stainless-steel stem shall be provided with wrench flats on all valves for ease of assembly and maintenances.

2. All pressure containing components shall be constructed of ASTM A536-65/45/12 ductile iron. The flanges shall be ASME B16.42, Class 150.

3. Valves shall have a protective fusion bonded epoxy coating internally and externally. The protective fusion bonded epoxy coating shall conform to the AWWA C550.

4. Valves shall provide smooth "frictionless" motion with actuation being achieved by the use of a flat style EPDM diaphragm. They shall be constructed of nylon fabric bonded with synthetic rubber. The diaphragms shall not be used as a seating surface. No lip seals or packing may be used to seal the actuator.
5. The valve cover shall have a separate stem cap giving access to the stem for alignment check, spring installation and ease of assembly.

6. Bonnets shall be accurately located to bodies utilizing locating pins or lip. Locating pins shall eliminate corrosion resulting from the use of uncoated ductile iron to ductile iron surfaces.

7. Valves shall have the 316 stainless-steel seat, bolted in place, utilizing "Spiralock" thread tapping technology or solid one-piece stainless-steel seat that is threaded in on 6-inch and smaller valves and machine screws for 8-inches and larger valves. The 316 stainless-steel seat ring shall be easily replaceable without special tools.

8. Valves shall form a drip tight seal between the stationary stainless-steel seat ring and the resilient disc, which has a rectangular cross-section and is retained by clamping on three- and one-half sides. The resilient disc shall be constructed of Buna or EPDM for normal service conditions.

9. Valves shall be covered by a minimum five-year (5) warranty against defects in materials and workmanship. The stainless-steel seat ring shall be covered by a lifetime replacement warranty.

B. Pilot

1. The pressure relief pilot spring range shall be 20 to 200 PSI, with set point preset at factory as indicated on the drawings. The valve shall remain closed when line pressure is below the set points of the pilot. The valve shall remain closed until inlet pressure exceeds a pre-determined set point at which time the valve opens quickly and modulates to limit the upstream pressure to the pre-determined set point.

2. The normally closed pilot shall be of brass and bronze construction with a spring to adjust the opening pressure.

3. The inner valve shall be of stainless steel 316 construction and the inner valve shall have EPDM resilient compound for seating. The EPDM compound must be bonded permanently to the inner valve and be ground flat and square to assure maximum performance.

4. The pilot shall be self-cleaning by locating the inlet directly into the seat area through the bottom of the pilot and the outlet ninety degrees to the inlet.

5. A separate port shall sense pressure either upstream or downstream, as shown on the drawings, to open the pilot and therefore the main valve when system pressure exceeds the pilot set point.

6. A single pole, double throw limit switch assembly shall actuate by the opening or closing of the control valve on which it is mounted. Switch shall be located in a weatherproof enclosure. Alarms shall be configured within the control system to notify when the valve is blowing off.
C. Manufacturers

1. Singer; Model 106-RPS
2. Cla-Val; Model 50G-01BPVY KC D.S. BBB X101
3. Or Approved Equal

2.09 GATE VALVES

A. Gate valves shall be resilient seated gates valves provided in accordance with AWWA C515, NSF61, and these specifications.

B. Materials

1. Valve body, bonnet, and gland: Ductile iron, ASTM A536 Grade 65-45-12
2. Wedge: Ductile iron, ASTM A536 Grade 65-45-12 fully encapsulated in EPDM rubber
3. Stem: 304 Stainless steel
4. Stem nut: Bronze
5. O-ring gasket and stem seals: EPDM
6. 2” Operating nut (if applicable): Ductile iron, ASTM A536 Grade 65-45-12
7. Handwheel (if applicable): Ductile iron, ASTM A536 Grade 65-45-12
8. Hardware: 304 Stainless steel
9. Internal and external coating: Fusion bonded epoxy in accordance with AWWA C550 and NSF61

C. Valve body shall be provided with integral ANSI 125 flanges.

D. Valve shall be oriented with the wedge rising vertically. Stem shall be non-rising. Each valve body or operator shall have a cast thereon word “OPEN” and an arrow indicating the direction to open.

E. Gate valves shall be designed for a minimum working pressure of 200 psi and a test pressure of 300 psi hydrostatic test pressure.

F. Valves 16” and larger:

1. Valves shall be non-rising stem configuration.
2. The valve shall be operated using a 2” square operating nut. The direction of rotation of the operating nut to open the valve shall be to the right (clockwise). Contractor shall furnish two (2) operating nut keys. 2-inch AWWA operating nut
shall be constructed of ductile iron ASTM A536 Grade 65-45-12 with integrally cast shield not less than 4-inch end to end, 3-inch side to side and a total height of not less than 2-11/16 inches. Total weight of the operating nut shall not be less than 2.25 pounds. The ductile iron operating nut shall be fusion bonded epoxy coated inside and out with no uncoated surface.

3. Valves shall be provided with gearing, as required, to limit pull required to operate the valve to 40 lbs. Valve shall be operable from the top slab with suitably sized operating T-wrench. Contractor shall provide T-wrench of suitable length size as required by the City. At a minimum, T-wrenches shall stand 3ft above grade. Provide two (2) T-wrenches.

G. Valves 14” and smaller:
1. The valve shall be operated using a handwheel. The direction of rotation of the handwheel to open the valve shall be to the right (clockwise). Each manual operator shall be designed to limit force required to operate the valve under a 40lbs on the handwheel.

H. Valve turn count shall meet Baltimore City requirements.

I. Valves shall be covered by a minimum two (2) year warranty against defects in materials and workmanship.

J. Manufacturers:
1. Kennedy Valve KS-RW 515 Resilient Wedge Valves
2. Or approved equal

2.10 SWING CHECK VALVE

A. The check valve shall be installed on the outlet line of the elevated tank to allow water to flow from the elevated tank to the distribution system when the pressure on the elevated tank side of the check valve is greater than the pressure in the distribution system. The check valve shall open with no more than six inches of differential pressure.

B. The check valve shall be designed to smoothly swing open at onset of effluent flow and close quickly but without hammer to prevent flow reversal. When closed, the valve shall seat drip tight. Disc seats shall be replaceable.

C. The check valve shall be of the swing check type meeting the requirements of ANSI/AWWA C508. The valve shall include an outside weight and lever. The valve shall have integral ANSI B16.1, Class 125 or ASME B16.42, Class 150 flanges. The valve shall have a bolted steel cover allowing complete access to and removal of all internal components while the valve is in the line.

D. Materials
1. Valve body: Ductile Iron, ASTM A536 65/45/12
2. Disc: Ductile Iron, ASTM A536 65/45/12

3. Seats:
   a. Body seat: 304 or 316 Stainless Steel
   b. Disc seat: Buna-N

4. Hardware: Stainless Steel

5. Interior and Exterior Coating: Fusion bonded epoxy meeting the requirements of NSF61 and AWWA C550

E. Manufacturers

1. DeZURIK model CVS-250LW Outside Weight and Lever Swing Check Valve
2. Cla-Val model 585LW Outside Weight and Lever Swing Check Valve
3. Or approved equal.

2.11 ALTITUDE VALVE

A. Main Valve

1. Valves shall be a hydraulically operated, full port globe valve. The inner valve assembly shall be top, and bottom guided by means of replaceable bearing bushings. The inner valve assembly shall be mounted on a 316 stainless steel stem. The stainless-steel stem shall be provided with wrench flats on all valves for ease of assembly and maintenance.

2. All pressure containing components shall be constructed of ASTM A536-65/45/12 ductile iron. The flanges shall be designed to ASME16.42, Class 150.

3. Valves shall have a protective fusion bonded epoxy coating internally and externally. The protective fusion bonded epoxy coating shall conform to the AWWA C550 and NSF61.

4. Valves shall provide smooth "frictionless" motion with actuation being achieved by the use of a flat style EPDM diaphragm. They shall be constructed of nylon fabric bonded with synthetic rubber. The diaphragms shall not be used as a seating surface. No lip seals or packing may be used to seal the actuator.

5. The valve cover shall have a separate stem cap giving access to the stem for alignment check, spring installation and ease of assembly.

6. Bonnets shall be accurately located to bodies utilizing locating pins. Locating pins shall eliminate corrosion resulting from the use of uncoated ductile iron to ductile iron surfaces.

7. Valves shall have the 316 stainless steel seat, bolted in place, utilizing "Spiralock" thread tapping technology. The 316 stainless steel seat ring shall be easily replaceable without special tools.
8. Valves shall form a drip tight seal between the stationary stainless-steel seat ring and the resilient disc, which has a rectangular cross-section and is retained by clamping on three- and one-half sides. The resilient disc shall be constructed of Buna or EPDM for normal service conditions.

9. Valves shall be covered by a minimum five-year (5) warranty against defects in materials and workmanship. The stainless-steel seat ring shall be covered by a lifetime replacement warranty.

B. Pilot

1. The altitude valve pilot spring range shall be 60 to 225 ft, with set point preset at factory to 136 ft. The valve allows normal forward flow to fill the reservoir to the maximum level then closes drip tight at the set point. It opens to refill the tank when upstream pressure increases from the pumping station pumps turning on.

2. The normally closed pilot shall be of brass and bronze construction with a spring to adjust the opening pressure.

3. The inner valve shall be of stainless steel 316 construction and the inner valve shall have EPDM resilient compound for seating. The EPDM compound must be bonded permanently to the inner valve and be ground flat and square to assure maximum performance.

4. The pilot shall be self-cleaning by locating the inlet directly into the seat area through the bottom of the pilot and the outlet ninety degrees to the inlet.

5. A separate port shall sense pressure either upstream or downstream, as shown on the drawings, to open the pilot and therefore the main valve when system pressure exceeds the pilot set point.

C. Manufacturers

1. Singer; Model 106-A-Type 4 with Model 301-4 pilot

2. Cla-Val; Model 210G-01BYKC D.B.

3. Or Approved Equal

2.12 FLAP VALVE

A. Valves shall be of the circular port design with offset single pivoted hinge. The assembly shall consist of a flap gate, body, and hinge pin.

B. The flap gate and body shall be cast iron in conformance with ASTM A126, Class B. The rings shall be B62 bronze and the pins shall be stainless-steel. The flap gate seat ring shall be rolled into a dove-tailed groove under pressure to make one inseparable unit. The body seat ring shall be threaded and screwed into place in the body. Both the gate and body seat ring faces shall be machined to a smooth finish.
C. Manufacturers:
   1. Kennedy Valve F-3012 Flap Valves
   2. Or approved equal

2.13 OVERFLOW CHECK VALVE
   A. Valves shall be one part, maintenance free, all rubber duck bill check sleeve design with integral elastomer flange. Flange shall conform to ANSI B16.5 and B16.47, Class 150 standards. The valve shall be furnished with a 3/8-inch thick steel back-up rings for installation.
   B. Valves with hinged gates are not acceptable.
   C. Manufacturers:
      3. Red Valve Tideflex Series 35 Check Valves
      4. Or approved equal

2.14 ELASTOMERIC CHECK VALVES
   A. Manufacturer shall have available flow test data from an accredited hydraulics laboratory to confirm pressure drop data.
   B. Company name, plant location, valve size and serial number shall be bonded to each check valve.
   C. Inline check valves shall withstand up to 26ft of water head upstream pressure and downstream backpressure.
   D. Inline check valves shall not be buried under any condition.
   E. Inline check valves shall be comprised of a 316 stainless steel sleeve and synthetic rubber membrane, and be suitable for sewage service. The sleeve and membrane shall withstand abrasives, such as sand, detritus and other chemicals/materials normally found in raw sewage. The valve installed on the surge relief valve drain line shall be comprised of components suitable for use with potable water. Elastomeric check valves shall be WaStop Check Valve, as manufactured by WaPro, Chicago IL, or approved equal.
   F. Inline check valves shall be fully closed and sealed in the normal state when there is no flow of water or when there is any backflow/backpressure.
   G. Inline check valves shall be:
      1. Mounted in a 316 stainless steel sleeve that, during installation, is to be inserted as is on site into the host pipe, or;
2. Mounted in a 316 stainless steel sleeve that, during installation, is to be installed as intermediate pipe between two existing pipe ends with flexible couplings or flanges, and;

3. Made of synthetic rubber and designed as one single eccentric conical membrane with radius all around its conical periphery. The membrane shall have no flat pressure sensitive area/surface facing the potential back-flow liquid in order to avoid backpressure forces being directed in the same direction which can collapse the membrane. The conical design shall divert the forces toward the periphery of the membrane/pipe and minimize the total forces on the pipe.

2.15 MANUAL VALVE OPERATORS

A. Manually controlled valves, sizes 4-inches and below, shall be lever operated, infinitely adjustable, and capable of being locked in any position.

B. All handwheel operated valves, sizes 4-inches and larger, shall open with clockwise rotation of the handwheel.

2.16 CORPORATION STOPS

A. Corporation stops shall be bronze ball-type rated for 300 psi with a tapered threaded inlet and an iron pipe threaded outlet. Corporation stops shall be as manufactured by Mueller Company or equal.

PART 3 - EXECUTION

3.01 EXISTING UTILITIES

A. Where new piping is to be connected to existing piping, the Contractor shall drain or purge the existing piping, cut, grind and prepare the existing piping in every respect in order that it is suitable for connecting to the new piping.

B. Where existing utilities are to be abandoned and removed, the Contractor shall not reuse the piping on the project. Abandoned utilities remaining in place shall be plugged and capped using retainer glands. Utilities that have been removed shall be hauled offsite and disposed by the Contractor.

3.02 LAYING PIPE AND FITTINGS

A. Pipe, fittings and accessories shall be stored and handled in a manner that will ensure installation in a clean, sound, and undamaged condition. Ductile iron pipe, fittings, valves and appurtenances shall be unloaded, handled, and stored in accordance with AWWA C600. If damage or coating abrasion occurs and is deemed repairable, it shall be repaired as directed by the Engineer in accordance with manufacturer's recommendations. If damage is not repairable in the opinion of the Engineer, such pipe, fittings, valve or appurtenance will be rejected and shall be removed and replaced at Contractor's expense.
3.03 INSTALLATION OF VALVES

A. All valves shall be installed in accordance with the manufacturer’s instructions and as required herein.

B. All valves should be installed with position dials clearly visible from the operating locations.

3.04 TESTING

A. A factory trained representative shall check the installation and supervise the field testing of the hydraulically operated valves and their controls, to adjust the speed of opening and closing as to secure a minimum of surge oscillation or pressure as indicated by the specified recording gauge, and perform all other work and adjustment necessary for the proper operation of the system. This work shall be performed in cooperation and to the complete satisfaction of the City, County, and Engineer. The manufacturer or his authorized representative shall certify in writing to the Engineer that the cylinder operated valves and controls have been installed in accordance with the manufacturer’s instructions and recommendations, have been inspected and field tested and are ready for service. The cost of this work shall be included in the bid price in the proposal, and no additional compensation be made to the Contractor.

B. Operate all valves twice through a complete open/close cycle. Check for valve seating to be drip tight. If leaking occurs, adjust or replace valve packing as necessary and retest. Replace valves if persistent leaking occurs.

C. Cone valve body and head shall be hydrostatically tested for ten minutes at test pressure of one and one-half times maximum working pressure for which valve is intended. Under test parts shall show no evidence of distress and shall be free from any leaks or weeping.

D. Cone valve shall be submitted to leakage test with valve in closed position and seats under maximum working pressure maintained for 15 minutes. Leakage shall not exceed 0.4 ounces per minute per inch valve diameter.

E. Cone valve, when fully shop assembled, shall be given at least three (3) operations. Wherever practical, when controls are involved, the valve and its respective controls shall be operated as a unit to test function of the control.

3.05 PAINTING

A. Paint valve as specified in Section 09900.

END OF SECTION
PART 1 - GENERAL

1.01 DESCRIPTION

A. Work performed under this section shall include, but is not limited to, furnishing and installing all components of the sodium hypochlorite supply system as well as any accessories including process control and electrical wiring necessary for the complete and satisfactory installation of the system.

B. Components of the sodium hypochlorite supply system shall include, but not be limited to (1) Chemical Metering Pump Skid, (1) Sodium Hypochlorite System Local Control Panel, (1) Fill Station Control Panel, (1) Chemical Feed System Flow Meter, (1) Chlorine Residual Analyzer, (1) Microprocessor-Based Compound Loop Controller, (2) Fiberglass Storage Tanks, as well as level indicators, leak detector units, float switches and other accessories necessary to provide a complete and operable sodium hypochlorite feed system. All sodium hypochlorite feed system components shall be supplied by a single hypochlorite feed system Supplier.

C. The Contractor shall furnish and install one (1) completely pre-assembled, packaged chemical metering supply system. The equipment is to be supplied by a single, engineer-approved, equipment supplier for installation by the Contractor.

D. The Contractor shall provide all labor, materials, equipment and services necessary to install the sodium hypochlorite feed system as specified herein and as shown on the Contract Drawings.

E. Installation, wiring, interconnections, startup, and testing of the Hypochlorite System shall be the responsibility of the System Integrator as defined in Section 17010 in conjunction with the manufacturer’s certified technicians.

1.02 SUBMITTALS

A. Contractor shall schedule a pre-submittal meeting to discuss the Sodium Hypochlorite Supply System operation. Meeting attendees shall include representatives of the Owner, Engineer, Contractor, Hypochlorite System Supplier, and Process Control System Integrator.

B. Shop Drawings shall be submitted for all items specified herein as described under Section 01000, GENERAL REQUIREMENTS:

1. Submit manufacturer’s product data, specifications, and installation instructions.

2. Submit detailed show drawings for system material and equipment, including detailed wiring and control diagrams. Show complete information concerning fabrication, installation, anchoring, fasteners and other details.
3. Documentation demonstrating that the chemical metering pump system manufacturer is certified to the international quality standards ISO 9001 for design, assembly and manufacturer. Manufacturers who are not ISO 9001 certified will be required to submit, on each actual unit supplied, factory witness test data certified by a registered Professional Engineer.

4. Approval of the shop drawings will not relieve the Contractor of any responsibility for accuracy of dimensions and detail.

5. Submit detailed certified dimensional shop drawings and manufacturer's product data for materials and equipment, including wiring and control diagrams.

6. Catalog data for each piece of equipment.

7. Shop drawings for all equipment.

8. Submit dimensioned layout plan of the complete system and all associated components. Equipment located within and exterior to the building shall be included as well as all other trade equipment to ensure no conflicts are present.

9. Manufacturer’s installation recommendations.

C. Show complete information concerning materials of construction, fabrication, protective coatings, installation and anchoring requirements, fasteners and other details.

D. Maintenance Data and Operating Instructions:

1. Submit an Operation and Maintenance Manual for the equipment furnished including a detailed description of the function of each principal component, procedures for operation, instructions for overhaul and maintenance. Operation and Maintenance Manual shall be submitted in accordance with Specification Section 01000 – GENERAL REQUIREMENTS.

2. Operation and Maintenance Manual shall include:
   a. Lubrication schedule
   b. Safety precautions
   c. Test procedures
   d. Electrical schematics
   e. Parts lists
   f. Principle of operation
   g. Installation instructions
   h. Description of unit and component parts
i. Operating procedures

j. Maintenance procedures

k. One line wiring diagram (of the controller) detailing wire number, terminal numbers, and wiring as exactly seen in the controller cabinet. The drawing should be provided with information on all parts and including their part numbers and/or catalog numbers.

l. Troubleshooting guide with possible failures and their corrections.

E. Equipment Warranty and Certification Form: In addition to submitting working drawings for the Sodium Hypochlorite Feed System, the Contractor shall obtain and submit to the Engineer certification from the Hypochlorite Feed System manufacturer that the system (chemical metering pump skid, fiberglass storage tanks, and all associated appurtenances) meets the requirements of the contract specification. This certification shall be provided by way of the Equipment Warranty and Certification form, as provided under Section 01780.

1.03 QUALITY ASSURANCE

A. Reference standards:

1. American Society for Testing and Materials (ASTM)
   
a. ASTM D618 Standard Practice for Conditioning Plastics for Testing
   
b. ASTM D638 Standard Test Method for Tensile Properties of Plastics
   
   
d. ASTM D883 Standard Terminology Relating to Plastics
   
e. ASTM D1505 Standard Test Method for Density of Plastics by the Density-Gradient Technique
   
f. ASTM D1525 Standard Test Method for Vicat Softening Temperature of Plastics
   
g. ASTM D1693 Standard Test Method for Environmental Stress-Crackling of Ethylene Plastics
   
h. ASTM D1998 Standard Specification for Polyethylene Upright Storage Tanks
   
i. ASTM D2765 Standard Test Methods for Determination of Gel Content and Swell Ratio of Crosslinked Ethylene Plastics
j. ASTM D2837 Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products

k. ASTM D3892 Standard Practice for Packaging/Packing of Plastics

l. ASTM F412 Standard Terminology Relating to Plastic Piping Systems

2. Association of Rotational Molders (ARM)
   a. Low Temperature Impact Resistance (Falling Dart Test Procedure)

3. American National Standards Institute (ANSI)
   a. B-16.5 Pipe Flanges and Flanged Fittings

4. Occupational Safety and Health Administration (OSHA)
   a. 29 CFR 1910.106 Occupational Safety and Health Administration, Flammable and Combustible Liquids

5. Uniform Building Code

   B. Chemical metering pumps shall be certified to NSF Standard 61 Drinking Water System Components, UL standard 778 motor operated pump and CSA standard C22.2 process control equipment.

1.04 RELATED WORK

   A. Section 05500 – Metal Fabrications
   B. Section 09900 – Painting
   C. Section 15100– Pipe
   D. Division 16 – Electrical Work

1.05 PRODUCT DELIVERY, HANDLING, AND STORAGE

   A. During shipment, all equipment shall be braced and protected from any distortion or damage, any such distortion or damage shall be basis for rejection of the equipment. If special shipping and handling precautions are required, prominently and legibly stencil such precautions on the outside of the equipment or its crating.

   B. Inspect materials delivered to site for damage; unload and store with minimum handling. Store materials on-site in areas to be designated by the Owner. Do not store materials directly on the ground.
1.06 WARRANTY

A. The Contractor shall submit to the Owner a written manufacturer’s warranty covering equipment defects and workmanship, and shall be responsible for repairing or replacing at his own expense, including labor and shipping, all parts defective in material or workmanship for a period of two years from the date of final acceptance.

B. All components of the chemical metering pump skid system shall be warranted by the manufacturer for three years from the date of final acceptance.

PART 2 - PRODUCTS

2.01 GENERAL NOTES

A. The Contractor shall verify all structural and equipment dimensions so that the sodium hypochlorite supply system will fit together properly within the space available and will conform to the arrangement as shown on the drawings. In selecting piping and equipment layout, the Contractor shall be guided by the dimensions of equipment to which connections are made and by the indicated dimensions on the drawings.

B. All materials and coatings used in the construction of the sodium hypochlorite feed system that come in contact with the treated or process water shall be NSF 61 Certified and approval for use in potable water installations.

C. Provide a chemical metering pump system with components, metering pump(s) and accessories, suitable for feeding 12-15% sodium hypochlorite against a 100 PSIG maximum discharge pressure. All wetted materials of construction shall be compatible with sodium hypochlorite. The system shall be sized to provide a minimum incremental chlorine residual increase of 0.1 to 1.0 mg/L at the design flow rate of 2.304 MGD.

2.02 CHEMICAL METERING PUMP SKID

A. Performance requirements

1. Furnish complete chemical metering pump skid as specified in this section and as shown on the contract drawings. The chemical metering skid shall be completely self-contained.

2. The chemical metering pump system shall be designed to safely feed metered amounts of sodium hypochlorite as the specified capacity and pressure. All wetted materials of construction shall be compatible with sodium hypochlorite.

3. The design of the skid shall include a solid base, back panel and side panels with an open front and top. Pedestals shall be provided to elevate the metering pumps to accommodate suction piping.

4. The pump skid equipment shall be pre-assembled and shop tested to assure compliance with pressure and operational requirement.
5. Each chemical feed metering pump skid must include (2) chemical metering pumps, (2) pressure relief valves, (2) pulsation dampeners, (2) diaphragm protected pressure gauges, (1) ball check valve, (1) calibration column and all required piping, sodium hypochlorite rated ball valves and supports. Piping shall include isolation valves and unions for all serviceable components.

6. The manufacturer must be ISO 9001 certified in order to provide the highest level of quality assurance. Manufacturers who are not ISO 9001 certified will be required to submit, on each actual unit supplied, factory witness test data certified by a registered Professional Engineer.

7. The package unit shall be pre-piped and pre-wired at the factory with all components assembled and mounted on a fiberglass framework. The package unit(s) shall be hydraulically and electrically tested at the factory and shall ship assembled to the fullest extent possible.

8. Skid for mounting pumping system shall be constructed of lightweight, permanently welded 6060 T6 aluminum with an exterior grade corrosion resistant polyester polyurethane powder coat applied according to the manufacturer’s recommendations.

B. Metering Pumps

1. The pumps shall be positive displacement self-priming peristaltic tubing type pumps driven by brushless variable-speed motors. Each pump shall have a minimum 10,000:1 turndown ratio and be designed to deliver anywhere from 0.0002 to 2.1 gph of 12.5% sodium hypochlorite at 80 psi. Pumps shall be unable to vapor lock or lose prime. Pump shall be capable of running dry without damage and shall be of corrosion resistant material suitable for the intended service conditions.

2. Pumps shall be sized to accurately and consistently feed a quantity of sodium hypochlorite sufficient to provide a minimum incremental chlorine residual increase of 0.1 to 1.0 mg/L at the design flow rate of 2.304 MGD. Dosing accuracy shall be +/- 0.5 percent of full scale and repeatability shall be +/- 0.5 percent. All chemical-metering pumps shall be suitable for 24-hour operation. Pump shall be Blue-White Model M-324-*ND, or approved equal.

3. The pump output shall be capable of being manually controlled via front panel user touchpad controls. The pump motor speed shall be adjustable from 0.001% to 100.0% in 0.001% increments less than 1% motor speed, in 0.01% increments between 1% and 10% motor speed, and in 0.1% increments greater than 10% motor speed.

4. The pump output shall be capable of being remotely control via 4-20mA analog input. The input resolution shall be 0.01 of input value and capable of adjusting the pump motor speed from 0% to 100.0% motor speed in 0.1% increments.
5. Pump shall have non-spring loaded roller assembly located in the pump head with two CNC precision machined squeeze rollers and two alignment rollers in addition to a heavy duty, single piece plastic rotor with no metal springs or hinges. Squeeze rollers with encapsulated ball bearings shall be directly coupled to a one piece thermoplastic rotor. The roller diameters and occlusion gap shall be factory set to provide the optimum tubing compression; field adjustment shall not be required.

6. Rotor assembly shall be installed on a D-shaped, chrome plated motor shaft and removable without tools. Hand cranking of the rotor assembly shall not be required for tubing installation and removal. The pump head cover shall be clear, annealed acrylic thermoplastic with an integral ball bearing fitted to support the overhung load on the motor shaft. Cover shall be positively secured to the pump head using a minimum of four thumb screws. Tools shall not be required to remove the pump head cover and the cover shall include an imbedded magnetic safety interlock which will limit the motor rotation speed when removed.

7. To ensure pump performance and accuracy, only tubing provided by the manufacturer is acceptable. There shall be no valves, diaphragms, springs, or dynamic seals in the fluid path. Process fluid shall contact the pump tubing assembly and connection fittings only. Pump tube shall be assembled to connection fittings of PVDF material. Connection fittings shall be permanently clamped to the tubing with stainless steel clamps. Fittings shall insert into keyed slots located in the pump head and secured in place by the pump head cover.

8. Pump shall be provided with a tube failure detection system to sense tube failure by detecting chemical in the pump head. Tube failure detection sensors shall be wholly located in the pump head and the failure detection system shall not trigger with water contact. Float type switches shall not be used. Process fluid waste ports or leak drains shall not be provided.

9. The metering pumps shall be capable of both manual operation utilizing the integral controls and display and automatic operation utilizing a 4-20mA compound loop signal and 0-30VDC contact(s) for remote start and stop operation. This Integral controller shall also provide a selectable 4-20mA output, one 205V/6A programmable relay, and three 115V/1A programmable contact closures capable of monitoring TFD, the revolution counter, remote/local status, forward/reverse status, input signals, output signals, motor on, motor fault, operator mode settings, etc.

10. Pumps shall be capable of adjusting capacity through 100% of the range via controls and a multicolor LCD display provided integral to the pump’s NEMA 4X enclosure. This manual capacity adjustment shall be possible whether the pump is running or stopped. Provided display shall also indicate remote/local control status, motor speed, output rate, input signal values, service and alarm status, and a revolution count display with user programmable alarm set point for tube maintenance. Display shall have a four digit password protected configuration menu. Upon power interruption a user programmable pump restart option shall either automatically restart or require a user re-start. A wiring compartment shall be provided for connection of input/output signal wires and alarm output loads to un-pluggable type terminal block connectors. Terminal
board shall be secured to the rear of the pump housing and fully enclosed by the wiring compartment cover. The terminal board shall not be disturbed by the removal of the wiring compartment cover. Ribbon cables shall not be used in the wiring compartment. Conduit hubs, liquid-tight connectors, connector through holes and tapped holes shall be sized in U.S. inches.

11. An automatic air release valve (an integral degassing device) shall be included into the liquid end assembly to automatically vent any build-up of gasses common with sodium hypochlorite systems.

12. Reversible, brushless DC gear motor rated for continuous duty shall be provided. Motor shall include overload protection and the maximum gear motor RPM shall be 125 RPM. Drive system enclosure shall be NEMA 4X rated pressure cast aluminum with the exterior grade corrosion resistant polyester polyurethane powder coat applied according to the manufacturer’s recommendations.

C. Piping

1. The packaged system is to be supplied complete with suction and discharge piping and accessories as described herein. The suction piping shall be sized to provide adequate NPSH to the pump(s). Pressure relief valve(s) shall be provided on the pump discharge to protect the pump(s) from excessive backpressure of dead-head conditions. A by-pass line shall run from the pressure relief valve(s) back to the suction line. Isolation valves shall be provided on the suction and discharge of the pump(s) for ease of maintenance.

2. Pump suction lines shall be piped to a common inlet and pump discharge lines shall be piped to a common outlet. Isolation ball valves shall be provided at the inlet and outlet connection of the packaged system. A compression fitting shall be provided on the any transitions between tubing and PVC. Tubing shall be reinforced braided PVC, 200 psi max rated, meeting NSF standard 51. Tubing shall be suitable for use with 12-15% sodium hypochlorite.

3. All piping shall be schedule 80 CPVC and assembly shall be performed in a controlled shop environment by the skid manufacturer. All pipe shall be squarely cut with precision equipment. All socket-welded connections shall follow the guidelines set by the pipe/fitting manufacturer for proper cleaning, priming, and gluing procedures. A medium bodied solvent suitable for use with sodium hypochlorite shall be used. The glue shall contain solvent and PVC material with no additional additives. All threaded connections shall utilize military grade Teflon tape, a suitable thread sealant, or a combination of both.

4. Vented Ball Valves shall be provided shall be solvent welded schedule 80 CPVC with PTFE shaft bearings and seals. Valves shall be suitable for use with 12-15% sodium hypochlorite.

D. Accessories. The chemical metering pump system(s) shall include the following accessories:

1. Calibration Column: The calibration column shall be piped to the suction line as close to the metering pumps as possible and shall include an isolation valve. The top of the calibration columns shall be vented back to the supply container for
overflow protection. Column shall be direct reading in GPH and sized to allow at least a 30-section drawdown. Column shall be constructed of clear PVC and all column wetted materials are to be compatible with sodium hypochlorite.

2. Pressure Relief Valves: Pressure relief valves shall be provided to eliminate excess pressure in the system. The pressure relief valves shall be PVC with a PTFE diaphragm and have no metal parts in contact with the chemical. The outlet from the pressure relief valve shall be piped back to the suction of the appropriate metering pump. A pressure relief valve shall be provided at the discharge of each pump. The relief valve setting shall be set at a pressure lower than the pump internal relief valve. Valve wetted materials are to be compatible with the chemical to be pumped.

3. A single ball check valve shall be provided on the common pump discharge.

4. Pressure Indicators: Diaphragm Protected Pressure Gauges shall be provided for indication of system pressure. Industrial quality gauges shall be utilized and the isolators shall have a PVC body with a Teflon sealing diaphragm and suitable liquid filling. The gauges shall be sized at least 25% higher than the pump internal relief valve set pressure. Diaphragm seal wetted materials are to be compatible with Sodium Hypochlorite.

5. Pulsation Dampeners: Discharge pulsation dampeners shall be provided and sized to limit discharge pressure to plus or minus 10% and shall have a minimum volume of 10 cubic inches. Pulsation dampeners shall include a diaphragm-separating air chamber, charged to the manufacturer’s recommended pressure. Pulsation dampener wetted chamber and diaphragm material are to be compatible with the chemical to be pumped. Pulsation dampeners shall be field adjustable and field serviceable without special tools. Pulsation dampeners shall have pressure gauges and charging valves.

E. Spare Parts. Spare Parts kit shall be provided with the Chemical Feed Skid and delivered to the Owner and must contain:

1. One (1) uninstalled spare chemical metering pump of the same size and model as the installed pumps. Pump shall be complete with motor and all necessary appurtenances.

2. Two (2) spare uninstalled Blue-White Model M-324-*ND peristaltic chemical metering pumps.

3. One (1) Severn Trent Capitol, series 1451 Model 0101010101XX controller

4. One (1) Hach C117 chlorine analyzer

5. One (1) maintenance kit for each installed chemical feed pump. The kits shall include diaphragm, check valve seats, O-rings, and seals.

6. One (1) safety kit per skid that shall include gloves, apron, goggles, and respirator.
7. One (1) spare parts kit containing a diaphragm for the pulsation dampeners, a pressure relief valve, and a ball check valve.

F. Manufacturer. The chemical metering pump skid supplier shall have experience in furnishing equipment of similar capacity and service capability to the equipment described herein. Chemical metering pump skid pre-qualified manufacturers include:

1. The skid system shall be ProSeries, Chem-Feed model CFS manufactured in the U.S.A. by Blue-White Industries or approved equal.

2.03 CONTROL PANEL

A. The Sodium Hypochlorite System Local Control Panel (LCP) shall be provided by the hypochlorite feed system manufacturer for installation and wiring by the contractor.

B. The Sodium Hypochlorite LCP shall have a NEMA 4X enclosure and shall provide all components and functions as shown on the drawings and specified herein.

C. All power, control, and alarm wiring to or from the control panel shall be run through conduit.

D. The LCP shall include all components necessary to control and operate the chemical feed pumps as well as all other components of the hypochlorite feed system. All pertinent warning and alarm indication lights necessary to diagnose problems with the system shall be provided on the face of the panel.

E. All necessary controls including motor starters and properly sized overload protection. The only required field electrical connection shall be the power supply.

F. Required components for the LCP shall include, but not necessarily be limited to:

1. A location disconnect (ON-OFF) switch and indicating light for the hypochlorite feed system.

2. A HAND-OFF-AUTO switch shall be provided for each chemical feed pump provided for the hypochlorite feed system. Placing the HAND-OFF-AUTO switch in the HAND mode shall allow for manual pump speed adjustment via potentiometers located on the face of the control panel. When the switch is in the HAND mode a discharge-mounted flow monitor shall send a signal back to the control panel upon loss of flow and the pump motor(s) shall be shutdown. The user shall be required to manually start the stand-by pump. Placing the switch in AUTO shall allow for automatic pump speed adjustment via an external 4-20 mA input signal from the externally mounted microprocessor based hypochlorite feed system controller.

Whether in HAND or AUTO mode, the LCP shall receive a run signal from the discharge pumps. Therefore, when the pump station is inactive, the chemical metering pump motors shall be shutdown.
Whether in HAND or AUTO mode, the LCP as well as all other Sodium Hypochlorite Supply System components shall restart automatically following any power outage. Should power to the pump station be lost, the Hypochlorite Supply System shall restart once power is restored without the need for alarm acknowledgement or reprogramming.

3. A 2-position selector switch, “P1-P2”, which shall allow the user to select which pump is to be the primary and which is to be the stand-by. This shall allow the user to maximize pump life.

4. One potentiometer for each pump to manually control pump speed when the system is being run in the HAND mode.

5. One digital display for each pump shall be provided and shall indicate the % of pump speed based upon the external 4-20 mA input signal from the externally mounted microprocessor based hypochlorite feed system controller. Digital display shall only read % speed when the system is in AUTO mode.

6. A high residual indicator light which illuminates when a high residual alarm is received from the chlorine residual analyzer.

7. A low residual indicator light which illuminates when a low residual alarm is received from the chlorine residual analyzer.

8. A low flow indicator light which illuminates when the chemical feed flow meter drops below the threshold value. The light shall only be illuminated when the chlorine system is powered and the LCP is receiving a run signal from the discharge pumps.

9. A pair of sodium hypochlorite storage tank leak detection indicator lights for each of the two sodium hypochlorite storage tanks. A green indicator light shall be illuminated whenever power is on and the sensor is not detecting a leak. A red indicator light shall be illuminated whenever power is on and the sensor has detected a leak. Only one bulb can be illuminated at a time. No illumination means that at least one bulb is burned out.

10. A pair of sump pit high level alarm indicator lights for the float switch located in the sodium hypochlorite containment area sump pit. A green indicator light shall be illuminated whenever the level in the sump pit is below the float switch. A red indicator light shall be illuminated whenever the float switch detects a high level in the sump pit. No illumination means that at least one bulb is burned out. When a high level is detected in the sump pit, the sodium hypochlorite supply system shall be automatically shut down. This alarm shall be latching and shall require alarm acknowledgement before restarting of the system.

11. A low level indicator light for each of the two hypochlorite storage tanks. The light shall illuminate when the sodium hypochlorite level within the tank drops below the threshold value.
12. A high level indicator light for each of the two hypochlorite storage tanks. The light shall illuminate when the sodium hypochlorite level within the tank rises above the threshold value.

13. An alarm button to acknowledge any of the alarms detected by the LCP.

G. Lights, Push Buttons, and Switches

1. Refer to Section 17200 – Control Panels for general requirements for control panel components. The information below shall supplement the information provided within Division 17.

2. All indicating lights, push buttons, and selector switches shall be NEMA 4X rated, heavy-duty, full-size (30.5 mm), corrosion resistant and watertight.

3. Each indicating light, push button, and selector switch shall have its own lamicold plastic legend plate. The legend plate shall surround the operator device and be keyed for alignment.

4. Each legend plate shall be custom engraved by the manufacturer.

5. All indicating lights shall be transformer type push-to-test lights. All indicating lights shall be LED, push-to test. Testing of lights shall not interrupt or affect operator control functions.

6. Control panel shall include the following operator controls and indicators as a minimum:
   a. Common failure alarm light, amber.
   b. Power on lights, white.

H. Control Panel Electrical Requirements

1. Power: 120-Volts, single-phase, 60 Hz.

2. Main Disconnect: Fused switch or circuit breaker.

3. Provide branch circuit breakers for feeding all ancillary equipment requiring power. Where necessary provide power supplies and current to current signal isolators for the ancillary equipment.


5. Control power transformer with fuses on primary and secondary wiring. Size the transformer for all process equipment requiring 120V ac power.
2.04 FILL STATION CONTROL PANEL

A. The Sodium Hypochlorite System Fill Station Control Panel shall be provided by the hypochlorite feed system manufacturer for installation and wiring by the Contractor.

B. The Sodium Hypochlorite System Fill Station Control Panel shall be a NEMA 4X enclosure and shall provide all components and functions as shown on the drawings and specified herein.

C. All power, control, and alarm wiring to or from the fill station shall be run through conduit.

D. The Fill Station Control Panel shall include all components necessary for filling each of the two hypochlorite storage tanks. The panel shall display the current tank level, quantity of sodium hypochlorite in each tank, and provide alarm indication when a high level is reached.

E. Required components for the Fill Station Control Panel shall include, but not necessarily be limited to:
   1. Digital meters to display tank level and meters to display quantity of sodium hypochlorite remaining in the tank. Meters shall have an alarm set point for indication of a high level alarm. The meter shall display tank level to the nearest tenth of a foot. Each digital meter shall have a legend plate indicating to which tank it is associated, and its respective tank fill level in feet.
   2. Alarm Horn triggered by the digital meters set-point for indication of a high tank level.
   3. Push button for silencing the high level alarm and a pushbutton for resetting/clearing the alarms.

F. Lights and Push Buttons
   1. All indicating lights, digital meters, push buttons, and selector switches shall be NEMA 4X rated, heavy-duty, full-size (30.5 mm), corrosion resistant and watertight.
   2. Each indicating light or push button shall have its own lamicoid plastic legend plate. All indicating lights shall be LED, push-to test. Testing of lights shall not interrupt or affect operator control functions. The legend plate shall surround the operator device and be keyed for alignment.
   3. Each legend plate shall be custom engraved by the manufacturer.

2.05 CHLORINE RESIDUAL ANALYZER

A. General Requirements
   1. The hypochlorite system manufacturer shall provide one (1) chlorine residual analyzer with sample conditioning kit for monitoring of free residual chlorine.
The method of measuring free chlorine will be colorimetric. Instrument chemistry will employ N, N-diethyl-p-phenylenediamine (DPD) method. Other methods of chlorine measurement such as amperometric, potentiometric, and iodometric that employ electrodes or other electrochemical techniques are not acceptable.

2. Chlorine analyzer shall consist of a sample and reagent valve and pump, measurement cell, controller, and shall utilize and shall be provided with buffer and indicator solutions. The analyzer shall operate with an LED light source at a peak wavelength of 510nm and shall be able to operate unattended for 30 days between chemical reagent changes and measurement cell cleaning. Analyzer shall meet the following minimum performance, operational, and environmental requirements:

   a. Measurement range: 0 to 5 mg/L (ppm) free or total residual chlorine
   b. Accuracy: ±5% of reading or ±0.03 mg/L (ppm), whichever is greater
   c. Precision: 5% of reading or 0.01 mg/L (ppm), whichever is greater
   d. Minimum detection limit: 0.03 mg/L (ppm)
   e. Resolution: 0.01 mg/L (ppm)
   f. Repeatability: 0.05 mg/L (ppm)
   g. Cycle Time: 2.5 minutes
   h. Sample flow rate: 200 to 500 mL/minute
   i. Sample pressure (with conditioning kit): 120 psi (8.27 bar)
   j. Sample temperature: 41 to 104 ºF (5 to 40 ºC)
   k. Operating temperature: 41 to 104 ºF (5 to 40 ºC)
   l. Operating humidity: 90% at 40 ºC maximum

3. A measurement shall be taken every 2.5 minutes and results displayed by a three digit LCD readout in the range of 0 to 5 mg/L.

4. The analyzer must perform a self-test and auto-blanking between analysis points to compensate for sample color, turbidity, and changes in light intensity due to voltage fluctuations or light source aging.

5. The analyzer shall be housed in a NEMA 12, IP62 rated enclosure with a latched and gasketed door.

B. Electrical

1. Analyzer shall operate using 115V or 230V selectable AC power.
2. Measurement shall be transmitted via standard optically isolated analog outputs, selectable as 4 to 20mA, field programmable over any portion of the analyzer range. Two standard, programmable SPDT relay alarms shall be provided, with contacts rated for 5 amp resistive loads at 230V AC power. Alarm options include concentration set point, analyzer system warning, and analyzer system shut down.

C. Residual Analyzer Accessories.
1. The analyzer shall be supplied with the following accessories:
   a. One (1) PVC flushing Y-strainer.
   b. One (1) sample shut-off valve.
   c. One (1) sample-throttling valve.
   d. Twenty (20) week supply of pre-mixed buffer and indicator solutions.
2. The following residual analyzer spare parts shall be included:
   a. One (1) spare analyzer cell assembly.
   b. One (1) set residual analyzer O-rings.

D. Manufacturer
1. The chlorine residual analyzer shall be Model CL17 Chlorine Analyzer, Free Chlorine Residual as manufactured by the Hach Company in Loveland CO or approved equal.

2.06 MICROPROCESSOR-BASED COMPOUND LOOP CONTROLLER

A. General Requirements
1. The hypochlorite system manufacturer shall provide one (1) microprocessor based compound loop controller. The controller shall interface with the Sodium Hypochlorite Feed System Control Panel to automatically adjust the metering pumps and maintain the desired feed rates based upon input signals from the plant flow meter and/or the chlorine residual analyzer.

2. The controller shall be microprocessor-based with a 2-line, 48-character, back lighted LCD alphanumeric display. Control modes shall be fully field selectable and include the following. In the event that the flow or residual input is lost, the controller shall automatically transfer the single loop operation, and automatically resume compound loop control when the signal is reestablished. Transfer between manual and automatic loop control shall be bumpless.
   a. Flow Proportioning Control where the quantity of sodium hypochlorite pumped is proportional to the metered flow through the pump station.
   b. Residual Control where the quantity of the sodium hypochlorite pumped is varied to maintain a chlorine residual set-point.
c. Compound Loop Control where the controller integrates the flow and residual measurements to provide the proper sodium hypochlorite pumping rate and maintain the desired chlorine residual.

3. The operating program shall provide for selection of automatic or manual control, control mode, and for entry and storage of setup parameters for residual analyzer range, residual set point, fixed and variable process lag time, integral dosage, residual deviation and water flow alarm. A minimum of four (4) day internal battery backup for protection of set-up parameters shall be provided.

4. Control range adjustment of dosage (loop gain) on the flow input signal extends upwards to a ratio of 4:1 or down to zero permitting accommodation of an oversized flow meter or metering pump. Dosage adjustment is automatic in compound loop.

B. Electrical

1. The residual input signal shall be 4-20 mAdc. The flow input signal shall be 4-20 mAdc. Dry contact switches for external switches rated 5 volts @ 0.5 amps shall be provided for high low vacuum, duty standby, and residual inhibit. The output signal shall be 4-20 mAdc. The controller shall operate from a 120 Vac, 50/60 Hz, single phase power source.

2. LED alarm indicators shall be mounted on the front panel for easy viewing. Alarms shall include low or no plant water flow and high or low deviation of residual beyond limits preset by the operator. Each alarm shall include relay contacts for control of remote warning and control devices.

C. Manufacturer

1. The microprocessor-based controller shall be Capital Controls Captrol Model 1451 controller, as manufactured by Severn Trent Services, Capital Controls Div.

2. No other equipment manufacturer shall be accepted.

2.07 FIBERGLASS UPRIGHT STORAGE TANKS

A. Scope of Supply

1. The contractor shall provide two (2) fiberglass upright, flat bottom and flat top storage tank assemblies. Each assembly consists of one cylindrical tank.

2. The tanks shall be designed for above-ground, vertical installation and shall be capable of containing chemicals at atmospheric pressure.

3. Tank capacities shall be at least 150 gallons and no more than 164 gallons each. Tank diameter, including factory-installed penetrations and fittings shall not exceed 2’-6”, so that the tank can pass through the chlorination room door and be installed as a single piece. Tank height shall not exceed 7’-6” so that the tank can be installed on an equipment pad, have penetrations and fittings on the top of the tank, and fit below the 10’ ceiling of the chlorination room.
B. Chemical Compatibility

1. Each tank shall be manufactured for chemical compatibility with 0% to 15% sodium hypochlorite solution to be stored at ambient temperatures and located indoors where shown on the plans.

C. Materials

1. Centrifugal Casting of tanks is not allowed. Tanks shall be filament wound or contact molded conforming to the following appropriate ASTM specifications:

   a. Filament Wound Tanks shall be designed and fabricated in accordance with ASTM Specification D3299-08, "Filament-Wound Glass-Fiber-Reinforced Thermoset Resin Chemical-Resistant Tanks".

   b. Contact Molded Tanks shall be designed and fabricated in accordance with ASTM Specification D4097-01, "Contact-Molded Glass-Fiber-Reinforced Thermoset Resin Chemical-Resistant Tanks".

2. Tanks shall be as manufactured by an ASME RTP-1 fabricator, certified FRPI (Fiberglass Reinforced Plastic Institute) fabricator.

3. Resin - The resin used shall be a commercial grade, premium, corrosion resistant vinyl ester that has been evaluated in a laminate by test in accordance with ASTM C-581 in Sodium Hypochlorite service comparable to the intended service and recommended for this service by the resin manufacturer.

   a. The tank manufacturer shall strictly adhere to the resin manufacturer's recommendations for surface veil materials, resin cure systems, and post cure requirements.

   b. The resin shall contain no pigments, dyes, colorants, or fillers except as follows:

      1) A Thixotropic agent that does not interfere with visual inspection of laminate quality may only be added for viscosity control in resins that are not to be used in the inner corrosion barrier, interior layers, interior secondary layers, and interior top coats.

      2) Resin pastes used to fill crevices may contain Thixotropic agents provided that all such areas are subsequently covered with a full corrosion-resistant barrier laminate.

      3) A pigmented exterior gel coat shall be provided to reduce ultraviolet decomposition of the Sodium Hypochlorite. And ultraviolet absorbers shall be added to the exterior surface for improved weather resistance on indoor and outdoor tanks since tanks may be outdoors during construction and installation periods.
c. Resin shall be Approved Premium Vinyl ester resin - BPO/DMA cured inner corrosion barrier with 2 ply synthetic surface veil by Nexus-Burlington Industries or approved equal.

4. Reinforcement shall be as follows:
   a. Chopped Strand Mat - Chopped strand mat shall be constructed from commercial grade E-type glass strands bonded together using a binder. The strands should be treated with a binder that is chemically compatible with the resin system used.
   b. Continuous Roving - Continuous roving shall be a commercial-grade of E-type glass fiber with a binder that is chemically compatible with the resin system used. Continuous roving for chopping in spray-up process shall be principally silane finished with as little chrome compounds as practical to achieve chopper performance while maintaining visual laminate clarity requirements.
   c. Woven Roving - Woven roving shall be in accordance with ASTM Specification.

D. Laminate Construction Requirements
   1. Structural Tank - The laminate comprising the structural tank (bottom, cylindrical shell, top head) shall consist of a corrosion-resistant barrier comprised of an inner surface, interior layer, and a structural layer. The tank bottom shall be integral with the bottom tank shell. No patched or repaired hole shall be allowed in the center of the tank bottom resulting from tooling or fixture support. Bottom and bottom tank shell that are fabricated separately shall be joined by seam in accordance with ASME RTP-1
   2. Inner Surface - The inner surface exposed to the chemical environment shall be a resin rich 0.015 to 0.030 inches thick, reinforced with 2 ply of synthetic fiber surface mat such-as Nexus (Burlington Industries) or approved equal.
   3. Interior Layer - The inner surface layer exposed to the corrosive environment shall be followed with a layer composed of resin, reinforced only with noncontiguous glass-fiber strands applied to a minimum thickness of 0.100 inches. The combined thickness of the inner surface and interior layer shall be 0.115 to 0.130 inches
      a. Glass content of the inner surface and interior layer combined shall be 27% ± 5% by weight.
      b. Resin used in these layers shall be Derakane 411, Derakane 510C, AOC F010, AOC K022 or approved equal incorporating a BPO/DMA cure system as recommended by the manufacturer.
      c. The degree of cure, after post cure (see Section 4) shall be such as to exhibit a Barcol hardness on the inner surface of at least 90% of the resin manufacturer's minimum specified hardness for the cured laminate with a synthetic surface mat.
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4. Structural layer:
   a. Filament Wound Structural Layer - Subsequent reinforcement shall be continuous-strand roving in accordance with the requirements above and as needed to satisfy the design requirements. Glass content of this filament-wound structural layer shall be 50 to 80% by weight. Only those constructions evaluated for design properties shall be used.
   b. Contact Molded Structural Layer - Subsequent reinforcement shall be comprised of 1.5 oz/ft² chopped strand mat or equivalent weight of chopped roving, or shall be comprised of chopped strand mat or chopped roving and such additional number of alternating plies of 24 oz/yd² woven roving to a thickness as required to meet the physical properties that are used for the design. Each successive ply or pass of reinforcement shall be well rolled prior to the application of additional reinforcement. Where woven rovings are used, chopped strand glass reinforcement shall be used as alternating and final layers. All woven roving and chopped strand shall be overlapped. L laps in subsequent layers shall be staggered at least 2.25 inches from laps in the preceding layer.
   c. Resin used in the structural layer shall be the same as used in the inner surface and interior layers except that the BPO/DMA cured resin system is not required. Other generic types of resin such as Isophthalics or general-purpose resins shall not be used.

E. Fittings and Removable Cover
   1. A removable flat top shall be provided and shall be secured with appropriately sized bolts. Cover shall be provided with 1/8-inch thick full-face EPDM gaskets and 316 stainless steel bolts.
   2. Flanged Nozzles - All flanged nozzles shall be of hand lay-up construction with the pipe stub molded integrally with the pipe flange. Compression molded or cemented on flanges is prohibited. The resin used for the inner surface and interior layer of flanged stubs shall be the BPO/DMA cured resin system detailed herein. Nozzles 4-inch diameter and smaller shall be gusseted conically or with four (4) 3/8 inch thick plate gussets.
   3. Installation of all flanged nozzles shall be the flush-type per ASTM D3299 or D4097. Penetrating-type installation shall not be used in Sodium Hypochlorite service. Nozzles less than 1½” diameter should not be used.
   4. All interior overlays of nozzles, manways, and other internal accessories shall incorporate the BPO/DMA cured resin system as detailed herein.
   5. Threaded Fittings - Threaded fittings shall not be used in Sodium Hypochlorite service.

F. Post Cure: The completed tank shall be post cured with dry heat in accordance with the resin manufacturer's recommendations. Any internal repairs or rework must be completed prior to post curing. If repairs are made following post cure, an additional post cure cycle is required.
G. Design Requirements

1. The hydrostatic design stress shall be rated for service above 100 degrees Fahrenheit and for mechanical loading of the tank.

2. The standard design specific gravity shall be 1.9.

3. Hydrostatic Water Test
   a. A hydrostatic water test shall be performed. The hydrostatic water test shall consist of filling the tank to bring full capacity for a minimum of four hours and conducting a visual inspection for leaks.
   b. The tank shall be visually inspected to determine such qualities as are discussed under Workmanship in the following section.

H. Workmanship

1. The finished tank wall shall be free, as commercially practicable, of visual defects such as foreign inclusions, air bubbles, pinholes, pimples, crazing, cracking, and delaminations that will impair the serviceability of the vessel.

I. Manufacturers

1. Plas-Tanks Industries, Inc.

2. Augusta Fiberglass Coatings, Inc.

3. Or Approved Equal.

2.08 ULTRASONIC LEVEL INDICATORS

A. Each tank shall be equipped with an ultrasonic level sensor/transmitter. Refer to Division 17 specification sections for more details.

B. The sensor may be equipped with male pipe threads and be connected to the tank with a PE bulkhead fitting, or the sensor may be Teflon faced and flange bolted to the tank with encapsulated 316 S.S. bolts.

C. The sensor is connected to a display unit that is mounted to the containment tank.

D. The display unit box shall be NEMA 4X rated and factory pre-wired for 110 VAC power. All connections shall be labeled to prevent errors in field installation. The display unit shall be mounted in a location and at a height which is in clear view for the operations staff. The display unit shall be no greater than 5 feet above the floor.

E. The display unit shall be preprogrammed for the tank ordered and shall display the tank volume in gallons.

2.09 LEAK DETECTOR UNIT

A. Each tank shall be equipped with a leak detector unit to provide an alarm in the event that the interior tank would leak.
B. The leak detector unit shall consist of a proximity sensor, a welded 2 in. fpt connection, a 2 in. bung plug with a ¾ in. strain relief, and an indicator box.

C. The sensor shall be placed in the containment basin beneath each tank approximately 1 in. above the tank bottom.

D. The indicator box shall be NEMA 4 rated and factory pre-wired for 110 VAC power. All connections shall be labeled to prevent errors in field installation. The indicator box shall show a green light when power is on and the sensor is not detecting a liquid. The indicator box shall show a red light when the power is on and the sensor has detected a leak. Only one bulb can be illuminated at a time. No illumination means that at least one bulb is burned out.

E. A dedicated set of discrete outputs shall be supplied and wired to the annunciator panel for relay back to the City TCC.

2.10 FLOAT SWITCH

A. A float switch shall be provided in the containment area sump pit to indicate when a high level is reached in the containment area.

B. The float switch shall consist of a single pole, mercury switch in a smooth, chemical resistant polypropylene casing with integral 2-wire cable. The mercury switch shall be furnished in a normally open configuration and shall be permanently molded to the signal cable at the factory.

C. Signal cable shall be minimum #18 AWG. Length of cable shall be as required to reach the pump control panel. Contractor shall field verify necessary lengths.

D. Specific gravity of sensors shall be 0.95-1.10. Sensors shall remain operable at temperatures down to 0 degrees C and up to 90 degrees C. Mercury switch contacts shall operate on 24 volts DC.

E. Provide a 316 stainless steel mounting bracket for the Type S (suspended) float switches.

F. The float switches shall be Anchor Scientific Roto-Float, or approved equal.

2.11 QUICK DISCONNECT

A. Quick disconnect shall be constructed of 316 stainless steel with dust cover, chain, and a locking mechanism as manufactured by P.T. Coupling Co., Inc.

2.12 SIGNAGE

A. On exterior doors to the Chlorination Room, provide a right to know plastic sign for Sodium Hypochlorite model CH40346 as manufactured by EMED Co. Also provided shall be the material safety data sheet in a protective plastic holder posted in vicinity of the sodium hypochlorite tanks.

2.13 FINISHES

A. Requirements for shop and field coatings shall conform to Section 09900 – Painting.
PART 3 - EXECUTION

3.01 INSTALLATION

A. The Sodium Hypochlorite Feed System shall be installed in accordance with the manufacturer’s recommendations, shop drawings, and instructions.

3.02 ELECTRICAL CONNECTIONS

A. The Contractor shall provide all electrical and control connections necessary to provide a complete and operable system as described herein and presented in the Contract Drawings.

3.03 MANUFACTURER’S SERVICES

A. The Contractor shall furnish the services of the manufacturer’s technical representative.

1. Certify proper installation, provide startup and field testing:
   a. One (1) 8-hour day

2. Operator training:
   a. The manufacturer’s representative shall conduct two (2) four-hour training sessions on the use and maintenance of the installed equipment. Training shall be planned for at least two separate days and shall be coordinated through the Contractor with the Owner.

3.04 SYSTEM INSTALLATION, STARTUP, AND COMMISSIONING

A. Install the chemical metering skid as indicated on the drawings and specified and in compliance with the manufacturer’s instructions.

B. Upon completion of the installation, a full operating test shall be performed in the presence of the Engineer and qualified manufacturer’s representative (not a sales representative). The Contractor shall furnish all the labor, materials, and equipment required for such a test and shall correct any installation-related deficiencies as noted at no extra cost.

C. Provide manufacturer signed forms in accordance with Specification 01780.

END OF SECTION
PART 1 - GENERAL

1.01 DESCRIPTION

A. Work performed under this section shall include installing plumbing appurtenances as shown and as specified.

B. The Contractor shall verify all clearances and obstructions by field measurement prior to preparing working drawings for the plumbing fixtures, drain piping and appurtenances.


1.02 SUBMITTALS

A. Product Data: For each type of plumbing fixture indicated. Include selected fixtures and trim, fittings, accessories, appliances, appurtenances, equipment, and supports. Indicate materials and finishes, dimensions, construction details, and flow control rates.

B. Shop Drawings: Layout drawings for drain piping and fittings.

1.03 QUALITY ASSURANCE

A. NSF Standard: Comply with NSF 61, ‘Drinking Water System Components—Health Effects,” for materials that will be in contact with potable water.

PART 2 - PRODUCTS

2.01 DRAIN PIPING

A. Drain piping shall be installed where required and shall, in general, conform to the locations indicated on the drawings.

B. Pipe and fittings above grade may be any one of the following at the Contractors option:


2. Type “K” hard copper tubing ASTM B88 using hard type DWV copper drainage fittings and lead-free tin alloy, 95-5 tin antimony solder or silver-bearing tin approved equal to Harris “Stay-Brite”, “Stay-Brite 8” or “Bridgit”.

3. No-hub cast iron pipe and fittings ASTM 888-90 with hubless type joints consisting of neoprene gasket ASTM C564 stainless steel shield and stainless steel bands.

C. Traps shall be same material as the connecting piping.
2.02 WATER PIPING

A. Interior and above ground piping: Hard copper water tubing, Type “K”, ASTM B88

B. Underground (buried) piping: Annealed (soft) copper water tubing, ASTM B88, type “K”

C. Cast copper fittings: ASME B16.18, pressure fittings, solder or threaded ends.

D. Wrought copper fittings: ASME B16.22, wrought copper pressure fittings, solder or threaded ends.

E. Solder: ASTM B 32 lead-free alloys, approved equal to Harris “Stay-Brite”, “Stay-Brite 8” or “Bridgit”.

F. Copper unions: MSS SP-123, cast copper alloy, hexagonal stock body, solder-joint or threaded ends.

2.03 VALVES

A. Globe Valves

1. Valves shall lead free, bronze, Class 125, PTFE seat, NPT multi-turn, and rated for 200 psi.


3. Valves shall have adjustable graphite stem packing, screw-in bonnet, malleable iron rugged hand wheel, and back seat protection.

4. Manufacturers:
   a. Apollo 120TLF Series Globe Valves
   b. Or approved equal

B. Check Valves

1. Valves shall lead free, bronze, Class 125, lead-free brass seat, and rated for 200 psi.

2. Valves shall be in accordance with MSS SP-80, MSS SP-139, ASME B1.20.1, ASTM B 584-C89836 Bronze, ASTM B16 Brass, and NSF/ANSI 372 Lead Free.

3. Manufacturers:
   a. Apollo 161TLF Series Swing Check Valves
   b. Or approved equal.
C. Corporation Stop

1. Valve shall be low-lead brass alloy ball-type, with AWWA inlet taper, and compression fitting outlet.

2. Valves shall be in compliance with AWWA C800 and NSF 61 certified.

3. Manufacturers:
   a. Mueller B-25008N
   b. Or approved equal.

2.04 BACKFLOW PREVENTERS

A. Backflow preventer shall be of the reduced-pressure principal type, installed on the existing incoming water service line to the pumping station and on the potable water feed line for the Sodium Hypochlorite Feed System. Backflow preventers shall be Watts Regulator No. 909 QT, or approved equal, with strainer and air gap. Repair Kit No. RK 909QT shall be included to provide a complete set of rubber repair kits. Backflow preventer shall be compliant with ASSE 1013.

B. Provide a Watts 8A, or approved equal, hose connection backflow preventer on all hose bibs and on the sink faucet outlet.

2.05 WATER CLOSET

A. Water Closet: Kohler Anglesey K-4386 vitreous china, elongated bowl, low-flow (1.6 gpf) and seat Church 9500C.

B. Flush Valve: Sloan “Regal XL” No. 111, complete with vacuum breaker, NPS 1.5 (DN40) top spud connection and flanges, 1.6 gallon (6 L) per flushing cycle. Include cast escutcheon, vandal-resistant stop cap and ADA-compliant handle operation.

2.06 FLOOR DRAIN

A. Floor drain shall have double drainage flange, weepholes, threaded or inside caulk bottom outlet, galvanized cast iron grate, anti-tilt, with P-trap, as manufactured by Josani, J. R. Smith, Wade, Ancon, or Zurn, or approved equal.

2.07 BATHROOM SINK

A. Bathroom sink shall be wall-hung, acid resistant enameled cast iron with wall hanger and nominal dimensions of 19-inches by 17-inches by 4 inches deep. Service sink shall have a rim guard strainer, cast iron P-trap with cleanout and floor stand, and shall be drilled for 3-hole faucet ledge at rear with 4-inch faucet centers and front overflow. Sink shall be Kohler Model K-2867, or approved equal.

B. Faucet: Chicago Faucets 3300-CP deck mounted, vandal resist, metermix, chrome plated cast brass construction metering single inlet faucet and grid strainer.
2.08 LABORATORY SINK, CABINET AND FIXTURE
A. Laboratory sink shall be HEMCO Unline Laboratory Furniture model 42026, or approved equal, with a nominal dimensions of 30 inches in length by 30 inches in width by 36 inches in height.

B. Cabinet shall be corrosion resistant with a composite resin work surface which is dished 3/8” to contain spillage. Tabletop shall 1-1/4” thick and be chemical resistance with superior scratch and wear resistance with a drop in sink. Cabinet shall be HEMCO Unline Laboratory Furniture model 71811, or approved equal. Work surface shall be HEMCO Unline Laboratory Furniture model 20315X, or approved equal.

C. Laboratory faucet shall be a deck mounted mixing faucet with a 6” gooseneck. Faucet shall be HEMCO Unline Laboratory Furniture model 50040, or approved equal.

2.09 INSTANTANEOUS WATER HEATER
A. Point of use instantaneous water heater, KW and voltage as noted on drawings. EEMax SP series or approved equal.

2.10 HOSE BIBBS
A. Hose bibs shall be solid bronze construction, angle pattern, and renewable washer. Sweat copper to standard ¾-inch hose and outlet, NIBCO Fig. 763, or approved equal.

2.11 WATER HAMMER ARRESTORS
A. Water hammer arrestors shall be provided to protect individual fixtures. Water hammer arrestors shall be Watts Series 05, or approved equal.

B. Provide isolation ball valves with each water hammer arrestor to permit replacement without interruption to water distribution system.

2.12 EMERGENCY SWING-DOWN EYE/FACE WASH
A. Wall-Mounted emergency eyewash with swing-activation.

B. Fixture shall comply with ANSI Z358.1. Unit shall have a 20-degree valve activation angle, with ½” NPT, ceramic, stay-open valve and chrome-plated brass and fittings. Unit shall provide minimum 4.0 GPM at 30 PSI when activated.

C. Manufacturer
   1. Bradley S19274HW
   2. Or approved equal.

2.13 EMERGENCY SHOWER
A. Ceiling/deck-Mounted emergency drench shower.
B. Fixture shall comply with ANSI Z358.1. Unit shall have 1” NPT stay-open brass ball valve, operated by stainless steel pull rod with triangular handle.

C. Manufacturer
   1. Bradley S19-130SS
   2. Or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Drain pipe shall be reamed to remove all burrs. Horizontal pipe shall be carefully aligned to assure even pitch. The pipe shall be pitched a minimum of 1/8 inch per foot unless indicated otherwise. All adaptors from one material to another shall be a standard manufactured product designed for that specific use. Contractor shall not run piping above electrical switchgear.

B. Floor drains shall be carefully adjusted to the correct elevation for proper drainage. Except at floor drains having integral traps, each floor drain shall be provided with a P-trap installed as close to the drain as possible.

C. Floor drains shall be set with rim 3/4-inch below finish floor level unless otherwise noted or directed. Verify exact location and desired rim elevation before installation.

D. Assemble plumbing fixtures, trim, fittings, and other components in accordance with manufacturers’ written instructions. Install all fixtures level and plumb.

E. Install off-floor supports, affixed to building substrate for wall-mounting fixtures. Install wall-mounting fixtures with tubular waste piping attached to supports.

F. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind or under fixtures. Install stops in locations where they can be easily reached for operation. If supply stops are not specified or included with fixture, use ball, gate or globe valves.

G. Install trap or tubular waste piping on drain outlet of each fixture and connect to sanitary drainage piping.

H. Seal joints between fixtures and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color.

3.02 TESTING

A. Testing for drain piping shall include a rough test and final test, in conformance to local plumbing code requirements.

B.Leaks discovered during testing shall not be patched. Threaded or flanged connections shall be either tightened or replaced. Small leaks in welded pipe may be chipped and rewelded.

END OF SECTION
SECTION 15500

HEATING AND VENTILATION EQUIPMENT

PART 1 - GENERAL

1.01 DESCRIPTION

A. This Section includes requirements for providing an exhaust fan, louver, damper, unit heaters, and requisite accessories and appurtenances necessary for furnishing and installing heating and ventilation systems in accordance with the Contract Documents.

B. All work shall be done in accordance with the applicable Codes and Standards.

C. Completely coordinate with work of all other trades.

1.02 QUALITY ASSURANCE

A. All equipment shall be the product of recognized and reputable manufacturers. Equipment shall be locally serviceable and replacement parts shall be readily available.

B. Reference Standards

1. ASHRAE - American Society of Heating, Refrigeration, and Air Conditioning Engineers.

2. AMCA - Air Movement and Control Association.

3. OSHA - Occupational Safety and Health Administration.

4. SMACNA - Sheet Metal and Air Conditioning Contractor’s National Association.

1.03 SUBMITTALS

A. Catalog data, specifications and color selection charts for fans, louvers, dampers, unit heaters, and appurtenances.

B. Wiring diagrams, control diagrams and electrical schematic for the operation, control and power supply of the fans, motor operated dampers, and unit heaters.

C. Layout drawings showing fans, louvers, dampers, unit heaters, supports, and other accessories necessary for a complete ventilation system. Air flow rates shall be included on all layout drawings.

D. Manufacturer’s curves or tables for all fans, louvers and dampers, indicating air flow versus static pressure losses and leakage adjusted to account for bird screen loss.

E. Operation and Maintenance Manual for fans and unit heaters.

F. Manufacturer’s installation instructions for all equipment.
PART 2 - MATERIALS

2.01 GENERAL

A. All fans shall be furnished and installed complete with motors, drives, controls, and accessories as required for satisfactory operation and as herein specified. All fans shall be rated in accordance with the standards of the Air Movement and Control Association (AMCA) and shall bear the AMCA Certificate Rating label unless otherwise specified herein. All fans shall be UL listed and have an integral disconnect switch.

B. All fans shall be statically and dynamically balanced by the manufacturer before shipment.

C. All fans shall be guaranteed to deliver the specified air quantities and pressure when tested in accordance with AMCA Bulletin Number 110. Fans shall be quiet in operation and free from objectionable vibration, and shall have sone ratings less than 20. Vibration isolators shall be required.

D. Fan motors shall be accessible for repairs and maintenance and shaft guards shall be provided in accordance with OSHA standards.

2.02 LOUVERS

A. Louvers and dampers shall be installed in combination at the locations shown on the Contract Drawings. Fixed weatherproof louvers with drainable blades shall be Ruskin Manufacturing Company Type ELF6375DXH, or approved equal. Performance data shall be included with shop drawings.

B. Louvers shall be stationary drainable type and shall include a drain gutter in each blade and downspouts in jambs and mullions, with a minimum of 57-percent free area. Refer to the drawings for louver sizes.

C. Louver frames shall be six inches deep and shall be constructed of 6063-T5 extruded aluminum with 0.125-inch nominal wall thickness. Include downspouts and caulking surfaces.

D. Blades shall be constructed of 6063-T5 extruded aluminum with 0.125-inch nominal wall thickness, positioned at 37-1/2 degree angle and spaced approximately 5-29/32 inches on center.

E. Bird screen of ¾-inch x 0.051-inch expanded, flattened aluminum in removable frame shall be installed on all louvers.

F. Louvers shall be furnished with a Kynar finish in the color selection as made by the Owner.

2.03 MOTOR-OPERATED DAMPERS

A. Thin line control damper shall be Ruskin Manufacturing Company Type CD40, or approved equal. Performance data shall be included with shop drawings.
B. Damper frame shall be four inches deep and be constructed of aluminum alloy 6063-T5 with mounting flanges on both sides of frame.

C. Damper blades shall have air foil shape and be of aluminum alloy 6063-T5 construction with integral structural reinforcing tube running full length of each blade. Blade edge seals shall be extruded vinyl double edge design with inflatable pocket which enables air pressure from either direction to assist in blade to blade seal off. Blade seals shall be mechanically locked in extruded blade slots. Adhesive or clip-on type seals are unacceptable. Bearings shall be non-corrosive molded synthetic. Axles shall be hexagonal positively locked into the damper blade. Linkage shall be concealed out of airstream, within the damper frame to reduce pressure drop and noise.

D. Dampers shall be furnished with an anodized finish in the color selection as made by the Owner.

E. Operators for dampers shall be properly sized to control the respective dampers without overloading the operators. Pilot positioners shall be furnished and installed for damper operators for sequencing control applications. Operators shall be totally enclosed, dustproof, spring-return-to-damper-open electric actuators, with mounting brackets suitable for mounting on the damper frame.

2.04 MOTOR ROOM EXHAUST FAN

A. Description: Exhaust fan designated EF-1 and EF-2 shall be a belt-driven propeller fan, wall mounted as manufactured by Greenheck, Loren Cook Company, or approved equal.

B. Certifications: Fan shall bear the AMCA certified ratings seal for sound and air performance.

C. Construction: Fan shall bear a permanently affixed manufacturer's engraved metal nameplate containing the model number and individual serial number. Fan wheel shall be steel, securely attached to fan shaft by welding or with standard square key and set screw or tapered bushing. Statically and dynamically balanced in accordance with AMCA standard 204-05. The propeller fan inlet shall have precise running tolerances for maximum performance and operating efficiencies. Fan shaft shall be ground and polished solid steel with an anti-corrosive coating. Wheel shall be centrifugal backward inclined, constructed of 100% aluminum, including a precision machined cast aluminum hub. Wheel inlet shall overlap an aerodynamic aluminum inlet cone to provide maximum performance and efficiency. Wheel shall be balanced in accordance with AMCA Standard 204-96, Balance Quality and Vibration Levels for Fans.

D. Motor: Motor shall be heavy duty type, ODP with permanently lubricated sealed ball bearings and furnished at the specified voltage, phase and frequency as shown on the Electrical Drawings.

E. Bearings: Bearing shall be cast iron pillow block with grease fittings. Bearing shall be selected for a minimum L10 life in excess of 100,000 hours at maximum cataloged operating speed. Bearing shall be air handling quality and 100% factory tested by bearing manufacturer.
F. Belts and Drives: Belts shall be oil and heat resistant, non-static type. Drives shall be precision machined cast iron type, keyed and securely attached to the wheel and motor shafts. Drives shall be sized for 150-percent of the installed motor horsepower. The variable pitch motor drive must be factory set to the specified fan RPM. Belt driven fans shall be provided with a belt guard conforming to OSHA regulations.

G. Accessories: Fan shall be furnished with a motorized backdraft damper with an extruded aluminum frame, aluminum blades and aluminum hinge pins with nylon bushings. Fan shall also be furnished with aluminum birdscreen and extended lube lines.

H. Spare Parts:
1. Two (2) belts per fan size.
2. Two (2) fan bearings per fan size.

2.05 UNIT HEATER

A. Unit heaters shall be bracket-mounted, forced air, electric, with completely enclosed fan motor, suitable for service shown on the electrical drawings, and UL approved. Unit heaters shall be a Q-Mark Type MUH, or approved equal.

B. Unit heaters shall have an 18-gauge die-formed steel housing, phosphate coated and finished with baked enamel, and aluminum-finned, copper clad steel sheath heating element, fan delay feature, and a venturi outlet. Adjustable louvers with 30-degree downward stops shall be furnished to provide desired control of discharge air.

C. Unit heaters shall have a 24V control transformer, an automatic capillary type reset linear thermal cut-out, an integral power disconnect switch, and all necessary brackets for mounting. Provide contactor integral to unit and all connections needed for thermostatic control.

D. Provide and install heater manufacturer’s 24-volt, single-pole, wall-mounted thermostat with a temperature range of 40 to 85-degrees F.

2.06 WALL HEATER - RESTROOM

A. Wall heaters shall be surface mounted, forced air, electric, with completely enclosed fan motor, suitable for service shown on the electrical drawings, and UL approved. Wall heaters shall be a Q-Mark Type CWH3000, or approved equal.

B. Wall heaters shall have an 18-gauge die-formed steel housing, powder paint finish, and aluminum-finned, copper clad steel sheath heating element, and fan delay feature.

C. Wall heaters shall have integral double pole thermostat, a bi-metallic, snap-action type thermal cut-out, an integral power disconnect switch, and all necessary brackets for mounting. Provide contactor integral to unit and all connections needed for thermostatic control. Thermostat to have a temperature range of 40 to 90-degrees F.
2.07 WALL HEATER – VAULT

A. Wall heater shall be surface mounted, forced air, electric, with completely enclosed fan motor, suitable for service shown on the drawings, and UL listed and approved. Wall heater shall be a King Model PAW-SS, or approved equal.

B. Wall heater shall have a 20-gauge, 304 stainless steel housing. All fasteners shall be stainless steel or nickel plated. Unit shall be supplied with stainless steel grille. Heating elements shall be steel sheathed tube, plate-finned, in a block design containing coiled nickel-chrome wire embedded in a magnesium oxide insulator.

C. Wall heater shall have a factory supplied, built in single pole thermostat, thermal overload protection, and all necessary brackets for mounting. Provide contactor integral to unit and all connections needed for thermostatic control. Thermostat to have a temperature range of 40 to 90-degrees F.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install all items to be furnished under this section of the Specifications in accordance with the manufacturer’s instructions and as required herein using stainless steel anchors and fasteners.

B. All apparatus housings and other items shall be erected with all runs straight and true, smooth on the inside with neatly finished air-tight joints. All equipment shall be securely anchored to the building or other support means with reinforcing, as required to be completely free from vibration.

C. The inside of all equipment in the ventilation system shall be cleaned of metal cuttings, paper, loose pieces of insulation and all other debris.

D. Exterior joints around louvers shall be caulked in accordance with Section 07900.

3.02 TESTING, ADJUSTING AND BALANCING

A. Dampers shall be tested once from full open to closed position. Blades shall be checked for binding and motors checked for bracket movement.

B. Fans shall be tested in manual and automatic positions. Check for excessive vibration, noisy operation, or motor overheating. Check motor current against rated amperes.

C. Unit heaters shall be started up and operated to demonstrate capability and compliance with all requirements.

D. After testing capacity and performance of all equipment, make all necessary adjustments to design conditions.
E. System balancing shall be performed by an independent test and balance agency that specializes in, and whose business is limited to, the testing and balancing of mechanical systems. The agency must be fully certified by the Associated Air Balance Council and have an engineer certified by the National Examining Board. All final reports shall be signed and officially stamped by the certified testing and balancing engineer.

F. Test and balance all ventilation systems. The work shall include but not be limited to the following:
   1. Adjust all fans to required speeds for design air flow.
   2. Test capacity and performance of all equipment and adjust to design conditions.
   3. Operate and test all systems under all sequences of operation and adjust equipment and controls for efficient and stable operation.

G. Retest or rebalance the systems as required during the warranty period.

H. Coordinate the testing and balancing work with the work of other trades.

I. Furnish complete and up-to-date contract documents, shop drawings, installation and coordination drawings, submittal data, and other information to the testing and balancing agency so that the work is performed using all required system and equipment data.

J. Plan and schedule testing and balancing at required time during construction. Review all plans, schedules, and procedures with the Engineer before proceeding.

K. Prepare all systems for testing and balancing.

L. Make all necessary adjustments and repairs to the work, correcting any malfunctions or deficiencies which are disclosed by testing and balancing.

M. Perform all testing and balancing in complete accordance with AABC National Standards for Field Measurement and Instrumentation, Form No. 81266, Volume One.

N. Furnish all test instruments and equipment. All instruments shall have been calibrated within six (6) months prior to use and shall be checked for accuracy prior to and during the work.

O. Review all system designs and equipment manufacturer’s data and become completely familiar with the work before proceeding.

P. Plan all operations and procedures; review with the Engineer before proceeding. Make system layouts and diagrams where required.

Q. Inspect all systems and determine that the work is complete and ready for testing and balancing before proceeding.

R. Maintain complete and accurate records of all tests results showing initial and final conditions. Record all temperatures, pressures, flows, speeds, current voltages, control settings, ambient conditions, time, date and other pertinent data.
S. Report all malfunctions of deficiencies to the Contractor so that corrective action can be taken. Repeat tests where required until design conditions are achieved.

T. Where systems or equipment cannot be balanced or adjusted to design conditions, determine cause and submit complete report to the Engineer.

U. Upon completion of the work and before final acceptance, submit three (3) copies of complete testing and balancing report to the Engineer showing all recorded data and results.

V. If, in the opinion of the Engineer, test results or portions thereof are incomplete or inconclusive, repeat necessary portions of the work to the satisfaction of the Engineer.

END OF SECTION
PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Note: This work is subject to applicable special construction and mechanical sections where there is specified equipment with electrical connections. All work in other parts of Division 16 and 17 shall meet requirements of this section.

B. Included within the Contractor’s scope of work are all labor, materials, equipment and services for a complete electrical system. Included in this Contract, but not limited to, is the following:

1. Coordination of connections and providing conduits for all work required for the complete installation of electrical service.

2. Electrical equipment and building grounding systems.

3. Furnish and install electrical connections complete to all equipment whether indicated on the plans or not.

4. Coordinate connection of mechanical and heating and cooling equipment with furnishing trade. Furnish and install motor starters and disconnects as required by National Electrical Code. Do all power wiring from panel to disconnect to starter and to motor or equipment. Wire all line voltage controls carrying motor or equipment power.

5. Support systems for electrical work.

6. Cutting and patching for installation of work specified under Division 16.

7. Temporary electrical service during construction.

8. Test of electrical systems.

9. All site work required for electrical equipment, which includes but is not limited to, trenching and backfill, and service entrance, and power and control cabling.

10. Coordinate all work with Control System Supplier and provide all related conduit and wiring for power and control.

11. Switchgear, automatic transfer switches, transformers, motor control centers, all required distribution equipment and associated feeders, and emergency power systems, where shown.

12. Demolition of electrical equipment in the existing pump station, and delivery of any requested salvageable equipment to the City’s Facilities Complex.
13. Station lighting systems.
14. All pump power, control and alarm wiring.
15. All materials and equipment required, and coordination needed with the electric and telephone utilities.
16. All wiring, conduit, and other equipment, whether shown on the plans, or specifically mentioned in the specifications or not, to accomplish a fully functional electrical system as described herein.
17. All work required by the electric and telephone utilities and all coordination of incoming services.

C. Under this section provide electric services for all fixtures, appliances and items of equipment requiring same and shown on any contract drawings, specified under this division, mechanical division or any other division of specifications, or specified to be furnished by County.

1.02 QUALIFICATIONS
A. The electrical subcontractor must be active on the current Baltimore County prequalification list for Work Category “G” and Work Class “3”, and licensed to work in Baltimore County.

1.03 LOCAL CONDITIONS
A. Examine the premises and observe the conditions under which work will be done and all other circumstances which will affect the work before submitting bid. The submittal of a bid will indicate that the Contractor has full knowledge of the problems involved in the performance of the work.

B. Prior to installation of materials and equipment, discrepancies between plans and actual field conditions or between plans and specifications shall promptly be brought to the attention of the Engineer for a decision.

1.04 APPLICABLE CODES AND STANDARDS
A. Unless stated otherwise in the GENERAL CONDITIONS, the currently adopted codes by the enforcing authorities shall govern.

1. National Fire Protection Association (NFPA)
2. International Building Code (IBC)
3. Local codes
4. Underwriter’s Laboratory (UL)
1.05 SUBMITTALS

A. All submittals shall include sufficient data to make a thorough evaluation of features, construction and performance. Submittals shall be bound in booklet form with a cover sheet indicating each item and respective manufacturer’s catalog number. Include contract number on all submittals.

B. Materials, equipment and fixtures shall completely satisfy specification requirements and be suitable for their intended use. Items of equipment submitted shall include all accessories and options recommended by the manufacturer for satisfactory, reliable and safe operation in its designated location.

C. Where model number or name of one manufacturer is followed in specifications by one or more other manufacturer’s names, design has been based on first product named and shall be considered to be the specified product or manufacturer, named alternates may require minor deviations. Contractor shall indicate deviations in submittals/shop drawings, and bear any resulting additional costs arising from those deviations.

D. Under base bid, furnish equipment and material specified or named alternates. Products submitted shall be equal in quality to products of the specified manufacturer and shall include the standard features of the specified product and also optional features or necessary changes specified herein. Submittal of alternates shall include all changes in building systems, piping, wiring, supports or accessories required for satisfactory and intended operation. Engineer shall be final judge of equivalence.

E. Manufacturer’s model and catalog numbers, change frequently and may not necessarily include specified or required features and may not insure compatibility with supporting systems or intended application. Contractor shall insure that material and equipment delivered to job site is suitable for the intended application and indicated connections. Review of shop drawings shall not include review and verification of submitted catalog numbers or quantities required.

F. Review of and noted comments on Contractor’s submitted shop drawings does not constitute a change order or a waiver of contract requirements. In the event of conflict between submittals or shop drawings and contract documents, the latter shall govern. If waiver of particular requirement is requested by Contractor a formal written request shall be made to County per General Conditions.

G. When directed, Contractor shall provide samples of material or equipment, as directed.

H. Equipment shall be shipped or fabricated in sections of suitable size for entering building and all necessary arrangements for their installation shall be made by Contractor.

I. Shop drawings and submittals shall bear the General Contractor’s review and approval stamp prior to submission to the Engineer.

J. Submittals shall be bound in booklet form, include a summary cover page listing manufacturer and model number and shall indicate if the submitted item is a substitute.

K. Submit copies of shop drawings for all electrical equipment custom-made for this Contract. Drawings shall be revised as directed and resubmitted.
L. Manufacturer’s drawings, sketches, and instructions shall supplement but not supersede contract drawings and specifications.

M. Submittals shall show:
   1. Physical size and arrangement of equipment.
   2. Conduit layout proposed for the site shall be submitted for review and approval prior to installation.
   3. Wiring diagrams for all equipment showing all circuit devices, conductor sizes, color coding, type, etc.
   4. Elementary control diagrams in straightline form for motor control equipment showing all control devices connected to the system.
   5. Specifications for all components.

N. See Section 01000 for additional submittal requirements.

1.06 CUTTING AND PATCHING
   A. Refer to the General Conditions for cutting and patching. Patch all existing areas which were cut for installation of electrical equipment and wiring.

1.07 MATERIALS AND ACCESSORIES
   A. Materials shall be new and listed by the Underwriters Laboratories, Inc., or locally approved national testing agency as conforming to standards in every case where such a standard has been established for the particular materials in question.

   B. Equipment shall be packaged in their original containers and be limited to products regularly produced and recommended for service ratings in accordance with manufacturer’s catalogs, engineering data or other comprehensive literature made available to the public, and in effect at the time of contract award and shall be turned over to the County free of all defects.

   C. All equipment or materials for any one system shall be furnished by the same manufacturer. Such items as lamps, conduit fittings, wire, electrical switchgear, wiring devices, etc., shall be the same throughout the project.

   D. Materials installed on exterior of buildings shall be weathertight and of such design as intended for this purpose. Ferrous exterior materials shall be galvanized or stainless steel as indicated.

   E. Equipment shall be installed in strict accordance with manufacturer’s instructions for type, capacity and suitability of each piece of equipment used. Use weatherproof equipment where required. Install equipment in accordance with manufacturer’s recommendations and meet conditions for manufacturer’s standard warranty.
F. Contractor shall effectively protect his work, materials, or equipment which are liable to cause injury during construction period. Openings into any part of conduit system as well as associated fixtures, equipment, both before and after being set in place must be securely covered or otherwise protected to prevent obstruction of conduit or injury due to carelessness or maliciously dropped tools or materials, grit, dirt, or any foreign matter. Contractor is responsible for all damage so done until his work is installed and accepted. Conduit ends shall be covered with capped bushings.

G. Furnish minimum 4 inch thick, or as noted, reinforced concrete housekeeping pads to extend 6 inches, or as noted on the drawings, beyond equipment for all free-standing electrical distribution equipment, where designated on drawings.

H. Provide all accessories, equipment and connections required for complete installation, ready for continuous use by County.

1.08 INSPECTION AND REGULATIONS

A. Do not allow or cause any of this work to be covered up or enclosed until record photographs are taken of installed items, and the work has been inspected, tested and approved by the authorities having jurisdiction over the work. Should any of this Contractor’s work be enclosed or covered before such an inspection and test, he shall, at his own expense, uncover the work and after it has been inspected, tested and approved make all repairs with such material as may be necessary to restore all of his work and that of the other contractors to its original condition.

B. Work shall meet all requirements of Baltimore County, National Electrical Code, local regulations, and rules and construction standards of the Utility Company. Equipment and materials shall bear label of approval of National Board of Fire Underwriters and be UL listed for their particular application.

1.09 TESTS

A. Give timely notice of intention to test or cover up work to permit observation. Contractor shall obtain the services of an Independent NETA Member Testing Agency to test all wiring for continuity and grounds before connecting any equipment or outlets. The Agency shall test the entire electrical system in accordance with current procedures stated in Acceptance Testing Specifications published by the National Electric Testing Association, Inc. All equipment necessary to conduct such test shall be furnished at the Contractor’s expense.

1.10 WORK BY OTHERS

A. Power company and telephone company charges for permanent work shall be paid for by the County for the work installed by them. Contractor shall be responsible for coordinating, scheduling, providing raceways for the services, relocating existing services as required, providing work indicated by the utility to install service, and bear the cost of same.
1.11 COOPERATION WITH OTHER TRADES

A. Confer with all other trades whose work might affect installation and arrange work in proper relation to that of others and with architectural finishes.

B. Where interferences occur, Contractor shall, before installing work involved, consult with the Engineer and other trades to reach agreement as to exact location and level of work, and submit agreed upon layout for approval prior to starting this work.

C. Contractor is responsible for arrangement of work, equipment and maintenance of proper clearances for installation. Should work installed require modification to avoid interference, such changes shall be made without additional cost.

D. If work is dependent for its proper execution on contiguous work not specified in this Division, The Contractor shall examine such work and report in writing any defects therein or conditions rendering it unsuitable. Beginning of work without making of such a report shall constitute an acceptance of such work, and any subsequent defects in his work consequent shall be of his responsibility.

1.12 FIELD MEASUREMENTS

A. Visit the site before submitting bid and check location of existing utilities, conditions, verify dimensions and locations shown on the plans and over all costs and work herein described or shown.

B. Take measurements necessary for this work and be responsible for their accuracy. Necessary pull boxes and junction boxes as required to accomplish distribution shall be provided.

1.13 STRUCTURAL DIFFICULTIES

A. Should structural difficulties prevent performing work, necessary deviations, as determined by Engineer, shall be performed.

1.14 DRAWINGS AND SPECIFICATIONS

A. Drawings shall be considered schematic in nature and shall represent a completed product. Contractor is responsible for installation of equipment and methods of achieving a satisfactory and intended installation. Locations of devices are intended to show a general arrangement and intended function. Door swings and architectural features shall be checked for final condition. Coordinate with all contract documents, County provided furniture or equipment drawings, structural, and mechanical plans and specifications. Coordinate with other trades.

B. Where there exists a conflict between drawings and specifications, the final contract document interpretation shall provide compliance with all codes. See also the General Requirements.
C. Wiring devices shall be located uniformly with respect to building structure and other work. Locations shall be coordinated. Should there be an interference between electrical wiring and other trades, Contractor shall notify the Engineer so that proper location may be decided upon.

D. Maintain a complete set of blueline prints of contract. As work is installed, carefully draw on prints, in red colored pencil, correct locations of work installed with dimensions from permanent walls, wiring diagrams and details corrected. Upon completion of project, deliver as-built prints to County in good condition.

1.15 PERMITS

A. All permits, licenses or incidental fees not otherwise identified under provisions of General Conditions of this contract specification shall be borne by the Contractor.

B. Permit fees will not be charged by the County on permits issued for County projects.

1.16 GUARANTEE

A. Unless otherwise specified, guarantee unconditionally for a guarantee period as set forth in General Conditions all materials, workmanship and installation. During this period, adjust, repair or replace at no cost to County any item of equipment or workmanship found to be defective.

B. Contractor shall be responsible for and pay for damages caused by or resulting from defects in workmanship.

END OF SECTION
PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawing and general provisions of the Contract, including General and Supplemental Conditions and Division 1 specification sections, apply to this section.

1.02 SUMMARY

A. The work covered by this section includes the furnishing of all materials and equipment and the performing of all labor and services necessary to complete the electrical equipment field inspection and testing requirements specified in the electrical specification sections of this project.

1.03 SUBMITTALS

A. Qualification Data: For testing agency. Submit the following for approval:

1. Company profile.

2. Listing of 10 similar projects performed in the last two years including contact information for use as references.

3. Company and employee qualifications, certifications, etc.

B. Final Equipment Test Report: After all specified field inspection, testing and evaluation are completed, submit for approval the Final Equipment Test Report.

C. Project work schedule. Coordinate project work schedule with the Owner and submit for approval prior to start of work.

1.04 QUALITY ASSURANCE

A. Testing Agency Qualifications: A single independent agency, with the experience and capability to conduct the required inspections and testing indicated that is a current full member company of the InterNational Electrical Testing Association (NETA), and that is acceptable to Authorities Having Jurisdiction (AHJ). Companies that are not a current full member company of NETA shall not be permitted to bid on or perform this work. All persons performing inspection and testing functions shall be permanently employed by the single independent agency.

1. Testing Agency’s Field Supervisor: Person currently certified by NETA to supervise on-site testing specified in Part 3.
B. The testing agency shall have an up to date equipment calibration program. All test equipment used shall be currently calibrated. Submit certifications of calibration for all equipment.

C. Prior to submitting the bid, the Contractor shall visit the site and be thoroughly familiar with the existing conditions. Any errors, discrepancies, or missed items shall be brought to the attention of the Engineer during the bidding process. No additional cost will be allowed for any discrepancy that could have been noticed at the site visit by the Contractor.

1.05 PROJECT CONDITIONS

A. This work will be performed in an existing operational facility. Perform all work in accordance with the Owner scheduling requirements in order to provide minimal impact to building operations.

PART 2 - PRODUCTS

(NOT USED)

PART 3 - EXECUTION

3.01 INSPECTION AND ELECTRICAL TESTING

A. Perform all visual and mechanical inspections and all electrical tests in accordance with all applicable sections of the latest edition of the NETA Acceptance Testing Specifications (ATS) and in accordance with manufacturer recommendations for all electrical equipment that is installed as part of this project. Optional tests referred to in the NETA ATS are not required. Return all equipment to safe operational condition after inspections and electrical tests are completed.

B. NETA Acceptance Testing for all Motor Control Center circuit breakers shall be performed at the system integrators factory prior to Factory Acceptance Testing.

C. The Overcurrent Coordination and Arc Flash studies shall be completed and approved prior to performing the Factory Acceptance Testing. Factory Acceptance Testing shall not occur prior to the Overcurrent Coordination and Arc Flash studies being completed.

3.02 FINAL EQUIPMENT TEST REPORT

A. Prepare and submit for approval a written Final Equipment Test Report including the results from inspections, electrical testing and power system data collection. The report shall include, but not be limited to, the items listed below. Submittals received without all of the information listed below will be rejected in their entirety and will not be reviewed:

1. Cover Sheet: Typed, including project name, project location, testing agency name and date.

2. Summary of results: Typed, summarizing inspection results, test results and recommendations for any required corrective actions. NOTE: All equipment shall be evaluated. All equipment shall be noted as being acceptable or requiring corrective action (with recommended corrective action noted).
3. Letter from the testing agency stating that all equipment included in the report has been tested and evaluated in accordance with all applicable NETA recommendations.

4. Equipment inspection and test data sheets including the following information on each sheet for each equipment:
   a. Company name.
   b. Date of test.
   c. Equipment designation.
   d. Field inspection and test data including all NETA required information. Include all recommended test ranges.
   e. Evaluation of test data in accordance with NETA recommendations, manufacturer’s requirements or industry standard practices. Reference what criteria is used for evaluation. Provide a clear pass/fail indication on each sheet for each piece of equipment. NOTE: All equipment shall be evaluated. All equipment shall be noted as being acceptable or requiring corrective action (with recommended corrective action noted).
   f. Reference which NETA section is used for testing recommendations.
   g. Recommended corrective action for any discrepancies, deficiencies or other as-found conditions requiring repair.
   h. Field test reports and all data shall be typed.

END OF SECTION
SECTION 16055

OVERCURRENT PROTECTIVE DEVICE COORDINATION AND ARC FLASH STUDY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes computer-based, fault-current and overcurrent protective device coordination studies, and the setting of these devices. This Section also includes completion of an arc flash study. All studies and reports shall include the electrical system from the utility company service entrance down to including all proposed and existing to remain MCC’s, panelboards, motors, automatic transfer switches, disconnect switches, generators and any other major distribution system equipment. All studies and reports shall address all possible system-switching configurations and alternate operating conditions that could result in maximum fault current conditions.

1.03 SUBMITTALS

A. Product Data: For computer software program to be used for studies.

B. Product Certificates: For coordination-study and fault-current-study computer software programs, certifying compliance with IEEE 399.

C. Qualification Data: For coordination-study specialist.

D. Other Action Submittals:

1. Coordination-study input data, including completed computer program input data sheets.

2. Coordination-study report.

3. Equipment evaluation report.

4. Setting report.

5. Arc flash study report.

6. Arc flash warning labels for use in the field.

1.04 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are not acceptable.
B. Coordination-Study Specialist Qualifications: An organization experienced in the application of computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices for at least 3 years. Submitted study shall be stamped and signed by a professional engineer registered in the state of Maryland.


1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association to supervise testing specified in Part 3.

D. Comply with IEEE 399 for general study procedures.

E. Comply with IEEE 242 for short-circuit currents and coordination time intervals.

PART 2 - PRODUCTS

2.01 COMPUTER SOFTWARE DEVELOPERS

A. Available Computer Software Developers: Subject to compliance with requirements, companies offering computer software programs that may be used in the Work include, but are not limited to, the following:

1. CYME International, Inc.
2. EDSA Micro Corporation.
3. SKM Systems Analysis, Inc.

2.02 COMPUTER SOFTWARE PROGRAM REQUIREMENTS

A. Comply with IEEE 399.

B. Analytical features of fault-current-study computer software program shall include "mandatory," "very desirable," and "desirable" features as listed in IEEE 399, Table 7-4.

C. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output. Computer software program shall report device settings and ratings of all overcurrent protective devices.

1. Optional Features:
   a. Simultaneous faults.
   b. Explicit negative sequence.
   c. Mutual coupling in zero sequence.
PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine Project overcurrent protective device submittals for compliance with electrical distribution system coordination requirements and other conditions affecting performance.

B. Proceed with coordination study only after relevant equipment submittals have been assembled. Overcurrent protective devices not submitted for approval with coordination study may not be used in study. Studies shall be based on equipment approved for use on this project.

C. Perform site survey to obtain any additional information that is not shown on the drawings required to complete the specified studies.

3.02 FAULT-CURRENT STUDY

A. Source Impedance: Utility Company's fault-current contribution. Coordinate with the local utility for site specific fault-current data.

B. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project and use approved computer software program to calculate values. Include studies of system-switching configurations and alternate operations that could result in maximum fault conditions. Study and report shall include the electrical system from the utility company service entrance down to and including all MCC’s, panelboards, motors, automatic transfer switches, disconnect switches, generator and any other major distribution system equipment.

C. Calculate momentary and interrupting duties on the basis of maximum available fault current.

D. Calculations to verify interrupting ratings of overcurrent protective devices shall comply with the following:


2. Low-Voltage Fuses: IEEE C37.46.


4. Other equipment: As applicable.

E. Study Report: Enter calculated X/R ratios and interrupting fault currents on electrical distribution system diagram of the report. List other output values from computer analysis, including momentary (1/2-cycle), interrupting, and 30-cycle fault-current values for 3-phase, 2-phase, and phase-to-ground faults.

F. Equipment Evaluation Report: Prepare a report on the adequacy of overcurrent protective devices and conductors by comparing fault-current ratings of these devices with calculated fault-current momentary and interrupting duties.
3.03 COORDINATION STUDY

A. Gather and tabulate the following input data to support coordination study:

1. Product Data for overcurrent protective devices specified in other Division 16 Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.

2. Impedance of utility service entrance.

3. Electrical distribution system diagram showing the following:
   a. Load current that is the basis for sizing continuous ratings of circuits for cables and equipment.
   b. Circuit-breaker and fuse-current ratings and types.
   c. Relays and associated power and current transformer ratings and ratios.
   d. Transformer kilovolt amperes, primary and secondary voltages, connection type, impedance, and X/R ratios.
   e. Generator kilovolt amperes, size, voltage, and source impedance.
   f. Cables. Indicate conduit material, sizes of conductors, conductor insulation, and length.
   g. Busway ampacity and impedance.
   h. Motor horsepower and code letter designation according to NEMA MG 1.

4. Data sheets to supplement electrical distribution system diagram, cross-referenced with tag numbers on diagram:
   a. Special load considerations, including starting inrush currents and frequent starting and stopping.
   b. Magnetic inrush current overload capabilities of transformers.
   c. Motor full-load current, locked rotor current, service factor, starting time, type of start, and thermal-damage curve.
   d. Ratings, types, and settings of utility company's overcurrent protective devices.
   e. Special overcurrent protective device settings or types stipulated by utility company.
f. Time-current-characteristic curves of devices indicated to be coordinated.

g. Manufacturer, frame size, interrupting rating in amperes rms symmetrical, ampere or current sensor rating, long-time adjustment range, short-time adjustment range, and instantaneous adjustment range for circuit breakers.

h. Manufacturer and type, ampere-tap adjustment range, time-delay adjustment range, instantaneous attachment adjustment range, and current transformer ratio for overcurrent relays.

i. Panelboards, switchboards, motor-control center ampacity, and interrupting rating in amperes rms symmetrical.

B. Perform coordination study and prepare a written report using the results of fault-current study and approved computer software program. Comply with IEEE 399. Provide recommended settings for all adjustable over current protective devices including, but not limited to, the generator and load bank circuit breakers. Provide time current curve for all devices.

C. Comply with NFPA 70 for overcurrent protection of circuit elements and devices.

D. Comply with IEEE 141 and IEEE 242 recommendations for fault currents and time intervals.

E. Transformer Primary Overcurrent Protective Devices:

1. Device shall not operate in response to the following:
   a. Self-cooled, full-load current or forced-air-cooled, full-load current, whichever is specified for that transformer.
   b. Permissible transformer overloads according to IEEE C57.96 if required by unusual loading or emergency conditions.

2. Device shall protect transformer according to IEEE C57.12.00, for fault currents.

F. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA P-45-482, and conductor melting curves in IEEE 242. Verify adequacy of phase conductors at maximum three-phase bolted fault currents, equipment grounding conductors, and grounding electrode conductors at maximum ground-fault currents.

G. Coordination-Study Report: Prepare a written report indicating the following results of coordination study:

1. Tabular Format of Settings Selected for Overcurrent Protective Devices:
   a. Device tag.
   b. Relay-current transformer ratios; and tap, time-dial, and instantaneous-pickup values.
c. Circuit-breaker sensor rating; and long-time, short-time, and instantaneous settings.

d. Fuse-current rating and type.

e. Ground-fault relay-pickup and time-delay settings.

2. Coordination Curves: Prepared to determine settings of overcurrent protective devices to achieve selective coordination. Graphically illustrate that adequate time separation exists between series devices, including power utility company's upstream devices. Show the following specific information:

a. Device tag.

b. Voltage and current ratio for curves.

c. Three-phase and single-phase damage points for each transformer.

d. No damage, melting, and clearing curves for fuses.

e. Cable damage curves.

f. Transformer inrush points.

g. Maximum fault-current cutoff point.

3. Completed data sheets for setting of overcurrent protective devices.

3.04 OVERCURRENT PROTECTIVE DEVICE SETTING

A. Testing: Engage a qualified testing agency to perform the following device settings:

1. After installing overcurrent protective devices and during energizing process of electrical distribution system, perform the following:

   a. Verify that overcurrent protective devices meet parameters used in studies.

   b. Adjust devices to values listed in study results.

3.05 ARC FLASH STUDY

A. Perform an arc flash study in conjunction with the previous specified fault current and protective device coordination study. Perform study in accordance with IEEE 1584.

B. The study shall be calculated using an approved computer software program. Pertinent data and the rational employed in developing the calculations shall be incorporated in the introductory remarks of the study. The study and the report shall include the electrical system from the utility company service entrance down to and including all MCC’s, panelboards, motors, automatic transfer switches, disconnect switches, enclosed circuit breakers, generator and any other major distribution system equipment.

1. Determine the following for each bus analyzed:

   a. Flash Hazard Protection Boundary
b. Incident Energy Level

c. Required Personal Protective Equipment (PPE) Category

d. Type of Fire Rated Clothing

e. Limited Approach Boundary

f. Restricted Approach Boundary

g. Prohibited Approach Boundary

2. Produce an Arc Flash Warning label for each piece of electrical equipment that includes a specific equipment ID and the previous items a-g listed. Also include the system operating voltage and date of issue. Labels shall be printed in color on adhesive backed nylon labels. Sample label shall be submitted for approval prior to installation. Labels should follow latest NFPA requirements.

C. Arc flash study report: Prepare a written report indicating the following results of arc flash study:

1. Tabular format summary sheet including the following for each bus analyzed:

   a. Flash Bus Name
   b. Protective Device Name
   c. Bus Operating Voltage
   d. Bus Bolted Fault Current
   e. Protective Device Bolted Fault Current
   f. Protective Device Arcing Fault Current
   g. Trip/Delay Time (Sec)
   h. Breaker Opening Time (Sec)
   i. Ground
   j. Equipment Type
   k. Gap (mm)
   l. Arc Flash Boundary (in)
   m. Working Distance (in)
   n. Incident Energy (cal/cm²)
   o. Required Personal Protective Equipment (PPE) Category

2. Tabular format of recommended settings for overcurrent protective device settings to lower the arc flash levels.
D. The electrical contractor shall permanently affix the arc flash warning labels to each piece of electrical equipment including, but not limited to, motor control centers, panelboards, switchboards, automatic transfer switches, disconnect switches, enclosed circuit breakers and any other major distribution system equipment.

END OF SECTION
SECTION 16100

BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Requirements of this section apply to all other parts of Division 16.

PART 2 - PRODUCTS

2.01 RACEWAYS AND FITTINGS, MINIMUM SIZE 3/4 INCH,

A. Non-metallic conduit; Olin, Triangle, Porter, Carlon, Schedule 40 polyvinylchloride (PVC) conduit. Schedule 80 only where shown on the plans.


C. PVC coated galvanized rigid steel (GRS) conduit and fittings; Permacote or approved equal.

D. Aluminum conduit shall not be used.

2.02 CONDUIT FITTINGS:

A. Plastic insulating bushings: T&B, O-Z Gedney, Scotch, Steel City, Raco, Appleton, Efcor, Union.

B. Metallic bushings: T&B, Gedney, Steel County, Race, Appleton, Efcor. Use metallic bushings where bushing is exposed.

C. Flexible liquid resistant conduit: Appleton or approved equal.

D. Expansion Joints:

1. Conduits, rigidly secured to building construction on opposite sides of a building expansion joint, shall be provided with expansion and deflection couplings. The couplings shall be installed in accordance with the manufacturer’s recommendations.

2. Expansion and deflection couplings shall also be installed where shown on the drawings.

3. The expansion/deflection couplings shall be by O-Z/Gedney or approved equal.

2.03 GROUND SYSTEM DEVICES AND EQUIPMENT

A. Ground rods - 3/4” x 10’ copper clad steel.
B. Ground rod and cable connections underground: Exothermic weld such as Caldwelded or Thermowelded.

C. Cable connections accessible: Burndy, Hy-press type.

D. Ground bushings; O.Z. Type BL.

E. Pipe connectors: O.Z. Type ABG.

F. Enclosure connector: O.Z. Type QG or KG.

G. Feed through lug: Burndy type Q2B.

2.04 BOXES

A. Manufactured pull boxes shall be one piece stamped galvanized steel, machine screw fasteners with ground bond screw, UL listed.

B. Direct burial handholes shall be constructed of reinforced fiberglass with a cover rated for “heavy duty” traffic. Size shall be as specified or as required by code, whichever one is larger. Provide Quazite, Armorcast Products Company, or Carson Industries LLC.

C. Conduit fittings shall match conduit type. Cast fittings of Feraloy (“gray metal”) shall not be acceptable. Conduit fittings shall be by Permacote, Allied Tube & Conduit; a Tyco International Ltd Co., or Anamet Electrical Inc.; Anaconda Metal Hose.

D. Outlet, junction and switch boxes shall be cast, typos FS and/or FD shall be of malleable iron or aluminum. Cast boxes of Feraloy (“gray metal”) shall not be acceptable. Cast boxes shall be Appleton, Hubbell Inc; Killark Electric Manufacturing Co. Division, or Thomas & Betts Corporation.

E. Group surface mounted device boxes shall be in a multi-gang cast box. The size shall be governed by the intended use.

F. Exterior wall surfaces or otherwise exposed to weather shall be cast FD boxes with threaded hubs and neoprene gaskets. U.L. Listed.

G. Pull boxes: construct of code gauge galvanized sheet steel with screw cover.

H. Where installed below the operating level slab, in damp or wet locations, or outdoors, all boxes shall be Type 316 SS, NEMA 4X.

2.05 CONDUCTORS:

A. General

1. Unless specifically indicated otherwise, all wiring shall be 98 percent conductivity copper conductors. Minimum wire size shall be #12 AWG for power, #14 AWG for control and #18 AWG for twisted stranded shielded pairs, unless otherwise noted. All wire AWG #8 or larger shall be stranded. All control wiring shall be stranded. Insulation shall be dual rated THWN/THHN. Manufacturers shall be Triangle, Phelps Dodge, Southwire, or Royal.
B. Wire within buildings

1. Single conductor wires: 600 volt dual rated THWN/THHN, within metallic raceways,

C. Exterior wiring:

1. Underground: In conduit, dual rated THWN/THHN.
2. Above grade: In conduit, dual rated THWN/THHN.
3. Aluminum wiring shall not be used.

D. Wire connectors

1. Copper wire: For connections of one or more #10 AWG or smaller, solderless twist-on connectors shall be used. The connectors shall have an outer insulating shell manufactured from nylon (polyamide) material and shall be formed with “S”-shaped fins to improve the twisting action. The spring insert shall be a helical elongated coil formed from square spring steel to cause the spring to have “live action” and reduce the turning friction. The connectors shall be rated flame and heat retardant for up to 105 degrees C maximum and be Underwriter’s Listed under UL 486. Connectors shall be Buchanan “B”-Caps or approved equal by Pass & Seymour, Ideal, Hyco, Thomas & Betts. Conductors #8 AWG and larger shall be terminated, spliced or tapped wherever practicable with T&B “Color Keyed” Series 54000, tool applied compression connectors or approved equal.

2. Terminations: Belleville type compression washers shall be used when ambient temperature exceeds 30 degrees C, T&B Series 60800 or approved equal.

3. Compression tools: All compression connectors shall be made with manufacturers recommended tool incorporating a ratchet release type mechanism to insure complete compression, typically Burndy Y-39 Hypress or approved equal.

E. Wire Fastening Products (Enclosure Interiors)

1. Provide wire fastening products when wiring is specified or required to be secured.

2. Wire fastening products shall include but not be limited to the following types of components: natural nylon cable ties, black (UV-resistant) cable ties, cable tie mounts, adhesive cable tie mounting pads, adhesive press clips, molded nylon clamps, molded polypropylene clamps, flat nylon clamps and adhesive-mount adjustable clamps.

3. The Contractor shall provide all accessories required for a complete and satisfactory installation.

4. Wire fastening products shall be by Brady or approved equal.
F. Wire Pulling Lubricants

1. Use pulling lubricants on all raceway wiring. Pulling lubricants shall be of a greaseless compound, non-corrosive, non-conductive, non-combustible, non-toxic, for use with PVC or steel raceways and safe for use on all UL-listed wire insulation. The pulling lubricant shall be “Quick-Slip” by Buchanan, Ideal, or approved equal.

G. Electrical supporting devices

1. Materials secured to the structure by: inserts cast in concrete, expansion anchors in concrete block, machine screws or bolts on metal surfaces. All hardware shall be 316 stainless steel. Hangers shall be as follows:
   b. Channel fittings: 316 stainless steel by Kindorf, Unistrut, or Globe Strut, fittings by ‘B-Line’.
   c. Conduit hangers: 316 stainless steel clevis type by Unistrut, Kindorf, or Grinnell.
   d. Wall anchors: Expansion bolt, toggle bolt, or other approved structural anchor. All hardware shall be 316 stainless steel. Wood or fiber plugs shall not be used.

2. All electrical materials and components secured to joists shall be fastened to the top member of the joist.

2.06 WIRING METHODS

A. In general, interior wiring shall be in PVC coated threaded galvanized rigid steel (GRS) conduit. Service and service entrance wiring and wiring in vaults shall be in PVC coated GRS conduit. Other wiring buried below grade shall be in PVC coated GRS conduit. Where connections are made to mechanical equipment, transformers, fixed appliances, and items requiring free movement or which are vibration producing, these connections shall be a flexible raceway with a ground wire installed within, such as Sealtite. All wire, cable or conductors of any type shall be in conduit unless approval is obtained otherwise from the Engineer.

PART 3 - EXECUTION

3.01 PREPARATION

A. Check door swings and clearances with equipment, cabinets, appliances and coordinate with all contract drawings prior to performing work.
3.02 INSTALLATION

A. Exposed wiring and conduit shall be installed in a neat and workmanlike manner with runs plumb and parallel to walls. Bends and offsets shall be avoided where possible, but where necessary shall be made with an approved hickey or conduit bending machine. Conduit or tubing which has been crushed or deformed in any way or has begun to rust shall not be installed. Use expansion bolts to secure equipment, conduit or devices. Wood or dowel plugs are not acceptable. Conduits or tubing shall be supported on approved types of stainless steel wall brackets, ceiling trapeze or pipe straps, secured by means of expansion bolts in concrete or brick. Nails shall not be used as a means of fastening surface boxes or conduits. Conduit or tubing shall be installed in such a manner as to insure against trouble from collection of trapped condensation and all runs on conduit shall be arranged as to be devoid of traps wherever possible.

B. Raceways and cable shall meet requirements of National Electrical Code and local codes.

C. Except as noted or specified otherwise, raceways shall be as follows:

1. Indoors exposed on walls or ceilings: 3/4” minimum PVC coated threaded GRS conduit.
2. Outdoors, exposed or in wetwell/clearwell or vaults: 3/4” minimum PVC coated threaded GRS.
3. Outdoors buried underground: 3/4” minimum PVC coated GRS.
5. Below concrete slab: 3/4” minimum PVC coated GRS.
6. Liquid-tight flexible metal conduit shall be used for connections to motors and other electrical equipment subject to movement, vibration or noise transmission, or where approved by the Engineer. Maximum length not to exceed 3 feet.
7. Where shown: PVC, Schedule 80.
8. All wire and cable shall be continuous without splicing from load to source of supply. Splicing shall only be performed after obtaining written approval from the Engineer and County.
9. All wire and cable, including grounds, shall be run in conduit unless written permission is obtained from the Engineer and County.

D. Clamps shall be stainless steel. Multiple runs shall be supported on metal channel with conduit clamps. Trapezes shall be metal channel with conduit clamps.

E. Penetrations through concrete walls, floors and footings, both interior and exterior shall be sleeved and caulked with grout or plastic compound to provide watertight seal.
F. Handling and installation: Bends shall be kept in accordance with minimum recommended by manufacturer. Cables shall be paralleled on reels and be pulled directly into raceway from the coil or reels on which they are received. Cable shall not be laid on the ground.

G. Use pulling lubricants on all raceway wiring. Wire and cable shall be installed only after raceways are free of obstructions and clean. All wire shall be color coded. Wiring shall be tagged with Brady “Quick” labels at all terminations with each individual wire having a unique identifying number. Wiring in panelboards and terminal cabinets shall be neatly trained and served.

H. All empty conduits shall be installed complete with a nylon pull cord.

I. Conduit layout shall be submitted for approval prior to any installation.

J. Wires and cables shall be pulled only once. Wires and cables which are pulled in one direction and retracted, shall be replaced with new wires and cables at no additional cost.

3.03 GUARANTEE

A. Unless otherwise specified guarantee unconditionally for a guarantee period as set forth in the General Conditions all materials, equipment, workmanship and installation. During this period, adjust, repair or replace at no cost to County any item of equipment or workmanship found to be defective.

END OF SECTION
SECTION 16130

ELECTRICAL CONDUIT TRENCHING AND BACKFILL

PART 1 - GENERAL

1.01 SCOPE OF WORK
   A. Trenching and backfill for electrical work.

1.02 RELATED WORK
   A. Division 2 - Site work

1.03 QUALITY ASSURANCE
   A. All backfill material and compaction shall be in accordance with Division 2.

PART 2 - PRODUCTS

2.01 SUITABLE MATERIALS
   A. Materials suitable for backfill shall meet the criteria of Division 2.

PART 3 - EXECUTION

3.01 TRENCHING AND BACKFILL
   A. Excavate and backfill all trenches and other excavations required for completing the work of this Division. All excavation required shall be “unclassified”.

   B. Excavation required for the placement of underground ductbank systems and other underground utility installations shall be in conformance with the drawings and as described herein.

1. Contractor shall perform all excavation of trenches to widths and depths for proper laying of pipe. All excavation shall be made by open cut. Banks of trenches shall be kept as nearly vertical as possible and, if required, shall be properly sheeted and braced. Trenches shall not be less than 12” nor more than 16” wider than the outside pipe or ductbank diameter and shall be excavated true to line so that a clear space not less than 6” nor more than 8” in width is provided on each side of the pipe.

2. Beddings shall be used, see underground conduit detail on drawings, and Section 02300 of specifications. Ductbank shall be concrete encased where shown on drawings.
3. Trenches shall be sheathed or braced as necessary to protect workmen and adjacent structures and to permit proper execution of the work. After piping installed has been tested and has been inspected and approved by the Inspector, the trenches shall be carefully backfilled with excavation materials approved for backfilling, consisting of loam, sandy clay, sand and gravel or other approved materials free from large clods of earth or stone, deposited in 6” layers and thoroughly and carefully tamped until the pipe has a layer of not less than the depth indicated on the drawings.

4. The bottoms of all trenches shall provide uniform bearing and support for each section of pipe on undisturbed soil at every point along its entire length. Where, in the opinion of the Engineer, damage is liable to result from the removal of sheathing, the sheathing shall be left in place. Where rock excavation is required, the rock shall be excavated to a minimum overdepth of 6” below the trench depth and the overdepth filled with 6” of carefully rammed backfill. Unauthorized over depths in excavation shall be backfilled at the Contractor’s expense, with crushed stone, slag or gravel, thoroughly tamped.

5. Should the Contractor encounter springs within the work area or soft soil conditions at the elevations required for load bearing, he shall immediately notify the Engineer and not place any portion of the work on such surfaces until instructions are received from the Engineer.

6. All materials excavated that are not suitable for backfilling or embankment shall be disposed of offsite.

7. The Contractor shall control the grading in the vicinity of excavations so that the ground surface is pitched to prevent water from running into the trenches. The Contractor shall provide equipment and pump any trench dry in which water had accumulated.

8. All tests on wiring and conduit shall be made prior to backfilling.

C. Backfill required shall be of approved materials above the conduit(s). The materials shall be deposited in 6” layers.

1. Pavement and concrete disturbed by trenching operations shall be replaced with materials equal to adjacent paving.

2. Backfilling shall be carefully performed and the original surface restored as directed by the Engineer. Compaction to be by mechanical, air or gasoline engine methods. Wherever trenches have not been properly filled or if settlement occurs, they shall be refilled, compacted, smoothed off and finally made to conform with the surface of the ground.

3. Shoring, including sheet piling, shall be furnished and installed as necessary to protect workmen, banks, adjacent paving, sidewalks and utilities. Shoring and sheeting shall be removed as excavations are backfilled, in a manner to prevent caving. Shoring and sheeting materials and placement shall conform to the safety requirements of Associated General Contractors. All trenching shall be performed in accordance with all applicable OSHA regulations and requirements, including OSHA Standard 1926.651 – Specific Excavation Requirements.
4. All excavations shall be performed to provide drainage from the site to prevent conditions that are detrimental to proper construction procedures and results. Water shall not be permitted to pond within footings or trench excavations. Completed footings and trenches shall be backfilled as soon as possible.

5. Construct proper temporary dams or barriers in excavated areas to prevent flooding of water flowing in from adjacent areas.

3.02 MASS EXCAVATION

A. Mass excavation to approximate building levels will be carried out under another section of the standard specifications. The Contractor shall, however, do all trench and pit excavation and backfilling required for work under this Section of the Specifications, inside and outside the building.

END OF SECTION
SECTION 16400
SERVICE AND DISTRIBUTION

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Work included:

1. Complete electrical distribution system.

2. Underground conduits and trench and backfill as required.

3. Infrared Testing of Motor Control Center, Switchgear, Panelboards, VFD’s, and ATS.

B. Work included elsewhere: See Section 16010- General Provisions (Electrical).

1.02 SUBMITTALS

A. Submit cuts on all items of electrical equipment. Include panelboards, switches, wiring, receptacles, motor starters, disconnections, wiring devices, cover plates, nameplates, distribution equipment and overcurrent devices.

1.03 INFRARED TESTING

A. The Contractor shall hire an independent certified testing laboratory to inspect and test the Motor Control Center, Switchgear, Panelboards, VFD’s, Transformer, and ATS. Infrared Tests shall be made to determine that all terminations are tightened to proper torques and that no part of the equipment is overheating beyond normal operating conditions. This test shall be made twice, once at 1 week after substantial completion of the project (after all MCC, VFD, and all equipment is supplying permanent loads under normal loaded conditions) and again at 23 months after the pump station has been turned over to the County. The finding of each test shall be incorporated into a report and 3 copies shall be turned over to the County. If the equipment is determined to be above normal operating temperatures the Contractor shall make the necessary corrections to the equipment.

PART 2 - PRODUCTS

2.01 EQUIPMENT

A. Circuit Breaker Panelboards: Provide Square D NQOD or NF with copper bus in accordance with panel schedules on drawings, or approved equal.

1. Enclosure: NEMA 250, Type 1.

3. Provide each panelboard with Surge Protection Device. Surge Protection Device shall be furnished internal to panelboard and shall be UL 1449 Second Edition Listed. Unit shall protect all modes (L-L, L-N, L-G, and N-G) applicable. Unit shall have 240kA of surge capacity per phase with a let thru voltage of less than 1500V L-L and 700V L-G. A disconnecting means shall be provided ahead of the surge suppressor so the unit can be serviced without de-energizing the panelboard.

2.02 CIRCUIT BREAKERS

A. Thermal-magnetic type, tripping free of handle and employing design principle of arc. Handles shall assume three distinctive positions; ‘OFF’, ‘ON’ and ‘TRIPPED’.

B. Provide solid state trip where indicated on the drawings.

2.03 THERMAL-MANUAL MOTOR STARTERS

A. Unless otherwise indicated on the drawings, thermal-manual motor starters shall be line-voltage type with thermal over-load protection and red “run” pilot light. Thermal-Manual starters shall be quick make and break, toggle operated, trip free, and shall be provided with a lock-off handle guard.

B. Where required for automatic operation by a remote pilot device under DIVISION 15 of this Specification, thermal-manual motor starters shall be provided with a “hand-off-automatic” selector switch (in addition to the “on-reset-off” toggle switch).

C. Thermal-manual motor starters shall be wall mounted with stainless steel plates.

D. Thermal-manual motor starters shall be rated 30 amps Square-D Class 2510 or approved equal by General Electric or Cutler Hammer.

2.04 MANUAL MOTOR STARTING SWITCHING

A. Manual motor starting switches shall be similar to thermal-manual motor starting switches except with no overload protection. Square D Class 2510 or approved equal by General Electric, Allen Bradley, or Cutler Hammer.

2.05 MOTOR STARTERS

A. Unless otherwise indicated on the drawings, magnetic motor starters shall be full voltage; horsepower rated, across the line starting with 120 volt, 60 Hz control. Provide 120-volt control transformer with fused secondary. Provide 24 VAC if required for starters or other pilot devices. Motor starters shall be NEMA rated.

B. Where indicated on the plans, provide VFD with solid-state reduced voltage soft start, soft-stop motor starters.

C. Provide red “run” and green “stop” pilot lights. Mount in cover.

D. Pilot lights shall be provided with factory-finished legend plates indicating “stop”, “run”, etc. Pilot lights shall be provided with interlocks controlled by the starter-operating coil. Pilot lights shall be in accordance with Specification 17100.
E. Provide Solid-State Overload Relay:
   1. Switch or dial selectable for motor running overload protection.
   2. Sensors in each phase.
   3. Class 10/20 selectable tripping characteristic selected to protect motor against voltage and current unbalance and single phasing.

F. Provide reset button, run time meter, start counter, and Hand-Off-Automatic switch for each starter. Items shall be mounted inside the bucket with their display through the front panel so the display can be read on the outside face of the bucket.

G. For each starter, provide 4 (min) auxiliary spare contacts (2 N.O. and 2 N.C.) for interlocking and automatic operation. Contacts shall also be convertible from N.O. to N.C.

H. All three phase starters shall have phase monitors that shall automatically shut down the load during single phasing conditions.

2.06 WIRING METHODS

A. In general, branch circuits shall be No. 12 AWG (minimum) THWN/THHN copper. Control wiring for discrete signaling shall be stranded No. 14 AWG THWN/THHN copper. Wiring for analog signaling shall be No. 18 AWG twisted shielded stranded pair. Refer to Specification 16930 for wiring requirements.

B. Branch circuit wiring for switches, lighting and receptacles shall be exposed on walls and ceilings.

C. All wiring shall be supported in accordance with provisions of National Electrical Code and local code requirements and shall utilize approved fasteners and clamps. Conduits secured to walls shall be fastened to wall studs where spacing permits. In all cases, conduits and clamps shall be rigidly secured and free of obstructions which may cause injuries.

D. All conductors shall be color coded per the NEC. All No. 12 and No. 10 branch circuit conductors shall have solid color compound or solid color coating.

E. No. 8 AWG and larger conductors shall have NEC required color coding as either:
   1. Solid color compound or solid color coating.
   2. Stripes, bands or hash marks of colors.
   3. Colored, pressure-sensitive plastic tape. Tape shall be applied in half overlapping turns for a minimum of three inches for all terminal points, and in all junction boxes, pull boxes, troughs, manholes, and handholes. Tape shall be 3/4-inch wide with colors as specified above. The last two laps of tape shall be applied with no tension to prevent possible unwinding. Tag all wires at terminal equipment, outlets, terminal cabinets, pull and junction boxes, and control center, with Brady “Quick” label tags.
4. Circuit number and panel identification shall be permanently printed on the stems or junction boxes of all lighting fixtures, and the back of all device plates on all receptacles and wall switches.

2.07 WIRING DEVICES

A. Switches shall be extra hard use, commercial premium specification grade and comply with Federal Specification W-S 896B and be rated 20 amperes and voltage as dictated by the system and shall not require derating for lamp loads. They shall be approved for control of motors up to 80 percent of the switch rating and shall be quiet AC type. Use single pole, double pole, three way and/or four way as shown connected.

B. Receptacles shall be extra hard use, commercial premium specification grade, two pole, three wire, and straight blade type and shall comply with Federal Specifications W-C 596E with a rating of 20 amperes for single receptacle circuits or as indicated on the drawings.

C. All outlets and switches shall be brown in color.

D. Ground Fault Interrupter devices shall be duplex receptacle type and shall comply with Underwriters Laboratories, Inc. standard 943, Class A. They shall be no more than one and one eighth inch deep with standard terminal screw connections and feed-through capability rated at 20 amperes.

E. All receptacles shall have weatherproof boxes with while-in-use covers. Switch and other device plates shall be stainless steel. Depth shall be suitable for sump pump controls.

F. Emergency stop push buttons shall be snap type maintained contact mushroom style switches. Allen Bradley 800 series, or approved equal.

G. Hatch and door switches shall be Honeywell, or approved equal, and suitable for hazardous locations where required.

2.08 CONNECTIONS TO MECHANICAL EQUIPMENT

A. Note carefully all other sections of this specification (in particular Division 15) describing electrical equipment to be furnished in order to fully understand all equipment wiring and motor starting requirements.

B. An enclosed disconnect switch and motor starter shall be furnished and installed for each motor installed unless specifically indicated as furnished under other sections of specifications.

C. All thermostats shall be furnished and installed under Division 15.

D. Furnish and install all power wiring for motors complete from panelboard thru motor starters to motor terminations.
E. Disconnect switches shall be provided where shown on the drawings or required by the NEC, fused or unfused as required, and shall be Square D class 3110 Heavy Duty, or approved equal. Any switch installed outdoors and below grade level in the pump station shall be rated NEMA 4X, and shall be 316 stainless steel. Provide option to allow locking in open and closed position.

2.09 FUSES

A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size.

B. Extra Materials: Furnish extra materials described below that match products installed and that are stored and identified with labels describing contents.

1. Fuses: 3 of each type and rating used.

C. 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 Bussman Inc.
2. Ferraz Shawmut Inc.
3. Tracor Inc.; Littlefuse Inc.
4. Or Approved Equal

D. Cartridge Fuses: NEMA FU1, nonrenewable cartridge fuse, class and current rating indicated; voltage rating consistent with circuit rating.

E. Fuse Applications:

1. Motor Branch Circuits: Class RK1, time delay.
2. Other Branch Circuits: Class RK1, time delay.

F. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

G. Install labels indicating fuse replacement information on inside door of each fused switch.

2.10 MOTOR STARTERS AND CONTROLS

A. Install items in accordance with manufacturer’s instructions.

B. Coordinate with the heating ventilation, air conditioning, ATC and plumbing Contractors and their associated drawings and specifications for the requirements for interlocks, contacts, pilot lights, and Hand-Off-Automatic switches which shall be provided by the Electrical Contractor for all starters provided under this section of the specification.
C. Provide all starters, push buttons, etc.; also install any motor starters or miscellaneous line voltage control devices which are furnished under other divisions of this specification.

D. Mount motor starters on wall and install suitable stainless steel enclosures and cover plates.

E. Install heaters correlated with full load current of motors provided

F. Set overload devices to suit motors provided.

G. All motors shall be connected with minimum 3 foot length of sealtite flex conduit at motor connection box. Sealtite flexible conduit shall not exceed three feet in length.

2.11 GROUNDING

A. Furnish, install and connect ground bond to cold water services and to auxiliary driven ground rods. Bond all non-current carrying metallic parts of equipment, mechanical systems, and building steel. Neutral conductor at main switches shall be grounded. Ground bus shall not be less than size required by National Electrical Code and local codes. Grounding system shall be complete and installed in accordance with all local jurisdictions and County’s requirements. Ground rods shall be copper clad steel, driven as indicated, or to refusal. Where soil conditions are poor, notify the Engineer so that supplemental grounding may be considered. Ground and bond all piping systems and building steel within building as required by the NEC.

2.12 TEMPORARY SERVICE

A. The contractor shall make the necessary arrangements and provide all temporary electric service and lighting required during the entire construction period. The metered costs of electricity used shall be borne by the Contractor until Final Acceptance. The electric service shall be of sufficient capacity and characteristics to supply the proper current for the various types of construction tools, motors, welding machines, lights, heating plant, pumps, and other work required. All necessary temporary wiring, panelboards, outlets, switches, lamps, fuses, controls and accessories shall be provided.

B. Exact location of temporary service delivery point shall be as agreed upon by utility company, Engineer, and County.

C. Contractor’s installation of temporary service shall comply with all applicable codes and regulations and shall include Ground Fault Interrupters.

2.13 POWER AND TELEPHONE COMPANY COORDINATION

A. Contractor to provide site facilities as per power and telephone company’s requirements.

B. Contractor shall not do any rough-in of empty conduits, transformer pads, meter sockets, etc. until the power and telephone company has produced engineered drawings indicating exact locations and conduits required.
C. Extend and reinstall all existing communications lines entering the facility to the proposed pump control panel for reuse. Provide ¾” PVC coated GRS to be installed from new Telephone NID to pump control panel with CAT 5 wiring.

PART 3 - EXECUTION

3.01 INSTALLATION

A. In general, switches and receptacles shall be installed in locations shown on contract drawings. All conduit and wiring for switches and receptacles shall be exposed on walls. Contractor shall study general building plans in relation to space surrounding each device in order that intended work may accommodate all other specified work, and shall make minor adjustments as needed. Boxes shall be installed in a rigid and satisfactory manner. Support all boxes independent of raceways. Adjacent wall mounted wiring devices, room thermostats or other equipment shall be coordinated and so located either at the same elevation or in line, one above the other. Install conduit, outlets and equipment to clear beams or obstructions. Do not cut into or reduce the size of any load-carrying member without the approval of the Engineer. Permission of Engineer shall be obtained before cutting any existing structure concrete walls or floors. Check drawings and work of others to prevent interference. Deviations of work to avoid obstructions as determined by the Engineer shall be done without additional cost.

B. Ground all equipment in accordance with the National Electrical Code requirements, the additional requirements of Division 16 and with local ordinances and utility company requirements.

C. Mounting heights, unless otherwise specified

1. Receptacles - 48 inches.
2. Wall switches - 48 inches
3. Panelboards - Mount top of trim 90 inches (2286 mm) above finished floor unless otherwise indicated.
4. Where applicable, mounting heights shall conform to Handicap Code for Barrier Free Installations.

D. All wiring devices shall be wired using the screw terminals. Push connections are not acceptable.

E. Support pull boxes and junction boxes in ceiling from structure and not from raceways or ceiling suspension systems.

F. Use locknuts and insulating bushings at all rigid conduit ends at junction boxes, pull boxes, panel, starters, disconnections, and other boxes.

G. Protect conduit openings and do not pull wire until work which would damage wire has been completed near ends of conduit. All empty raceways shall be furnished with nylon rope.
H. Bend conduits with hickey or bender, where bends are necessary. Do not bend in vise or use a pipe tee for bending.

I. When cutting conduit, square ends, thread, ream and clean.

J. Use Sealtite conduit and fittings for pumps, motor connections, in mechanical equipment rooms or out of doors for flexible connections.

K. Use gasketed covers and threaded raceway hubs for exterior raceway connections. Use vandal-resistant hardware at all outdoor locations.

L. Label all safety switches, disconnections, panelboards, motor starters, and other equipment with engraved laminated plastic tags, screw attached, not smaller than 3/8 inch high, indicating function served. Letters shall not be smaller than 1/4 inch high and shall be black on white background. Submit proposed designations and sample for approval.

3.02 GUARANTEE

A. Unless otherwise specified, guarantee unconditionally for a guarantee period as set forth in General Conditions all materials, equipment, workmanship and installation. During this period, adjust, repair or replace at no cost to County any item of equipment or workmanship found to be defective.

END OF SECTION
SECTION 16450

GROUNDING

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Contractor shall install new grounding systems for the entire facility in accordance with current code requirements and these specifications.

1.02 DESCRIPTION

A. System Grounding

1. Secondary service neutrals shall be grounded at the supply side of the secondary disconnecting means and at the related transformers.

B. Equipment Grounding

1. All metallic structures, enclosures, raceways, junction boxes, outlet boxes, cabinets, machine frames, and other conductive items in close proximity with electrical circuits shall be grounded for personnel safety and to provide a low impedance path for possible ground fault currents.

1.03 SUBMITTALS

A. Shop Drawings

1. Submit catalog cuts and descriptive literature for approval in accordance with Division 1, General Requirement, Shop Drawings. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.

2. Submittals: rods, connectors, and exothermic welding systems.

B. Test Reports

1. Submit and certify test reports from the NETA approved testing agency of ground resistance to the Engineer. Reports shall indicate date, time, temperature, and equipment used for ground resistance testing, by manufacturer and model number.

2. Test grounding systems in accordance with NETA standards and summarize in the report.

C. Certification

1. Two weeks prior to project completion, deliver to the County six copies of the following:
a. Certification from the NETA approved testing agency that the material and installation is in accordance with the drawings, specifications, and codes and that it has been properly installed.

PART 2 - PRODUCTS

2.01 GROUNDING WIRES

A. Wires shall be UL and NEC approved types, copper, with insulation color identified green, except where otherwise shown on the drawings, or specified.

B. Wire size shall not be less than shown on the drawings and not less than required by the NEC.

2.02 GROUND RODS

A. Shall be copper clad steel, 3/4-inch diameter by 10 feet long.

PART 3 - EXECUTION

3.01 SECONDARY EQUIPMENT AND CIRCUITS

A. Main Bonding Jumper:
   1. Connect the secondary service neutral to the ground bus in the service equipment.

B. Supplemental Electrodes
   1. Provide a ground loop with a minimum of three (3) rods and foundation ground connections and connect to the service equipment ground bus.

C. Service Entrance, Switchgear and/or Motor Control Center
   1. Provide a ground bar bolted to the enclosure with lugs for connecting the various grounding conductors. Provide additional ground rods if required.
   2. Connect the various feeder green grounding conductors to the ground bus in the enclosure with suitable crimped pressure connectors.
   3. Connect the grounding electrode conductor to the ground bus.
   4. Connect the neutral to the ground bus (main bonding jumper).
   5. Connect metallic conduits, which terminate without mechanical connection to the housing, by grounding bushings and ground wire to the ground bus.

D. Conduit Systems
   1. Ground all metallic conduit systems.
2. All conduit systems shall contain a grounding conductor.

3. Metallic conduit provided for mechanical protection and containing only a grounding conductor shall be bonded to that conductor at the entrance and exit from the conduit.

4. Use grounding bushings for feeder conduits attached through concentric knockouts, regardless of system voltage.

E. Feeders and Branch Circuits

Unless shown otherwise, install green grounding conductors with feeders and branch circuits as follows:

1. Feeders, where designated.

2. Receptacle outlets shall have a green pigtail from device to metallic box.

3. Motors and motor controllers shall have a bonding conductor to conduit system.

4. Fixed equipment and appliances shall have a bonding conductor to conduit system.

5. Items of equipment where the final connection is made with flexible conduit shall have a bonding wire.

6. Additional locations and systems as shown on the drawings.

F. Boxes, Cabinets, Enclosures and Panelboards

1. Bond the grounding wires to each pull box, junction box, outlet box, cabinets, and other enclosures through which the ground wires pass (except for special isolated grounding systems or critical circuits shown on the drawings).

2. Provide lugs in each box and enclosure for ground wire termination.

3. Provide ground bars in panelboards, bolted to the housing, with sufficient lugs for terminating the ground wires.

G. Motors and Starters

1. Provide lugs in motor terminal box and starter housing for ground wire termination.

2. Make ground wire connections to ground bus in motor control center.

H. Receptacles

1. Receptacles shall have a ground wire from green ground terminal to the outlet box ground screw, regardless of type, except for isolated ground devices.
I. Lighting Fixtures
   1. Units shall be grounded through the conduit systems. Fixtures connected with flexible conduit shall have a green ground wire included with the power wires from the fixture through the flexible conduit to a screw in the first outlet box.

J. Electrical Appliances, Pipe and Equipment
   1. Fixed electrical appliances and equipment shall have a ground lug installed for termination of the green ground conductor. Bond the water main with #6 AWG conductor.

3.02 GROUND RESISTANCE
   A. The grounding system shall be provided and tested in the presence of the County and City to insure that the ground resistance does not exceed 5 ohms. One week notice shall be given prior to the scheduled test and the Engineer shall also have the option to witness the testing.
   B. Services at power company interface points shall comply with the power company ground resistance requirements.
   C. Necessary modifications to the ground electrodes including driving of additional electrodes for compliance shall be without additional cost to the County.

3.03 GROUND ROD INSTALLATION
   A. Distance: Drive each rod vertically for not less than ten feet, and bury minimum 30 inches below finished grade.
   B. Multiple Rods: Where required to obtain the specified ground resistance, install multiple rods, but in no case less than three (3) rods minimum.
   C. Where ground connections will be permanently concealed, make the connections by the exothermic process to form solid metal joints. Make accessible ground connections with mechanical pressure type ground connectors.
   D. Where rock prevents the driving of vertical ground rods, install grounding electrodes in horizontal trenches to achieve the specific resistance.

3.04 GUARANTEE
   A. Guarantee unconditionally as set forth in the General Conditions following acceptance by County all work done under this section. During this period, adjust, repair or replace any item of equipment, material or workmanship found to be detective, at no cost to County.

END OF SECTION
SECTION 16461

LOW-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.01 SUMMARY

A. This section supplements all transformer requirements of the Standard Specifications.

B. This Section includes the following types of dry-type transformers rated 600 V and less, with capacities up to 1000 kVA:

1. Distribution transformers.

1.02 SUBMITTALS

A. Product Data: Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, and performance for each type and size of transformer indicated.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.


1.03 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a full member company of the InterNational Electrical Testing Association and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association to supervise on-site testing specified in Part 3.

B. Source Limitations: Obtain each transformer type through one source from a single manufacturer.

C. 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.

D. Comply with IEEE C57.12.91, "Test Code for Dry-Type Distribution and Power Transformers."
1.04 DELIVERY, STORAGE, AND HANDLING

A. Temporary Heating: Apply temporary heat according to manufacturer's written instructions within the enclosure of each ventilated-type unit, throughout periods during which equipment is not energized and when transformer is not in a space that is continuously under normal control of temperature and humidity.

1.05 COORDINATION

A. Coordinate installation of wall-mounting and structure-hanging supports with actual transformer provided.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

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:

2. G. E. Company
3. Square D; Schneider Electric.
4. Sola/Hevi-Duty

2.02 GENERAL TRANSFORMER REQUIREMENTS

A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.

B. Cores: Grain-oriented, non-aging silicon steel.

C. Coils: Continuous windings without splices except for taps.

1. Internal Coil Connections: Brazed or pressure type.
2. Coil Material: Copper.

2.03 DISTRIBUTION TRANSFORMERS

A. Comply with NEMA ST 20 and list and label as complying with UL 1561.

B. Cores: One leg per phase.

C. Enclosure: Ventilated, NEMA 250, Type 2 unless noted otherwise.

1. Core and coil shall be encapsulated within resin compound, sealing out moisture and air.
D. Transformer Enclosure Finish: Comply with NEMA 250.
   1. Finish Color: Gray.

E. Taps for Transformers Smaller than 3 kVA: None.

F. Taps for Transformers 7.5 to 24 kVA: One 5 percent tap above and one 5 percent tap below normal full capacity.

G. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and two 2.5 percent taps below normal full capacity.

H. Insulation Class: 220 deg C, UL-component-recognized insulation system with a maximum of 115 deg C rise above 40 deg C ambient temperature. The 115 deg C rise transformers shall be capable of carrying a 15% continuous overload without exceeding a 150 deg C temperature rise.

I. Energy Efficiency for Transformers Rated 15 kVA and Larger:
   1. Complying with NEMA TP 1, Class 1 efficiency levels.
   2. Tested according to NEMA TP 2.

J. Electrostatic Shielding: Each winding shall have an independent, single, full-width copper electrostatic shield arranged to minimize interwinding capacitance.
   1. Arrange coil leads and terminal strips to minimize capacitive coupling between input and output terminals.
   2. Include special terminal for grounding the shield.
   3. Shield Effectiveness:
      a. Capacitance between Primary and Secondary Windings: Not to exceed 33 picofarads over a frequency range of 20 Hz to 1 MHz.
      b. Common-Mode Noise Attenuation: Minimum of minus 120 dBA at 0.5 to 1.5 kHz; minimum of minus 65 dBA at 1.5 to 100 kHz.
      c. Normal-Mode Noise Attenuation: Minimum of minus 52 dBA at 1.5 to 10 kHz.

K. Wall Brackets: Manufacturer's standard brackets.

L. Fungus Proofing: Permanent fungicidal treatment for coil and core.

M. Low-Sound-Level Requirements: Minimum of 3 dBA less than NEMA ST 20 standard sound levels when factory tested according to IEEE C57.12.91.
2.04 IDENTIFICATION DEVICES
   A. Nameplates: Engraved, laminated-plastic or metal nameplate for each transformer, mounted with corrosion-resistant screws.

2.05 SOURCE QUALITY CONTROL
   A. Test and inspect transformers according to IEEE C57.12.91.
   B. Factory Sound-Level Tests: Conduct sound-level tests on equipment for this Project.

PART 3 - EXECUTION

3.01 EXAMINATION
   A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for each transformer.
   B. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's written instructions.
   C. Examine walls, floors, roofs, and concrete bases for suitable mounting conditions where transformers will be installed.
   D. Verify that ground connections are in place and requirements in Division 16 Section "Grounding" have been met. Maximum ground resistance shall be 5 ohms at location of transformer.
   E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION
   A. Install wall-mounting transformers level and plumb with wall brackets fabricated by transformer manufacturer.

3.03 CONNECTIONS
   A. Ground equipment according to Division 16 Section "Grounding."

3.04 FIELD QUALITY CONTROL
   A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.
   B. Tests and Inspections:
      1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
   C. Remove and replace units that do not pass tests or inspections and retest as specified above.
D. Infrared Scanning: See Specification 16400, Section 1.03.A for Infrared Scanning requirements.

E. Test Labeling: On completion of satisfactory testing of each unit, attach a dated and signed "Satisfactory Test" label to tested component.

3.05 ADJUSTING

A. Record transformer secondary voltage at each unit for at least 48 hours of typical occupancy period. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 10 percent and not being lower than nameplate voltage minus 3 percent at maximum load conditions. Submit recording and tap settings as test results.

B. Output Settings Report: Prepare a written report recording output voltages and tap settings.

3.06 CLEANING

A. Vacuum dirt and debris; do not use compressed air to assist in cleaning.

END OF SECTION
SECTION 16500

LIGHTING

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Work includes furnishing, storing, installing and connecting all fixtures, complete for continuous satisfactory operation. Included is furnishing lamps, mounting brackets, stems, escutcheons, frames, and trim required to match surrounding surface.

1.02 STRUCTURAL ANALYSIS CRITERIA FOR POLE SELECTION

A. Dead Load: Weight of luminaire and its horizontal and vertical supports ans supporting structure, applied as stated in AASHTO LTS-6-M.

B. Live Load: Single Load of 500lbf, distributed according to AASHTO LTS-6-M.

C. Ice Load: Load of 3lbf/sq. ft., applied according to AASHTO LTS-6-M for applicable areas on the Ice Load Map.

D. Wind Load: Pressure of wind on pole and luminaire, calculated and applied according to AASHTO LTS-6-M

1. Basic Wind speed for calculating wind load for poles 50 feet or less is 100 mph.
   a. Wind Importance Factor: 1.0
   b. Minimum Design Life: 25 years
   c. Velocity Conversion Factors: 1.0

1.03 SUBMITTALS

A. Refer to Section 16010, GENERAL PROVISIONS, in particular regarding submission on alternate products and form of submittals.

B. Contractor shall verify ceiling types and coordinate trim and mounting hardware prior to submission of fixtures and shall have final responsibility to insure proper compatibility of fixture type with ceiling system.

C. Manufacturer’s model and catalog numbers change frequently and may not necessarily include all features or options as specified herein or required for complete installation. In particular, catalog number may only indicate type and series of required fixture. When specified types, finishes, features, option or accessories conflict with given model number, former shall govern.

D. Submit cuts of all fixtures furnished, samples when requested, lamped for display. Submittals will not be checked for proper or complete catalog numbers.
E. Under base bid furnish fixtures and equipment specified or named equals (Note: named equals shall not be considered the specified equipment). Where no named equal is given and only “or approved equal” is noted, Contractor may at his option use alternates of his selection, however, such alternate MUST conform to the specified fixture’s or item’s construction performance and catalog features and shall have a similar aesthetic appearance. Failure to conform will result in rejection of item.

F. When an equal is submitted, it shall be equivalent in quality, construction, performance, features and aesthetic impact. Submit complete photometric data along with color photograph cuts. Alternate fixtures will not be evaluated unless complete photometric data including ITL or ETL Test Report, Isolux diagrams, and point-by-point comparison calculations are submitted. One submittal shall be composed of original catalog sheets complete with photometric data, remaining others may be photocopies of the original.

G. Submittals shall be in a covered brochure form and include a cover page indicating specified type, manufacturer’s catalog numbers, and fixture description. Where multiple types are indicated on sheets, the proposed item shall be clearly identified.

H. Substitute fixtures when named alternates are specified will not be considered unless they are named on an addendum as an equal that is issued 7 days prior to the bid date.

I. Final choice and review of finishes and colors shall be made by Engineer at time of submission at no change in contract price.

J. Submittals shall include anchor bolts for poles. Shop drawings for light pole and fixture shall also be provided for the following:

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

2. Anchor bolt templates eyed to specific poles and certified by manufacturer.

3. Foundation construction details, including material descriptions, dimensions, anchor bolts, support devices, and calculations, signed and sealed by a professional engineer licensed in the state of installation.

PART 2 - PRODUCTS

2.01 GENERAL EQUIPMENT

A. Fluorescent ballasts: Ballasts shall be General Electric, Advance, Universal, or approved equal.

B. Fluorescent lamps: by General Electric, Phillips, Sylvania, or equal.

C. Incandescent lamps, except where otherwise specified: 120 volt, inside frosted.

D. LED Lamps:
1. Color Temperature: 4000 K
2. Rated Lamp Life: 50,000 hours minimum.

E. H.I.D. lamp ballasts: Constant wattage, high power factor, voltage as noted.

F. Lighting fixtures shall bear label of Underwriters’ Laboratories, Inc. and shall be suitable for intended location. Fixtures shall be labeled indicating suitability for damp or wet locations where required.

G. Each fixture shall be supplied with necessary straps, supports or hangers, or other miscellaneous materials and devices to install them in a satisfactory manner to conform to architectural treatment and finishes in area in which they are to be installed. Consult all Mechanical, Architectural, and Structural plans and related contract documents to be familiar with all necessary details for proper fixture placement. Failure to do so will not relieve Contractor of responsibility of furnishing all necessary material, complete to perform function intended for indicated lighting system.

2.02 LIGHTING FIXTURES

A. All fixtures furnished shall be standard manufacturer’s cataloged and stocked fixtures. Specially fabricated fixtures, unless so specified, will not be accepted. Replacement parts and lenses shall be readily available from manufacturer. Fixture voltages shall be as shown to be connected on drawings.

B. Lighting fixture schedule: (Refer to drawings).

2.03 POLES AND SUPPORT COMPONENTS

A. Structural Characteristics: Comply with AASHTO LTS-4-M
   1. Wind-Load Strength of Poles: Adequate at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of speed indicated.
   2. Strength Analysis: For each pole, multiply the actual equivalent projected area of luminaires and brackets by a factor of 1.1 to obtain the equivalent projected area to be used in pole selection strength analysis.

B. Luminaire Attachment Provisions: Comply with luminaire manufacturers’ mounting requirements. Use stainless-steel fasteners and mounting bolts unless otherwise indicated.

C. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.
   1. Materials: Shall not cause galvanic action at contact points
   3. Anchor-Bolt Template: Steel.
D. Handhole: Oval-shaped, with minimum clear opening of 2-1/2 by 5 inches, with cover secured by stainless-steel captive screws.

E. Concrete Pole Foundations: Cast in place, with anchor bolts to match pole-base flange.

2.04 ALUMINUM POLES

A. Poles: Seamless, extruded structural tube complying with ASTM B 221, Alloy 6061-T6, with access handhole in pole wall.
   1. Shape: Round, tapered.
   2. Mounting Provisions: Butt flange for bolted mounting on foundation or breakaway support.

B. Brackets for Luminaires: Detachable, cantilever, without underbrace.
   1. Adaptor fitting welded to pole, allowing the bracket to be bolted to the pole-mounted adapter, then bolted together with stainless-steel bolts.
   2. Cross Section: Tapered oval, with straight tubular end section to accommodate luminaire. Match pole material and finish.

C. Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to pole top.

D. Grounding and Bonding Lugs: Bolted 1/2-inch threaded lug, complying with requirements in Section 16450 "Grounding," listed for attaching grounding and bonding conductors of type and size listed in that Section, and accessible through handhole.

E. Fasteners: Stainless steel, size and type as determined by manufacturer. Corrosion-resistant items compatible with support components.
   1. Materials: Compatible with poles and standards as well as to substrates to which poles and standards are fastened and shall not cause galvanic action at contact points.

F. Powder-Coat Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" recommendations for applying and designating finishes.
   1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1 to remove dirt, oil, grease, and other contaminants that could impair powder coat bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, according to SSPC-SP 5/NACE No. 1 or SSPC-SP 8.
2. Powder coat shall comply with AAMA 2604.
   a. Electrostatic applied powder coating; single application with a minimum 2.5- to 3.5-mils dry film thickness; cured according to manufacturer's instructions. Coat interior and exterior of pole for equal corrosion protection.
   b. Color: As indicated on drawings.

PART 3 - EXECUTION

3.01 FIXTURE INSTALLATION

A. Support fluorescent fixtures from structure above, provide rigid hangers or framing to support units.

B. Coordinate fixture locations with ceiling framing and equipment locations. Align all continuous row fixtures in uniform rows. Furnish metal channels to achieve alignment, if required. All fixtures shall be supported securely with approved hangers. Such hangers shall be set in perfect alignment and elevation.

C. Outlet mounted fixtures shall be mounted directly to mounting ears of outlet box or to fixture studs as required by selected fixture. Furnish structural supports for heavy fixtures.

D. All splices shall be carefully placed in outlet boxes or wiring gutters with no crowding in a neat and orderly manner.

E. Upon completion of above work and prior to final acceptance of building, each fixture shall be equipped with proper number of new lamps of specified size, all in good operating condition. Replace any lamp or ballast which appears to be defective or noisy or of the wrong color, in opinion of Engineer. Fixtures shall be clean at time of acceptance.

3.02 LIGHT POLE INSTALLATION

A. Alignment: Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on poles.

B. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer.

C. Foundation-Mounted Poles: Mount pole with leveling nuts. Tighten top nuts to torque level recommended by pole manufacturer.
   1. Grout void between pole base and foundation. Use nonshrink or expanding concrete grout firmly packed to fill space.
   2. Install base covers unless otherwise indicated.
3. Use a short piece of ½-inch diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.

3.03 GUARANTEE

A. Unless otherwise specified, guarantee unconditionally for guarantee period as set forth in General Conditions, all material, equipment, workmanship and installation. During this period, adjust, repair or replace at no cost to the County any item of equipment or workmanship found to be defective.

B. Fluorescent and HID lamps shall be guaranteed for 2 years and incandescent lamps for 6 months after final acceptance.

END OF SECTION
PART 1 - GENERAL

1.01 DESCRIPTION

A. This section includes requirements for providing standby power generator systems in accordance with the Contract Documents.

B. All work and tests shall be done in accordance with NFPA, NEMA ad IEEE Standards.

C. Completely coordinate with work of other trades.

1.02 QUALITY ASSURANCE

A. The standby generator system, including engine-generator set, generator and generator controls, shall be furnished by a single manufacturer who has been regularly engaged in the production of engine-generator sets, generators, engine auxiliaries, and controls for a minimum of ten years. The manufacturer shall have a local representative who can provide factory-trained servicemen, required stock of replacement parts, and technical assistance.

B. The generator set and controls shall provide a completely automatic unattended operation for the duration of a loss of normal utility power. All controls shall be the standard of the manufacturer.

C. The generator set manufacturer shall assume full responsibility for correct operation of the entire standby power generator system, including the fuel distribution system.

D. Design Prototype Tests

1. Components of the standby power generator system such as the engine-generator set, transfer switch and accessories shall not be subjected to prototype tests since these tests are potentially damaging. Similar design prototypes and preproduction models, which are not to be sold, shall be used for the prototype tests.

2. The results of the prototype tests shall show that the generator set meets or exceeds the data stated in the manufacturer’s printed literature. These tests shall include the requirements of NFPA 110 and the following:

   a. Maximum power (kW).

   b. Maximum motor starting (kVA) instantaneous voltage dip.

   c. Alternator temperature rise by embedded thermocouple and by resistance method per NEMA MG1.22.40 and 16.40.

   d. Governor speed regulation under steady state and transient conditions.
e. Voltage regulation and generator transient response.

f. Fuel consumption at ¼, ½, ¾, and full load.

g. Harmonic analysis, voltage waveform deviation, and telephone influence factor.

h. Three-phase short circuit tests.

i. Alternator cooling air flow.

j. Torsional analysis testing to verify that the generator set is free of harmful torsional stresses.

k. Endurance testing.

E. Final Production Tests

1. Each generator set shall be tested under varying loads with guards and exhaust system in place prior to shipment of the standby power generator system.

2. Final production tests shall include the following:
   b. Transient and steady state governing.
   c. Safety shutdown device testing.
   d. Voltage regulation.
   e. Rated Power.
   f. Maximum Power.

3. The Engineer shall be notified 30 days in advance of the final production tests, and shall have the option of witnessing these tests.

4. The specified generators are to be utilized to start and run large motors. Demonstrate to the County that the generators provided can support the motor in rush and running currents, and provide a fuel consumption chart.

F. Guarantee

1. The standby power generator system shall be guaranteed in writing for defects in materials and workmanship for a period of five years from the date of final acceptance. Multiple warranties for individual components such as engine, alternator and controls, will not be acceptable. The warranty shall be comprehensive, and shall include all parts, labor, travel and other miscellaneous expenses.
G. Service Contract

1. In addition to the stipulated guarantee, the generator manufacturer or his approved agent shall provide a comprehensive service contract for a period of five years from the date of final acceptance. The service contract shall cover all necessary parts, labor, travel, and other services required to keep the generator in complete working order at all times. The only items excluded from the service contract shall be fuel and regular oil changes and lubrication.

1.03 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: Equal to 3 of each size and type.

2. Filters: Equal to 1 of each type.

3. Lamps: Equal to 3 of each type.

1.04 SUBMITTALS

A. Submit the following in accordance with the General Conditions including the following:

1. Shop drawings showing fabrication, assembly, foundation and installation.

2. Catalog data and detailed specification sheets for all standard and optional accessories to be supplied.

3. Wiring diagrams and electrical schematics indicating operation, controls and power supply.

4. Clear description and images showing how batteries are accessed for maintenance.

5. Operation and Maintenance Manual for standby power generator system.

6. Certified copies of manufacturer’s final production test results.

7. Certificate from the fuel tank manufacturer that tank has been pressure tested to 3 psi.

8. Equipment Warranty and Certification Form

a. In addition to submitting working drawings for the standby power generator systems, the Contractor shall obtain and submit to the Engineer certification from the generator manufacturer that the generator systems meet the requirements of the contract specifications. This certification shall be provided by way of the Equipment Warranty And Certification Form included in Section 01780.
PART 2 – MATERIALS

2.01 GENERAL

A. Equipment specified for the standby power generator system is as manufactured by Kohler or equal. Generator set shall have a rating as indicated herein and/or on the drawings. Equivalent equipment as manufactured by Onan-Cummins or Caterpillar is acceptable subject to approval. However, the Contractor shall be responsible for changes in the work made necessary from the installation of equipment other than Kohler without additional cost to the Owner.

2.02 ENGINE-GENERATOR SET

A. The engine-generator set shall be mounted on a sub-base fuel tank. In order to maintain proper alignment between components, the fuel tank base shall incorporate vibration isolators of the type and quality recommended by the manufacturer to obtain a minimum of 95 percent vibration attenuation.

B. Engine shall be liquid-cooled for use with diesel fuel. Fuel shall be Grade DF-2.

C. The engine shall be furnished with the following accessories:

1. Replaceable full-flow oil filters and oil drain valve with hose extension. Provide one spare of each filter.

2. Replaceable dry element air cleaner. Provide one spare of each filter.

3. Replaceable fuel filters. Provide one spare of each filter.

4. Electric starting systems, including starting motor, batteries, battery charger, cables and battery rack. Provide float/equalize battery charger. Batteries shall be provided with cold cranking amp capacity 25-percent higher than the manufacturer’s standard for the unit provided.

5. Batteries shall be lead-acid or nickel-cadmium type and battery charger shall include temperature compensation feature with voltmeter and ammeter to indicate battery charging voltage and current.

6. Safety devices to prevent the engine against high and low coolant temperature, low lubricating oil pressure, overspeeding or overcranking.

7. Engine-mounted, thermostatically controlled jacket water heater rated as required. The heater shall be disconnected by an oil pressure switch mounted on the engine when the engine starts.

8. Unit mounted radiator with engine driven fan.

9. Instrument panel with lubricating oil pressure gauge, water temperature gauge, and battery charging ammeter.
10. Hospital type (critical) exhaust silencer, sized as directed by the generator set manufacturer. Provide thermal insulation jacket. All silencers and the straight pipe section from the silencer to the wall thimble shall be wrapped with high temperature-flexible insulation which conforms to Military Specification MIL-I-16411-E, Type II. Insulation shall be Type E Fiberglass Insulation designed for use in insulating high temperature equipment as manufactured by Advanced Thermal Products, Inc. or equal. Insulation shall be flexible, lightweight and shall not compact under vibration. Insulation shall be manufactured from chopped glass fibers and shall be free from resinous binders. Insulation shall be installed in accordance with the manufacturer’s recommendations.

11. All necessary piping, stainless steel flexible exhaust tubing, fittings, mounting hardware, flapper type exhaust cap, and other equipment necessary to complete the exhaust system shall be provided. Exhaust pipe opening through generator enclosure or building shall be made weatherproof, and vermin-proof. Provide manufacturer approved wall thimble.

12. The generator set supplier shall furnish lubricating oil to fill the crankcase and 50 percent ethylene glycol antifreeze solution to fill the engine cooling system.


14. Unit mounted main circuit breakers, one for building load and one for load bank.

15. Provide Kohler 150kW Diesel Generator, or approved equal.

2.03 GENERATOR

A. The alternator shall be salient-pole, brushless, 12-lead reconnectable, of 2/3 pitch to eliminate the third harmonic, self-ventilated of drip-proof construction with amortisseur rotor windings and skewed for smooth voltage waveform. The insulation shall meet the NEMA standard (MGI-22.40 and 16.40) for Class H and be vacuum, impregnated with epoxy varnish to be fungus resistant per MIL 1-24092. Temperature rise of rotor and stator shall be limited to NEMA Class F. The excitation system shall be brushless construction controlled by a solid-state voltage regulator located in the switchgear.

B. Frequency regulation shall be isochronous from no load to rated load. The voltage regulator shall be solid-state design and shall provide no load to full load regulation within plus or minus one percent of rated voltage during steady-state conditions.

C. All performance criteria shall be equal to the specified equipment. A rheostat shall provide a minimum range of plus or minus 10 percent voltage adjustment from rated value.

D. The alternator, exciter, and voltage regulator shall be designed and manufactured by the generator set manufacturer so that the characteristics are matched to the torque curve of the prime mover. The system shall provide automatic voltage reduction if the load demand exceeds the engine capacity to prevent engine stalling and saturation of magnetic components. Systems that routinely select a linear-type (straight Line) constant volts/hertz characteristic without regard for the engine power and torque characteristics are unacceptable.
E. Upon one-step application of any load up to 100 percent of the rated load at 0.8 power factor, the voltage dip shall not exceed 20 percent and shall recover to plus or minus two percent of rated voltage within one second.

F. The generator shall be capable of sustaining at least 250 percent of rated current for at least 10 seconds under a three-phase symmetrical short by inherent design or by the addition of an optional current boost system.

G. A resettable line current sensing circuit breaker with inverse time versus current response shall be furnished. This breaker shall not trip within the 10 seconds specified above to allow selective tripping of downstream fuses or circuit breakers under a fault condition. This breaker shall not automatically reset preventing restoration of voltage if maintenance is being performed. Generator breaker shall selectively coordinate with downstream overcurrent protection devices. Breaker shall be provided with adjustable long-time, short time, and instantaneous settings as required to achieve coordination.

H. The generator, having a single maintenance-free bearing, shall be directly connected to the flywheel housing with a semi-flexible coupling between the rotor and the flywheel.

2.04 CONTROL SYSTEM

A. The standby power generator system shall be provided with a generator-mounted solid-state 16-light microprocessor control and starting panel, incorporating complete controls for all functions of the generator set and associated mechanisms. The panel shall be of the dead front type, NEMA 1 construction and shall be mounted and wired to the generator set by the engine generator set manufacturer. Control wiring shall have termination identification on each wire as specified in Section 16100 of these Special Provisions.

B. Engine-generator controls shall include the following:

1. Two-wire, 24-volt DC engine controls including oil pressure gauge, coolant temperature gauge, and charge rate ammeter.

2. A manual selector switch providing three control positions, RUN-STOP-REMOTE, shall be included on the console. The RUN position shall permit the engine to be started locally at the selector switch and run unloaded; the STOP position shall serve as the RESET for alarm shutdown conditions; and the REMOTE position shall allow automatic starting on a signal from the transfer switch specified in Section 16710 of these Special Provisions.

3. Control console containing complete controls, which start the engine on closing contact, and stop the engine on opening contact. The starting controls shall be operated either manually or from a contact provided on the automatic transfer switch. When the engine fires, the starting controls shall be disconnected automatically. If the engine fails to fire or any safety device should operate while the engine is running, the engine shall stop immediately, and the starting controls locked out until manually reset.
4. Generator controller shall provide overload and short circuit protection required for the generator set.

5. Solid-state voltage regulator.


7. Panel light and switch.

8. AC output controls including:
   a. Voltmeter
   b. Ammeter
   c. Voltmeter – Ammeter phase selector switch with “OFF” position
   d. Frequency Meter
   e. Running Time Meter
   f. Voltage Adjusting Rheostat
   g. Speed Control Potentiometer

9. The required inputs and outputs to and from the generator, automatic transfer switch and pump control panel for control, monitoring and alarm as shown on the drawings. These shall include, as a minimum,
   a. Utility service failure alarm
   b. Generator start control
   c. Generator running status
   d. Generator failure alarm (including Overcrank alarm)
   e. Station on generator power status
   f. Generator not in auto status
   g. Low Fuel Level alarm
   h. Fuel Leak alarm
   i. Low oil alarm
   j. High coolant temperature alarm

All signals to the Pump Control Panel shall be wired to terminal blocks inside the generator enclosure for customer connections.
2.05 FUEL OIL STORAGE

A. Comply with NFPA 30, NFPA 37 and NFPA 110.

B. Base-Mounted Fuel Oil Tank: Factory installed and piped, complying with UL 142 fuel oil tank.

C. Features include the following:
   1. Capacity: 24 hours.
   2. Vandal-resistant fill cap.
   3. Dual wall.
   4. Fuel level gauge.
   5. Alarms and shutoff for low fuel level.
   6. Fill and vent facility with cap.
   7. Linear vibration isolators between base and engine-generator.
   8. Tank design provides capacity for thermal expansion of fuel.
   9. Fuel supply dip tube is positioned so as not to pick up fuel sediment.
   10. Fuel return and supply dip tube is separated by an internal baffle to prevent immediate re-supply of heated return fuel.
   12. Heavy 7 gauge steel construction.
   13. Both tanks are leak tested at 3 psi.
   15. Basin drain.
   16. The capacity of the outer tank is a minimum of 10% larger (110% of inner tank) to contain the fuel of the inner tank leaks or ruptures.
   17. Both tanks are separately vented.
   18. Mechanical direct read fuel gauge.
   19. Fuel fill-4” opening lockable flip top.
   20. Leak detection switch.
2.06 LOAD BANK

A. Permanent, unit mounted, 100kW resistive unit capable of providing a balanced three-phase, delta connected load to engine generator. Unit shall be capable of selective control of load in 10kW steps.

B. Resistive Load Elements: Corrosion-resistant chromium alloy with ceramic and stainless-steel supports. Elements shall be double insulated and designed for repetitive on-off cycling. Elements shall be mounted in removable aluminized-steel heater cases. Galvanized steel is prohibited. Element's maximum resistance shall be between 100 and 105 percent of rated resistance.

C. Load-Bank Heat Dissipation: Integral fan with totally enclosed motor shall provide uniform cooling airflow through load elements. Airflow and coil operating current shall be such that, at maximum load, with ambient temperature at the upper end of specified range, load-bank elements operate at not more than 50 percent of maximum continuous temperature rating of resistance elements.

D. Load-Element Switching: Remote-controlled contactors switch groups of load elements. Contactor coils are rated 120 V. Contactors shall be located in a separate NEMA 250, Type 3R enclosure within load-bank enclosure, accessible from exterior through hinged doors with tumbler locks.

E. Contactor Enclosures: Heated by thermostatically controlled strip heaters to prevent condensation.

F. Load-Bank Enclosures: NEMA 250, Type 3R, aluminized steel complying with NEMA ICS 6. Louvers at cooling-air intake and discharge openings shall prevent entry of rain and snow. Openings for airflow shall be screened with 1/2-inch-square, galvanized-steel mesh.

G. Protective Devices: Power input circuits to load banks shall be fused, and fuses shall be selected to coordinate with generator circuit breaker. Fuse blocks shall be located in contactor enclosure. Cooling airflow and overtemperature sensors shall automatically shut down and lock out load bank until manually reset. Safety interlocks on access panels and doors shall disconnect load power, control, and heater circuits. Fan motor shall be separately protected by overload and short-circuit devices. Short-circuit devices shall be noninterchangeable fuses with 200,000-A interrupting capacity.

H. Control Sequence: Control panel may be preset for adjustable single-step loading of generator during automatic exercising.

2.07 OUTDOOR WEATHER-PROTECTIVE SOUND ATTENUATING HOUSING

A. Description: The generator set shall be provided with a sound-attenuated housing which allows the generator set to operate at full rated load in the ambient conditions. The enclosure shall reduce the sound level of the generator set while operating at full rated load to a maximum of 75 dBA at any location 7 meters (23 feet) from the generator set in a free field environment. Housing configuration and materials used may be of any suitable design which meets application needs, except that acoustical materials used shall be oil and water resistant. No foam materials shall be used unless they can be demonstrated to have the same durability and life as fiberglass.
B. The enclosure shall include hinged doors for access to both sides of the engine and alternator, and the control equipment. Key-locking and pad-lockable door and latches shall be provided for all doors. Door hinges shall be stainless steel.

C. The enclosure shall be provided with an exhaust silencer which is mounted inside of the enclosure, and allows the generator set package to meet specified sound level requirements. Silencer and exhaust shall include a rain cap and rain shield.

D. All sheet metal shall be primed for corrosion protection and finish painted with the manufacturer’s standard color. All surfaces of all metal parts shall be primed and painted.

E. Painting of hoses, clamps, wiring harnesses, and other non-metallic service parts shall not be acceptable. Fasteners used shall be corrosion resistant, and designed to minimize marring of the painted surface when removed for normal installation or service work.

F. Engine Cooling Airflow through Enclosure: Maintain temperature rise of system components within required limits when unit operates at 110 percent of rated load for 2 hours with ambient temperature at top of range specified in system service conditions.

G. Louvers: Fixed-engine, cooling-air inlet and discharge. Storm-proof and drainable louvers prevent entry of rain and snow.

H. Automatic Dampers: At engine cooling-air inlet and discharge. Dampers shall be closed to reduce enclosure heat loss in cold weather when unit is not operating.

I. Interior Lights with Switch: Factory-wired, vapor proof-type fixtures within housing; arranged to illuminate controls and accessible interior. Arrange for external electrical connection.

J. Convenience Outlets: Factory wired, GFCI. Arrange for external electrical connection.

PART 3 – EXECUTION

3.01 INSTALLATION

A. The generator set shall be mounted in perfect alignment on a sub-base fuel tank and securely anchored to the concrete pad. The standby power generator system shall be installed as indicated in the Contract Drawings and in accordance with the Manufacturer’s recommendations. Where an enclosure is specified under another division of the specifications to be provided to house the generator and controls, the generator manufacturer shall be responsible for coordinating the compatibility of the enclosure with the generator system for size and function.

B. The generator concrete pad shall be as shown on the drawings with a minimum 6-inch clearance all around. Where access platforms and stairs are necessary, the Contractor shall provide properly sized concrete pad as well as turn downs for the platforms and stairs.

C. After completion of testing, the Contractor shall provide one full tank of diesel fuel.

3.02 FIELD QUALITY CONTROL

A. Verify that fuel piping, electrical connection, and exhaust piping work is complete.
B. Demonstrate operation with selector switch in hand-off-automatic positions.

C. Demonstrate performance of engine water jacket heater by filling the engine cooling system with coolant at room temperature. Energize the water jacket heater, determine the load current to the heaters and verify that water is rising in temperature using hand sensation as a detector.

D. Automatic Transfer Switch

1. Verify that the transfer switch transfers to engine-generator source when normal supply voltage is less than 90 percent of rated voltage and retransfers when normal supply is 100 percent of rated voltage. Use suitable test instruments to verify voltages.

2. Verify that failure of engine generator power source causes transfer to normal power supply by operating generator load circuit breaker.

3. Check sensor operation to prevent transfer to emergency power until the generator output reaches 100 percent of voltage and frequency. Use suitable test instruments to verify voltages.

E. Control Panel

1. Electrically check automatic engine shutdown controls as the engine proceeds through its start-up sequence as follows:

   a. Engine Overcrank

      Disconnect one wire from the fuel supply solenoid valve and turn the manual selector switch to the run position causing the engine to attempt to start for the period and number of cycles defined for overcrank alarm contacts to close. Verify overcrank alarm actuation and lockout. Reconnect the wire to the fuel supply solenoid valve and start the engine by turning the manual selector switch to the run position.

   b. Low Oil Pressure

      Electrically short out the low oil pressure switch contacts to verify engine shutdown.

   c. High Coolant Temperature

      Electrically short out the high coolant water temperature thermostat contacts to verify engine shutdown.

   d. High Lubrication Oil Temperature

      Electrically short out the high coolant water temperature thermostat contacts to verify engine shutdown.
e. Engine Overspeed
Manually adjust speed into overspeed range to verify engine shutdown.

F. Generator Remote Alarms: Provide the following alarm signals to the Pump Control Panel.

1. Control switch not in auto position.
2. Low oil pressure.
3. Low fuel level.
4. Engine high-temperature.
5. Generator overload.

G. Engine Generator Operation

1. With normal electrical power supply to transfer switch, open main circuit breaker to verify that initiating contactor closes to start automatic start sequence. Engine should start and control panel instruments should show voltage and frequency reach approximately rated value.

2. Close normal power main circuit breaker. Verify that the automatic transfer switch transfers load back to normal power, initiating contactor opens, beginning the automatic stop sequence. Verify that the generator set stops automatically if the engine has a failure.

3. Start and stop engine generator at least six times within a two-hour time period to verify operation.

4. Demonstrate that all safety devices furnished for automatic engine shutdown will cause engine shutdown when actuated.

H. Conduct a 4 hour load bank test on the generator and submit a field report indicating the test results.

I. Coordinate, connect and test all require inputs and outputs between the generator system, automatic transfer switch and pump control system.

J. Contractor shall demonstrate generator sound levels are within the specified requirements. Contractor shall provide calibrated sound meter and demonstrate sound levels during load bank testing.

K. An authorized representative of the manufacturer shall attend startup activities to assist the Contractor with installation, testing and certifying the system. The representative shall also conduct training as listed in Specification 01735. Start-up/testing activities and training activities shall be conducted on different days.

END OF SECTION
SECTION 16710

AUTOMATIC TRANSFER SWITCH WITH SOLID-STATE LOGIC

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Provide solid state logic, delayed transition automatic transfer switches. Acceptable manufacturers are Zenith, Onan or Russel Electric. The switch shall be stand alone or MCC mounted as shown on the drawings, and shall switch between two normal sources or between a normal and emergency source as shown.

1.02 SUBMITTALS

A. Submittal shall include specification sheets showing all standard and optional accessories to be supplied; schematic wiring diagrams; dimension drawings; and interconnection diagrams identifying by terminal number each required interconnection between the generator set (where applicable and the transfer switch.

1.03 SWITCH OPERATION

A. Provide a three-pole switch with a neutral conductor terminal lug.

B. The automatic transfer switch three-phase control panel shall utilize solid-state sensing for automatic, positive operation. The following shall be provided:

1. The normal/preferred source voltage across live lines shall be monitored line-to-line. Close differential voltage sensing shall be provided. The pickup voltage shall be adjustable from 75% to 100% of nominal, and the dropout voltage shall be adjustable from 70% to 98% of the pickup value. The transfer to emergency/secondary will be initiated upon reduction of normal/preferred source to 90% of nominal voltage, and retransfer to normal/preferred shall occur when source restores to 100% of nominal.

2. A test switch to momentarily simulate normal/preferred source failure.

3. Harnessing between transfer switch and control panel shall have built-in disconnect for routine maintenance.

4. All moveable parts of the operating mechanism shall remain in positive mechanical contact with the main contacts during the transfer operation without the use of separate mechanical interlocks. Automatic operation of the switch shall not require power from any source other than the line-to-line voltage of the source to which the switch is transferring.

5. An auto inhibit switch to allow for manual transfer of the switch.
1.04 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Cable Connector Lug: Equal to 1 of each type.
2. Solenoid: Equal to 1 of each type
3. Handle-Manual: Equal to 1 of each type
4. Handle Grip: Equal to 1 of each type
5. Auxiliary Contacts: Equal to 3 of each type
6. Coil Cutout Switch: Equal to 1 of each type
7. SCR: Equal to 1 of each type

PART 2 - PRODUCTS

2.01 EQUIPMENT

A. The automatic transfer switch shall consist of a power transfer module and a control module, interconnected to provide complete automatic operation. The automatic transfer switch shall be mechanically held and electrically operated by a single solenoid mechanism energized from the source to which the load is to be transferred. The switch shall be rated for continuous duty and be inherently double-throw. The switch shall be mechanically interlocked to ensure only one of two possible positions; normal/preferred or emergency/secondary. The automatic transfer switch shall be suitable for use with emergency sources, such as engine or turbine generator source, or another utility source.

B. All main contacts shall be of silver composition. The operating transfer time in either direction shall not exceed one-sixth (1/6) of a second.

C. All contacts, coils, springs, and control elements shall be conveniently removable from the front of the transfer switch without major disassembly or disconnection of power conductors.

D. The control module shall be supplied with a protective cover and be mounted separately from the transfer switch for ease of maintenance. Sensing and control logic shall be solid-state and mounted on plug-in printed circuit boards. Printed circuit boards shall be keyed to prevent incorrect installation. Interfacing relays shall be industrial-control-grade, plug-in type with dust covers and locking clips.

E. Automatic transfer switches utilizing components of molded-case circuit breakers, contactors or parts thereof which have not been intended for continuous duty or repetitive load transfer switching are not acceptable.

F. The automatic transfer switch shall conform to the requirements of NEMA standard ICS 2-447 and Underwriters Laboratories UL-1008 and shall be UL listed as follows:
1. For use in emergency systems in accordance with Articles 517 and 700 of the National Electrical Code.

2. Rated in Amperes for total system transfer including control of motors, electric-discharge lamps, electric-heating and tungsten-filament lamp load.

G. The automatic transfer switch shall be rated to withstand the manufacturer’s standard rating for symmetrical amperes short circuit current based on a coordinated circuit breaker.

H. The automatic transfer switch shall be mounted in a NEMA Type 1 gasketed enclosure, either separately wall mounted or as part of the motor control center as indicated on the plans.

I. The automatic transfer switch shall be open transition.

2.02 ACCESSORIES

A. Switches shall include a time delay on transfer from normal/preferred to emergency/secondary, field adjustable from 6 to 60 seconds.

B. Switches shall include a time delay on retransfer from emergency/secondary to normal/preferred, field adjustable from 1 to 30 minutes. The time delay shall be automatically bypassed if the emergency/secondary source fails and the normal/preferred source is available.

C. The switches shall include voltage and frequency sensing of the emergency/secondary source and shall be factory set to allow transfer to emergency/secondary when that source is at approximate rated voltage and frequency.

D. Contacts, with current and voltage rating as required, which close when the normal source fails shall be provided to initiate engine starting (where applicable). Provide signals to the generator as shown on the drawings.

E. Switches shall include a time delay to ignore momentary outages. It shall delay closing of the engine start contacts for an adjustable time from 0.5 to 6 seconds.

F. Switches shall include a time delay for engine cool down (where applicable), adjustable from 0 to 15 minutes.

G. One auxiliary contact closed when the switch is in the normal/preferred position and one closed when the switch is in the emergency/secondary position shall be provided. Contacts shall have current and voltage rating as required. Provide signals to the pump control panel as shown on the drawings.

H. Two pilot lights to indicate switch in normal/preferred or emergency/secondary position shall be installed in the door of the enclosure. Pilot lights shall be in accordance with Specification 17100.
I. Two contacts shall be provided which close when the generator runs and open when the generator stops (where applicable). Contacts shall have current and voltage rating as required. Provide signals to the pump control panel as shown on the drawings.

J. A plant exerciser that is (7 day, time adjustable more than 30 minutes) field adjustable for exercising the generator on 30 minute increments shall be provided. Provide a selector switch for load/no load operation.

K. Outputs shall be provided to the generator for control and to the pump control panel for monitoring and alarm as indicated on the drawings.

L. Switches shall be provided with auxiliary contacts to indicate normal utility power failure.

PART 3 - EXECUTION

3.01 TESTS

A. Certified laboratory test data on a switch of the same design and rating shall be provided to confirm the following switching abilities:

1. Overload and endurance per Tables 21.2 and 23.2 of UL-1008 when enclosed according to Paragraph 1.6.

2. Temperature rise tests after the overload and endurance tests to confirm the ability of the transfer switches to carry their rated current within the allowable temperature limits of the insulation in contact with current-carrying parts.


4. No welding of contacts. Transfer switch must be operable to alternate source after they withstand current tests.

5. Test all remote monitoring and alarm signals to and from all sources and the pump control panel.

B. All production units should be subjected to the following factory tests:

1. The complete automatic transfer switch shall be tested to ensure proper operation of the individual components and correct overall sequence of operation and to ensure that the operating transfer time, voltage, frequency, and time delay settings are in compliance with the specification requirements.

2. The complete automatic transfer switch shall be subjected to a dielectric strength test per NEMA Standard ICS 1-109.05.

C. The control panel shall meet or exceed the voltage surge withstand capability in accordance with IEEE Standard 472-1974 (ANSI C37.90a-1974) and the impulse withstand voltage test in accordance with the proposed NEMA Standard ICS 1-109.
D. An authorized representative of the switch manufacturer and County and City shall attend startup activities to assist the Contractor with installation, testing and certifying the system. Refer to Specification 01735 for training requirements. Start-up/testing activities and training activities shall be conducted on different days.

3.02 CERTIFICATION

A. The manufacturer shall provide a letter certifying compliance with all requirements of the transfer switch specifications. The certification shall identify equipment by serial number and shall include no exceptions to the specifications, except those stipulated with the submittal.

3.03 GUARANTEE

A. Each transfer switch shall be provided with an operator’s manual providing installation and operating instructions.

B. Each automatic transfer switch shall be warranted as defined in the General Conditions.

END OF SECTION
SECTION 16930
INSTRUMENTATION AND COMMUNICATION WIRING

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The work of this section shall consist of all electrical wiring to complete the Instrumentation Systems specified elsewhere in the specifications, herein and/or shown on the drawings. Work covered by this section shall include, but not be limited to, providing the following:

1. Conduit raceways for signal cables
2. Conduit raceways for AC power circuits
3. Signal cables and coaxial cables
4. Branch circuit (power) cables
5. Terminal cabinets, junction and pull boxes
6. Equipment connections
7. Category 5e cable (Ethernet & Telephone)

B. Contractor shall provide raceway systems, cables, and/or conductors from transmitters and/or sensing devices, etc. to instrumentation panels, terminal panels, etc. as shown on the drawings and specified in instrumentation and control divisions in the specifications and/or required by the equipment manufacturer.

1.02 SUBMITTALS

A. Shop drawings shall be submitted for the following:

1. Terminal cabinets
2. Power cables
3. Signal cables
4. Junction and pull boxes
5. Category 5 cable

1.03 COORDINATION

A. Coordinate the work as specified herein with work to be performed and equipment furnished under other divisions of the Specifications to insure a complete and satisfactory control and instrumentation installation.
1.04 WIRE AND DEVICE IDENTIFICATION

A. Each wire shall be labeled and numbered around the wires at each termination of the wires at relays, terminal boards and other devices.

B. Wire labels shall use a legible permanent coded wire-marking sleeve. Sleeves shall be white PVC tubing with machine printed black marking.

C. Wire numbers shall correspond to wire numbers on the wiring and loop diagrams.

D. All cabinets and instruments shall be identified by the same letter or number combinations used on the elementary wiring diagrams. Identification shall be by means of white laminated bakelite nameplates with ¼ inch engraved black lettering. The nameplates shall be fastened to the device or to the panel just below the device by stainless steel self-tapping screws.

E. In panels where foreign voltages exist, furnish a highly visible warning label outside the panel with the following words: “WARNING: FOREIGN VOLTAGES EXIST IN THIS PANEL. THEY ARE IDENTIFIED BY YELLOW WIRE COLOR.” Warning label shall be red with white lettering.

PART 2 - PRODUCTS

2.01 GENERAL

A. All wiring shall be stranded copper.

B. All wiring and terminal strips shall be isolated by voltage levels to the greatest extent possible.

C. All wiring shall conform to the following color code:

1. 120 volt, 1 phase: Black, White
2. 24 VDC: Blue
3. 120 VAC control wires: Red
4. Interlock control circuits energized from external source: Yellow
5. Ground wires: Green
6. 120 VAC control wires energized from a source external to the control panel power source shall be yellow.
7. Wiring for intrinsically safe circuits shall be purple.

2.02 TERMINAL CABINETS

A. Refer to Division 16 and Specification section 17200 – Control Panels for specific requirements.
B. Terminals in cabinets, panels, etc. for instrument wiring shall be miniature type with captive clamps to facilitate attachment of minimum size 14 AWG, rated for 600 volts. Terminals shall have continuous marking strips.

2.03 POWER CABLES

A. Power cable shall be sized as shown on the drawings and shall be multi-conductor type TC rated for 600 volts and shall have crosslinked filled polyethylene or ethylene rubber insulation over Class B stranded copper conductor groups covered with overall polyester film type and with an overall thermoplastic jacket. (Coding shall be ICEA, Method 1).

2.04 SIGNAL CABLES

A. Analog (4-20 mA) signal circuit wiring shall be one, twisted shielded pair of 16 AWG instrumentation cable. Each tinned copper conductor, made up of 19 strands of 20 AWG wire shall have color coded insulation. Two insulated conductors shall be twisted together in an overall aluminum-polyester 100% coverage shield. Must allow for 2 to 50 conductors per cable. Cables shall be run continuous without splices from transmitters to receivers and/or terminal cabinets. The shielded conductors, along with a stranded, bare 16 AWG drain wire shall be rated at 600 volts; shall bear the UL-TCER label as a recognized component of UR210. Each individual pair shall be shielded and the entire multi-conductor cable shall also be shielded. Cable shall be the product of Belden Wire and Cable, catalog number 1118A or approved equal.

B. Digital signal cables shall be multi-conductor twisted pairs. Conductor sizes and number of pairs shall be as shown on the drawings and/or as required by the manufacturer of the signal equipment. Must allow for 2 to 50 conductors per cable. Cables shall be run continuous without splices from transmitters to receivers and/or terminal cabinets. Cable shall be multi-conductor THWN UL-TC-ER wiring listed Type Belden 3108A, #14. Cable shall be Continental crossline CVTC, Okonite type SP-PS, or approved equal.

2.05 COMMUNICATIONS CABLES

A. Profibus Cabling shall be 600V UL-TC0-ER IS/OS 2118A cabling with gauge size and pair count as required. Modbus RTU cabling shall be 3 and 4 wired version as necessary to provide a complete and fully functional system.

B. Connections between PCs, Modbus devices, Profibus devices, network switches and control network shall be made using Category 5e Shielded Twisted Pair solid cable with PVC jacket and shielded RJ-45 connectors, unless otherwise specified. Use shielded Twisted Pair stranded cable for those links that may be subjected to repeated flexing.

C. Meet the following requirements:

1. Wiring Type: Category 5e, TIA/EIA 568C
2. Impedance: 100 +/- 15 Ohms
3. Conductor Gauge 24 AWG
4. Cable construction: 4 pair, PVC jacket, solid or stranded conductors.
5. Connectors: RJ45, shielded
6. Frequency: Up to 1 GHz
7. Shield: Copper braid, covering all 4 pairs and connectors. Shield connected to external drain wire.

D. Cat 5E cables shall be Data DataTuff Cat 5e 600V AWM-rated Cable by Belden or approved equal.

E. Factory terminated cables shall be provided, except as listed below. Maximum length is 300-ft, for communication links of greater lengths fiber shall be used with appropriate switches and media converters. Field terminated (bulk) cable is only permissible for the following:

1. Cables terminated on terminals of field instrument or control devices
2. Cables that leave a building

F. Telephone Cables: Provide Category 5E Cable with RJ-45 connectors for telephone applications where specified.

PART 3 - EXECUTION

3.01 GROUNDING

A. Per requirements of Division 16 Specifications.

3.02 INSTALLATION OF WIRE AND CABLE

A. General: Per requirements of Division 16 Specifications.

B. Shield Grounding: Each signal shield shall have only one grounding point which shall be located at the source of the signal, (e.g. analog transmitter) unless otherwise recommended by the instrument or equipment manufacturer. Shields shall be continuous through cabinets, panels, etc.

C. Terminations: Wire at both ends of the power and signal cables shall be terminated with pre-insulated solderless spade or ring lugs and in accordance with the requirements of Specification 17200 – Control Panels. Spare conductors shall be terminated on marked terminal strips or connector pins at each end.

D. Wires and cables shall be pulled only once. Wires and cables which are pulled in one direction and retracted, shall be replaced with new wires and cables at no additional cost.

E. No splices shall be permitted.

END OF SECTION
SECTION 17010

PUMP CONTROL SYSTEM GENERAL REQUIREMENTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. The Contractor shall obtain the services of a subcontractor who shall provide a complete integrated Pump Control System (PCS) including but not limited to provision and integration of a new PLC panel at the Sparks Pumping Station, field instrumentation and associated control panels, controls coordination at the Sparks storage tank, coordination with City Municipal Telephone Exchange, Verizon phone service and electrical subcontractor, and programmable controller system hardware and software, and software programming as shown on the contract drawings and as specified in Division 17.

2. The system integrator shall provide programming and graphic displays of the new pumping station PLCs, OITs, and the HMI systems, modify the existing Tank Site PLC, OIT, and HMI, and the HMIs and PLCs located within the Telemetry Control Center (TCC) at Ashburton Water Filtration Plant. Changes shall reflect all changes made to the control strategies and monitored signals under this contract. These modifications shall incorporate all new devices/equipment, in accordance with the Contract Documents; as well as the integration of new communication links between the PLCs and equipment associated with the new Motor Control Center at the Sparks Pumping Station.

3. SCADA communication:

a. The contractor shall work with the System Integrator and electrical subcontractor to coordinate with the City and Verizon for the relocation of the leased and dial-up telephone lines.

b. The contractor shall procure a cellular router for SCADA communications to the Telemetry Control Center (TCC) for both pump station and remote Elevated Storage Tank site.

c. At the beginning of the project, prior to the shop drawings phase, the contractor must coordinate with the City’s Municipal Telephone Exchange (MTE) for the provisioning of the 4G cellular service. MTE shall provision the cellular service and provide a cellular router SIM card to the contractor for installation into the cellular router.

4. This subcontractor will hereafter be referred to as the System Integrator (SI). The SI shall have total responsibility for the design, programming, testing, start-up and implementation of the Pump Control System, Elevated Storage Tank local control system, and all associated control, status and alarm functions for the two facilities.
5. As referenced above, the SI is responsible for performance and coordination of the PLCs and Control Systems at the Telemetry Control Center at Ashburton Water Filtration Plant. The SI shall coordinate all work with the City prior to performance, to ensure that the warranties provided for the existing control systems are not impacted or voided as a result of work performed under this Contract.

6. The SI shall be available for coordination with other equipment suppliers, Verizon, City phone exchange, for implementation of the required functions of the equipment in the Pump Control System.

7. The SI shall be one of the following System Suppliers:

- Sherwood Logan and Associates Inc.
- Micro-Tech Designs, Inc.
- SL Controls
- 4312 Black Rock Rd., Suite 1
- 2140 Renard Court
- Hampstead, MD 21074
- Annapolis, MD 21401
- (410) 239-2885
- Contact: Wesley Martin

- Trijay Systems, Inc.
- Industrial Monitoring and Control Systems, Inc. (IMACS)
- 10 Maple Avenue
- Line Lexington, PA 18932
- 3 Mill Dr., PO Box 248
- (215) 997-5833
- New Windsor, MD 21776
- Contact: Jim Arevalo
- (410) 635-2265
- Contact: Trevor McConville

- Allied Control Services, Inc.
- 611 Garfield Avenue
- PO Box 234
- West Point, Pennsylvania
- (800) 441-4844

B. The Systems Integrator shall provide all necessary junction boxes, panels, transformers, power supplies, relays, terminal blocks, fusing, grounding, and other components required to meet manufacturers' requirements and shall produce complete and fully functioning systems.

1. It is a requirement of these Specifications that the Systems Integrator be responsible for purchasing all pump control equipment consisting of, but not limited to, the following: motor control center, all PLC equipment including expansion and modifications of any existing PLC cabinet, all SCADA equipment, computer software, and all field instruments.

   a. Exception. Subject to the approval of the Owner, the Contractor and/or sub-contractor other than the Systems Integrator may be permitted to furnish pump control items requiring complete system integration. The decision by the Owner to deny or to permit pump control items to be furnished by parties other than the Systems Integrator shall be final, and the Contractor shall not be entitled to any claims based upon the decision rendered by the Owner.
b. Complete pump control system integration remains the responsibility of the Systems Integrator regardless whether the Systems Integrator furnished the pump control equipment or another party was permitted to furnish some portion of the pump control equipment.

2. The Systems Integrator shall be responsible for fully understanding all operating conditions, limitations, and criteria of all existing motors to remain and all new motors to be provided under this Contract regardless whether the motors are being furnished by other parties or are being furnished by the Systems Integrator. Furthermore, the Systems Integrator shall be responsible for fully integrating all motor operations required to provide a fully functioning pump control system. Motor operations requiring complete integration include, but are not limited to:

a. Normal starting (reduced voltage soft starting, across-the-line starting, etc.)

b. Emergency starting, as applicable

c. Running

d. Normal shut down

e. Emergency shutdown, including through the existing Emergency Pressure Control System

f. Alarming and report-back

3. As applicable to the Contract, the following components of the pump motors and the motor control center shall be fully integrated into the design provided by the Systems Integrator:

a. Exciters

b. Reduced voltage soft starters

c. Run contactors

d. Bypass contactors

e. Power factor correction capacitors

f. PLC’s

g. Uninterruptable power supplies

h. Surge protection devices

i. Other protective devices (example: Multilins)

j. Timers and relays

k. Switches, push buttons, and indicating lights
1. SCADA, monitoring devices, and recording devices

C. In addition to the main pumping units, other motor-driven devices that require complete integration to be provided by the Systems Integrator include:

1. Valves (motor-operated and/or solenoid controlled)

D. Field equipment requiring complete integration by the Systems Integrator includes, but is not limited to: level transmitters, pressure transmitters, limit switches, flow switches, flow meters, differential pressure transmitters, solenoid valves, HVAC controls (thermostats, humidistats, etc.), control systems enclosures, elevated tank overflow sensor and process analyzers.

1. Certain field equipment require integration by the Systems Integrator into multiple systems. The Systems Integrator shall be responsible for fully integrating all field equipment into all appropriate systems as required by this Contract.

1.02 QUALITY ASSURANCE

A. Regulations, Standards and Publications:

UL Underwriters’ Laboratories, Inc.

NEC National Electrical Code

NEMA National Electrical Manufacturers Association

ANSI American National Standards Institute

IEEE Institute of Electrical and Electronic Engineers

ISA Instrument Society of America

B. Quality Control:

1. All components of the Pump Control System shall be new and of the most current and proven design. All components shall be suitable for the intended application and shall be installed and wired in strict accordance with the manufacturer’s requirements and this specification. The System Supplier shall provide all necessary junction boxes, panels, transformers, power supplies, relays, terminal blocks, fusing, grounding and other components required to meet the manufacturer’s requirements and produce a complete and functional system.

2. The complete system must comply with all Federal, State, Municipal, or other authority’s laws, rules, or regulations.

3. All MCCs and control panels, and their components and materials, shall bear the label of the Underwriters’ Laboratory. All control panels shall be UL listed as a complete assembly.
C. Equipment Manufacturers:

1. The SI shall base his bid on providing the manufacturers specified under Division 17 for all equipment furnished for the System.

1.03 SUBMITTALS

A. General:

1. Submit in accordance with Section 01000.

2. Components required to function as a unit shall be submitted as a single item; separate submittals of individual components shall not be accepted and will be returned to the Contractor as "Rejected" without further review.

   a. New items requiring complete integration which are not being furnished by the Systems Integrator, nevertheless, shall require review and approval from the Systems Integrator.

   b. In addition to bearing the appropriate General Contractor and sub-contractor submittal cover sheet, submittals for such new items shall include a statement, signed and dated by the Systems Integrator, as follows:

   "Items (or item) included in this submittal are being furnished by parties other than the Systems Integrator. These items have been thoroughly reviewed by the Systems Integrator and have been determined to be in full compliance with the requirements of the Contract. Furthermore, the Systems Integrator has determined the items included in this submittal are fully compatible with all other items requiring systems integration including both existing-to-remain items and new items to be provided under this Contract."

B. Shop Drawings:

1. Submit required number of detailed shop drawings for all equipment being provided for the Pump Control System. Shop drawings shall be submitted within 90 days of the date of Notice to Proceed, but only after the required pre-submittal workshop has been conducted.

2. Shop drawings shall be submitted in 3-ring loose-leaf binders and shall be complete, neat, orderly, and indexed. Separate shop drawing submittals shall be made for each of the following:

   a. MCC.


   c. Programmable Controller System Hardware.

   d. Programmable Controller System Software.
e. Pump Control System Operation.

f. Verizon communication panel, including cellular modem

3. Refer to individual specification sections for specific shop drawing requirements.

4. The SI shall submit a complete set of engineered drawings for the MCC, Local Control Panel, and Programmable Controller system hardware. These engineered drawings shall be done by the System Supplier using AUTOCAD. The drawing size shall be 11”x 17”, or 22”x34” as requested by the Engineer. These drawings shall include, but not be limited to, the following:

   a. MCC elevation showing all unit locations, door mounted devices and dimensions.
   b. A chart for the MCC indicating nameplate engraving, starter size and type, circuit breaker size and type, transformer size, special controls, motor horsepower, and overload heater size, for each MCC unit.
   c. Three line wiring diagrams for each MCC unit showing power and control wiring, unit devices, terminal numbers, and interconnecting wiring.
   d. Control panel elevation, details, front and back panel layout, and wiring diagrams showing terminal numbers and interconnecting wiring. The control panel layout drawings shall include dimensions for the location of all panel-mounted devices.
   e. Programmable controller system block diagram, power wiring diagrams and I/O wiring diagrams showing terminal numbers and interconnecting wiring.
   f. Color copies of all screens developed for the Operator Interface Terminals along with a flow chart indicating how each screen is accessed.
   g. Calculations for the Uninterruptible Power Supply.
   h. Plan to integrate the new I/Os into the existing station controller and SCADA communication to the City’s Telemetry Control Center (TCC).
   i. All drawings shall be easily readable with minimum 1/8 inch text height.
   j. See Section 01000 for additional submittal requirements.

5. Prepare and submit comprehensive wiring diagrams for the instrumentation work performed under this section. Drawings shall include the following:

   a. Control wiring diagrams and ISA standard loop drawings with terminal numbers and all control devices shall be identified. Loop drawings shall be one (1) per sheet. The sheets shall be eight and one-half inches by eleven inches (8112” x 11”) or eleven inches by fourteen inches (11” x 14”) in size.
b. Drawings shall show sizes and locations of all equipment and their control locations. Include detailed dimensions of all unit locations, elevations, details, door-mounted devices, and front and back panel layout. Include detailed dimensions of all conduits, pull boxes, and wiring troughs.

c. Wiring diagrams shall contain internal and external ladder wiring schematics with identified terminal numbers, relays and other control devices. Control electrical diagrams shall be drawn with circuitry arranged in functional sequence on ladder-type diagrams. Each horizontal line on the ladder diagram shall be assigned a number which shall be written to the left or right of the ladder. Relay coils shall be drawn on the right side of the ladder. The line numbers on which the relay contacts appear shall be shown on the right of each coil. A normally closed contact shall be designated by drawing a diagonal line through the contact. Timed contacts shall be designated by the letter "T" under the line number. Instrument logic diagrams and schematics shall be prepared using ISA 55.1, IEEE 315 and 315A, and NEMA standard symbols and identification letters.

d. All drawings shall be submitted in a timely manner to allow for engineering review and incorporation of additions or modifications.

e. Provide a list of all parts including numbers and quantities.

f. Final as-built drawings also shall be furnished on diskettes compatible with AutoCAD formats.

g. Control panels furnished by the Contractor shall include panel layout drawings and associated wiring schematics as defined above.

6. Integrator’s Data and Drawings

a. The Control Systems Integrator shall submit a minimum of seven (7) complete sets of the following information for the Engineer's approval:

1) Point-to-point wiring drawings
2) Process loop drawings
3) Dimensional drawings, wiring and/or piping drawings for field and pipeline-mounted equipment
4) Equipment specification sheets
5) For all control panels: fabrication and nameplate legend drawings and internal wiring schematic drawings
6) Systems schematic drawings illustrating all components being supplied complete with electrical interconnections
7) Computer input/output lists and a written description of the control strategy to be applied to the various process areas
8) For process computer systems: system block diagram and control room layout drawings

b. After approval, the Systems Integrator shall furnish seven (7) complete bound sets of the above information plus the following:

1) Individual Operating and Maintenance Manuals
2) Bulletins for each piece of equipment furnished
3) Complete spare parts list for each piece of equipment
4) Calibration sheets

7. A minimum of eight (8) weeks prior to the factory testing, the Systems Integrator shall be required to submit color copies of all proposed Human-Machine Interface (HMI) screens along with a flow chart indicating how each screen is accessed to the Engineer and the Owner for approval.

C. Installation, Operation and Maintenance Manuals:

1. Submit in accordance with Section 01000.

2. Installation, operation and maintenance manuals shall be submitted in 3-ring loose-leaf binder, and shall be complete, neat, orderly and indexed. Information shall be submitted for each of the following:

   a. MCC
   b. Control Panel
   c. Instrumentation
   d. Programmable Controller System Hardware
   e. Programmable Controller System Software
   f. Pump Control System Operation

3. Unless directed otherwise by the Engineer, include the following elements in the preliminary and final O&M manuals:

   a. Erection and installation sequence and instructions;
   b. Exploded view drawings and illustrations with sequence description for assembly and disassembly of equipment;
   c. Comprehensive parts and materials list for each equipment element indicating manufacturer and manufacturer's identification number; include name, address, and telephone numbers of sales and service offices nearest project site for each major equipment item;
d. Schedules of recommended spare parts to be stocked, including part number, inventory quantity, and ordering information;

e. Performance rating and nameplate data for each major system component;

f. Procedures for starting, operating, adjusting, calibrating, testing, and shutting down system equipment;

g. Emergency operating instructions and troubleshooting guide;

h. Schedule of routine maintenance requirements and procedures, and preventative maintenance instructions required to insure satisfactory performance and equipment longevity;

i. Maintenance instructions for extended out-of-service periods;

j. Complete listing of all software programming and licensing agreements;

k. Complete operator's Supervisor's Manual for the Control System which includes system hardware and software and the "how to's" of the system;

l. Testing reports;

m. ISA specification sheets filled out to reflect final field instrument calibration, purchased model number, and any other as-built condition;

n. As-built shop drawings of panels, wiring, instruments, etc.; and

o. All standard O&M manuals for all equipment.

PART 2 - PRODUCTS

(NOT USED) SEE INDIVIDUAL SECTIONS FOR PRODUCTS REQUIREMENTS.

PART 3 - EXECUTION

3.01 COORDINATION

A. The SI shall conduct an initial pre-submittal workshop and coordination meeting with the Engineer, Contractor, County, and City to review the scope of the project and the project schedule and discuss the Owner’s preferences for how the system will be designed to operate.

B. A submittal progress meeting shall be conducted by the SI at the 50 percent complete stage with the Contractor, Engineer, County, and City, to discuss progress of the design and questions that may arise.

C. Approximately 30 days after the 100 percent complete submittal is made, the SI shall conduct a final submittal review meeting with the Contractor, Engineer, County, and City, to discuss final comments prior to system fabrication.
D. The SI shall be responsible for coordinating the compatibility of all components and equipment with the Contractor, particularly the pump motors and associated components.

E. The Systems Integrator shall be responsible for coordinating the compatibility of all components and equipment used in control systems of this Contract.

1. New Work: Should the Systems Integrator determine that there is some incompatibility regarding two (2) or more components to be provided under this Contract, he shall bring this issue to the attention of the Engineer prior to the fifty percent (50%) complete submittal stage. The Engineer shall make a decision regarding systems integration; the decision by the Engineer shall be final.

2. Rehabilitation Work: For rehabilitation work utilizing existing components to remain, the Systems Integrator shall be required to develop an understanding of those existing components to the fullest extent practicable and shall incorporate that understanding into the integration of all new and all existing components. In the event the Systems Integrator determines there is some incompatibility between one (1) or more existing components to remain and one (1) or more new components to be provided under this Contract, he shall bring this issue to the attention of the Engineer prior to recommissioning existing components and prior to the fifty percent (50%) complete submittal stage for new components. The Engineer shall make a decision regarding systems integration; the decision by the Engineer shall be final.

3. In order to insure compatibility between all instrumentation components and equipment, it shall be the responsibility of the Systems Integrator to coordinate all interface requirements with the existing mechanical and electrical hardware and to furnish and install all signal isolation devices as required to provide safe, reliable, and fully functioning control systems.

F. The Systems Integrator and the Contractor shall investigate each space in the building through which equipment must pass to reach its final location. If necessary, the Systems Integrator shall be required to ship the components in sections, sized to permit passage through such areas. The Systems Integrator and the Contractor also shall investigate space and allocated access (front, rear, side); any subsequent concerns shall be brought immediately to the attention of the Engineer.

G. The Systems Integrator shall coordinate the installation, placing, and location of system components, their connections to the process components, panels, cabinets, and devices as required to complete the work subject to the Engineer's approval.

H. As this is an operating pumping station, the pumping and disinfection facilities shall be fully operational at all times. All work shall be coordinated with the Owner's personnel.

3.02 FACTORY ACCEPTANCE TEST

A. The SI shall conduct a factory acceptance test for the Pump Control System prior to shipment of the equipment. The factory test shall be conducted at the supplier’s facility and shall demonstrate the control system was designed and performs in accordance with the Specifications and Drawings. All equipment furnished for the Pump Control System shall be assembled and interwired so that it functions as a complete system for the factory acceptance test.
B. The SI shall provide all necessary equipment and hardware required to conduct the factory test.

C. The factory acceptance test shall demonstrate the proper operation of all control logic in accordance with the Specifications and Drawings, specifically specification section 17500, and all system hardware and software. The factory test shall be witnessed by the Engineer. The Owner will not witness the factory test. Testing shall occur within the 48 contiguous states. If testing is not within two (2) hours of the project site, the SI shall be responsible for the travel expenses of up to two (2) Owner representatives to witness the test. Coordinate scheduled dates with all required parties.

D. A detailed step-by-step test procedure for all testing activities is to be delivered to Engineer not less than sixty (60) calendar days prior to the scheduled start date. Engineer reserves the right to reschedule the start of the test if a proper, approved, complete test procedure is not available at least six weeks in advance of the scheduled test date.

E. Confirm in writing, times and dates two weeks before a test.

F. Perform a walkthrough of all equipment supplied. Utilize checklist provided as part of the test procedure documents to verify presence of all required components. Note all exceptions. Engineer reserves the right to cancel remaining test activities if items are missing.

G. Inspect each enclosure. Demonstrate quality of workmanship, labeling, dressing of cables, conformance of enclosures with drawings. Record all comments on test procedure documents.

H. Demonstrate basic PLC functions for each PLC including, but not limited to the following:

1. The System Integrator shall utilize the new PLC controller in conjunction with the PLC cards, backplane, and Ethernet switch specified as spare parts under Specification 17200, to allow for factory testing of the new PLC programing and simulation of the interaction and communication between the individual system components and the Pump Control panel. Any additional temporary or special equipment, relays, etc. needed to fully test the system shall be provided by the SI. Following testing the spare equipment shall be repackaged for long term storage and turned over to the City.

2. Exercise every I/O point served by the Pump Control Panel PLC modified under this Contract. Include all spares. Provide necessary simulation equipment to simulate all discrete inputs, discrete outputs, analog inputs, analog outputs, and serial communication. Simulation equipment should be provided with multiple channels to enable testing of several I/O points without need to connect/disconnect for each point.

3. Test each analog input at 0, 50%, 100% of full scale by creating proper signal (e.g. 4-20 mA or 1-5 Volts) using signal sourcing device.

4. Provide an appropriate load (light or buzzer) to test each discrete output. LEDs on DO cards are not sufficient as an indication of proper DO function.
5. Provide suitable meter to measure each analog output point at 0, 50 and 100% of full scale. Provide appropriate switches to simulate contact closures to test every digital input point.

6. Demonstrate UPS operation for brief power outage.

I. Provide the following documentation:

1. One copy of submittals applicable to the equipment to be tested.

2. One copy of the Drawings and Specifications together with addenda and change orders.

3. One master copy of the test procedure.

4. A complete inventory of the equipment to be tested including make, model and serial number.

J. Provide use of the following test equipment:

1. Input/Output Test Set: This set shall be wired to representative input and output components to allow complete testing of these components.

2. Off-line diagnostic and test programs.

3. Maintenance and test equipment including, but not limited to: voltmeter, ammeter, ohmmeter, oscilloscope, electrician’s tool set, and special test equipment.

3.03 RECORD DRAWINGS

A. Submit required number of record or as-built drawings for the Pump Control System prior to the delivery of any equipment to the site. Provide an as-built drawing in the control panel.

B. Following start-up and commissioning of the system, the SI shall make all necessary changes to the as-built drawings and re-submit required number of final as-built drawings. A final as-built drawing shall also be provided in the control panel.

3.04 SYSTEM INSTALLATION, START-UP AND COMMISSIONING

A. System Installation:

1. All field wiring to the equipment furnished by the SI shall be performed under the Division 16 electrical portion of the Contract by the Electrical Contractor under the supervision of the Pump Control System Supplier.

2. The SI shall provide on-site supervision and advice to the installing Electrical Contractor to insure the system is installed in accordance with the specifications and the manufacturer’s requirements.

B. Field wiring may be performed by the Systems Integrator directly or may be performed by the electrical sub-contractor working under direct supervision of the Systems Integrator.
1. The Systems Integrator shall provide on-site supervision and advice to the installing electrical sub-contractor to insure that all control systems are installed in accordance with the Specifications and the manufacturers’ requirements.

2. For the following connections, the Systems Integrator shall be responsible for insuring that all field wiring for power and signal circuits are done correctly in accordance with best industry practices to insure satisfactory functioning installations:
   a. Between individual existing devices;
   b. Between existing devices and proposed control systems;
   c. Between multiple proposed control systems; and
   d. Within individual proposed control systems

C. The Systems Integrator shall be responsible for ensuring that all control systems are installed properly, tested, and fully operational.

1. All proposed instrumentation and control systems shall be installed, tested, and operating properly before existing systems are taken out of service.

D. System Start-Up:

1. Submit a detailed testing and start-up plan two weeks prior to start-up for approval, and coordinate scheduled dates with all required parties. Submit open and closed loop signal test sheets listing all possible signals to be tested for review and approval.

2. Conduct open loop point to point wire testing in accordance with the approved signal test sheets in the presence of the Engineer, Owner and City. All conduit and wiring shall be installed prior to open loop testing.

3. Conduct closed loop testing from all field devices to PLC in accordance with the approved closed loop test sheets in the presence of the Engineer, Owner and City. The open and closed loop testing shall be on a separate days.

4. Start-up the control system by energizing the system equipment and testing the operation of all hardware, software, process control logic, and all customized software programs.

5. All start-up and testing shall be scheduled, performed in an orderly sequence, and conducted in the presence of and to the satisfaction of the Engineer, Owner and City.

6. Include the following information in the submittals for this section:
   a. Loop checkout schedule.
   b. Loop checkout procedure including sign-off forms.
c. Schedules, procedures and sign-off forms for all other tests specified.

7. Contractor shall supply for use during the field test activities two way radios and cellular telephones to permit two way communications by personnel between sites. These phones and radios shall be used by the Engineer, Owner, City and the Contractor as necessary.

8. Perform field testing to verify the operation of the Pump Station controls. Field tests are as follows:
   a. Loop tests after troubleshooting.
   b. Function tests.
   c. Integrated system test.

9. Testing shall begin after installation of the system components at the site. These shall include:
   a. PLC’s.
   b. Instrumentation.
   c. Communications equipment required for operation of the system.
   d. Other field instruments, panels, switches, termination cabinets, control devices and related interconnections.

10. Begin testing by performing the following steps:
    a. Check equipment against shop drawing list.
    b. Verify that the equipment has been installed in accordance with Contract Documents and manufacturer’s directions.
    c. Power up the equipment and calibrate power supplies.
    d. Load applications software.
    e. Run diagnostics to verify error-free operation.

11. Check each signal wire and all spares from the field element termination point to the PLC I/O terminal block. Verify end to end continuity of each wire, and that no stray voltage exists on any other wires. Verify that voltage drop through the wire from end to end is within acceptable limits, as specified by the Engineer. Note and correct any deficiencies.

12. Verify that each wire label shows proper wire identification, is legible and that the wire designation shown on the loop drawing matches exactly the wire designation shown on the wire label. Wires shall be identified at each end, including any intermediate junction points. Note and correct all deficiencies.
13. Provide space on the loop drawings and test sheets to hold Engineer, Owner, City and Contractor’s signatures and dates for this test.

14. Check each loop from the end element to the respective control display. Include instruments, control devices, panels, termination cabinets, input/output cards and other devices in the loop to ensure proper operation and linkage to appropriate HMI displays at station.

15. Whenever possible, motion check the final control element through panels and through operator control stations. When not possible to perform a motion check, simulate the motion check at the final control element location.

16. Document loop checks and submit to the Engineer. Include the following:
   
a. Loop number.
   
b. Loop description.
   
c. Termination information.
   
d. Loop drawing reference.
   
e. Type of test(s) performed.
   
f. Date tested.
   
g. Signature of tester and date.
   
h. Signature of Engineer and date.
   
i. Problem description, if any.

17. Summarize loops found to contain defective or inoperable equipment on separate sheets and submit to the Engineer.
   
a. Correct and recheck work performed under this Contract.
   
b. The Engineer will coordinate correction of defective work by others, (e.g. Owner, other contractors not involved in this project) and correction of deficiencies discovered in existing wiring or instrumentation. Perform rechecking as a part of this Contract.

18. Test function of the system.
   
a. Include a demonstration of the following maintenance and support functions:
      
1) System status displays and use.
      
2) Diagnostics.
      
3) Power fail/restart.
4) PLC alarming under loss of communications, loss of I/O, etc.

b. Operation of PLC on UPS backup power without AC power connected. Verify that battery has sufficient capacity to maintain operation of equipment for minimum period specified.

c. Test control functionality, assuring that all control schemes and backup schemes work according to descriptions found elsewhere in Division 17.

19. Document and submit tests to the Engineer. Include the following:

a. Description of function.

b. Test performed.

c. Copies of messages, displays, reports, and trends which verify operation;

d. Signature of tester and date.

e. Signature of Engineer and date.

f. Problem description, if any.

20. Schedule any field testing that may affect the station operation through the Engineer on a daily basis.

21. The SI shall not perform any testing which may affect the County and station operations without the Engineer’s concurrence.

22. Meet the following conditions prior to the start of any testing:

a. Correct deficiencies noted during in-factory testing and inspections following installation.

b. Keep on-site documentation pertinent to the equipment being tested.

c. Keep on-site, labeled, and properly stored, spare parts, expendables and test equipment pertinent to the equipment being tested.

d. Keep operational field equipment supplied and pertinent to the equipment being tested.

e. Submit Engineer reviewed test schedules and test procedures.

f. Re-load all PLC’S and all OIT’s using images supplied by Contractor or Owner as appropriate.

g. All installation work is complete and approved by the Engineer.

h. All drawings and Operation and Maintenance manuals are available for review.
23. Test procedures and test results will reflect information contained within the various operation and maintenance manuals furnished. Perform no test without the appropriate manuals being followed word-for-word unless approved by the Engineer. Lack of acceptable manuals will be cause for declaring the test to have failed regardless of the actual test results.

24. The Engineer shall determine the site sequence in which testing shall be performed.

E. System Commissioning:

1. Supervise the factory representative’s calibration for all instrumentation and place the complete control system into operation. The commissioning of the system shall include the overall calibration and tuning of all control loops and sequences to provide stable control of the pumps. The validity of all inputs and outputs for the system shall be checked and corrected during the system commissioning.

2. The SI shall provide someone on-site for the length of time necessary for system installation, start-up and commissioning.

3.05 FINAL ACCEPTANCE TEST

A. Following the commissioning of the Pump Control System, and the issuance of the Certificate of Substantial Completion to the Contractor by the Engineer, a final acceptance test shall be conducted for a period of thirty (30) consecutive days. This test shall be scheduled with the Owner and the Engineer and shall not begin until the SI receives written approval to start. During that time period, the system shall operate satisfactorily and in compliance with the Specifications. The SI shall promptly correct any problems that occur during the final acceptance test and perform retests as necessary to verify proper operation.

B. Following the successful completion of the final acceptance test, a certificate of final acceptance will be issued to the System Supplier.

3.06 EXPANSION OF SYSTEM I/O

A. The System Supplier shall include in his cost for this Contract the modification of an additional 10 existing system I/O points above and beyond those identified and/or required for completion of Contract work. This shall include all costs to configure these points within the system including software programming, drawing changes, and field verification.

3.07 ADDITIONAL SOFTWARE CONFIGURATION AND PROGRAMMING

A. The System Supplier shall include in his cost for this Contract four (4) additional man-days of on-site time for software configuration and programming. The service dates shall be determined by the Engineer in one day increments and may not be consecutive. This time shall be utilized for changes and/or additions that may be required after the commissioning of the system. The Supplier’s cost for these additional man-days shall include software documentation changes and all travel related expenses.

B. Copies of all software licensing and programming requirements shall be provided to the OWNER in digital format and printed format also.
3.08 TRAINING

A. During the final acceptance test, the System Supplier shall arrange for the instruction and training of City personnel in the operational procedures of the system. At the end of the training, operations personnel shall have, as determined by the Engineer, sufficient knowledge to operate the system. Refer to Specification 01735 for training requirements. This training shall be in addition to the training specified in the other Division 17 sections.

END OF SECTION
SECTION 17100

MOTOR CONTROL CENTER

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included;

1. Furnish and install a complete motor control center including required number of vertical sections, main breaker, digital meter, surge protective device, combination type motor starters, circuit breakers, magnetic relays, selector switches, push buttons, pilot lights, control transformers and special controls as shown on the Drawings and specified herein.

B. Special Requirements:

1. The Motor Control Center shall be furnished, programmed, commissioned and tested by the Pump Control System Supplier. The Electrical Contractor under Division 16 shall install the Motor Control Center and provide all conduit and wiring.

2. The Drawings indicate certain motor starters to be energized by a programmable controller output. If the current rating of the output is not sufficient to energize the starter directly, provide an interposing relay in the motor starter compartment and wire the relay as required to energize the starter.


1.02 QUALITY ASSURANCE

A. Comply with ALL Regulations, Standards and Publications published by:

UL Underwriters’ Laboratories, Inc.
NEC National Electrical Code
NEMA National Electrical Manufacturers Association
ANSI American National Standards Institute

1. All internal conductors are to be of sufficient cross-sectional area copper to carry the rated ampere load and not exceed the maximum heat rise above ambient temperature specified by UL and NEMA.

B. Quality Control:

1. The motor control center shall be new and limited to products regularly produced and recommended for service ratings in accordance with engineering data or other comprehensive literature. In all cases where device, or devices, or part of equipment is herein referred to in singular, reference shall apply to as many items as required to complete installation.
C. Guarantee

1. The Motor Control Center shall be guaranteed in writing for defects in materials and workmanship for a period of five years from the date of substantial completion. Multiple warranties for individual components such as circuit breakers, VFDs, Soft Starters, etc will not be acceptable. The warranty shall be comprehensive, and shall include all parts, labor, travel and other miscellaneous expenses.

1.03 SUBMITTALS

A. Shop Drawings:

1. Submit in accordance with the requirements of Section 01000, 16010 and 17010. Shop drawings shall be complete in all respects and shall indicate all dimensions, installation methods, size, weight, capacity, ratings, integral controls and types of materials, elevations, and sections. Shop drawings shall include manufacturer’s literature and complete information on the following:

   a. Freestanding Vertical Sections
   b. Main Circuit Breakers
   c. Digital Meters
   d. Surge Protective Devices
   e. Automatic Throwover System (where shown)
   f. Thermal-Magnetic Type Circuit Breakers
   g. Motor Circuit Protector Type Circuit Breakers
   h. Magnetic Across-the-Line Motor Starters
   i. Control Transformers
   j. Relays
   k. Selector Switches
   l. Push Buttons
   m. Pilot Lights
   n. Elapsed Time Meters
   o. Special Controls
   p. Engineered Control Diagrams and Connection Diagrams
   q. Nameplate Schedules
r. Variable Frequency Drives and Solid State Starters
s. Automatic Transfer Switch (See Section 16710)

1.04 MANUFACTURER
A. The motor control center shall be Square D, or approved equal by Eaton Corporation or Rockwell Automation.

PART 2 - PRODUCTS

2.01 MATERIALS
A. Motor Control Center Structure and Configuration:
   1. The Motor Control Center shall be NEMA Type I, gasketed. Wiring shall be NEMA Class II, Type C. The motor control center shall have a main breaker as indicated on the Drawings to feed the horizontal bus. Provide lugs of adequate size to terminate incoming cables. The motor control center shall be furnished with a ground bus.
   2. Motor starter units shall be combination type with a molded case circuit breaker. Control voltage for units shall be 120 volts.
   3. The motor control center shall be rated at 480 volts, 3 phase, 4 wire, 60 Hz and shall be braced to withstand a short circuit current of 65,000 rms symmetrical amperes.
   4. The motor control center shall consist of vertical sections bolted together to form a rigid, freestanding assembly.
   5. Vertical sections shall be formed of 13 gauge hot rolled steel with uniform blemish-free surfaces. Top and bottom structural parts shall be 10 gauge. End closing plates shall be 12 gauge, and unit parts and doors shall be 14 gauge. Base channels shall be provided constructed of rugged steel to easily withstand the stress of transit and moving the control center into position. Bolt holes in the base channels shall be provided in all sections for the purpose of bolting the control center to the floor. Steel removable lifting angles shall be provided on the top of the sections for convenience in handling the control center.
   6. Each section, to comply with standards of NEMA, shall be approximately 90” high excluding lifting angles and base channels. It shall be approximately 20” deep and width shall be as required for the application and/or as indicated on the Drawings.
   7. End sections shall have end-closing plates, which can be removed for the addition of future sections. The top plate shall be of a removable one-piece construction for added convenience in cutting conduit holes. Removable blank plates flanged on all 4 sides and having captive screws shall cover all unused unit spaces.
B. Main Circuit Breakers:

1. Where shown, main circuit breakers shall be provided, individually mounted and identified. The main breakers shall have sufficient interrupting capacity to properly close against and interrupt instantaneously, without damage, the maximum short circuit current available at the breaker. Minimum interrupting capacity shall be 65,000 amperes symmetrical at 480 volts.

2. The main circuit breakers shall be furnished with G.F.I. protection.

3. Where shown, provide an automatic transfer switch in accordance with Section 16710.

4. Auxiliary contacts shall be provided for the main circuit breakers and/or the automatic transfer switch to remotely signal breaker position and switch status to the pump control system PLC.

C. Digital Meter:

1. Provide a digital meter in the Motor Control Center to provide complete electrical metering for the active service. The digital meter shall be microprocessor based and shall be furnished complete with current transformers. The digital meter shall be Cutler-Hammer IQ DP4130, or approved equal.

2. The digital meter shall be furnished with an alarm contact for remote indication of a power failure on any individual or all three phases.

3. Provide optional communication interface and power management software and connect via network communications to Pump Control System.

4. In addition to the digital meter, a three phase monitor shall be installed to sense the presence of utility power on the line side of the utility main circuit breaker. The monitor shall output a discrete signal which shall be hardwired to the PLC in the Pump Control Panel for monitoring. The three phase monitor shall be ATC Diversified Electronics SLA (230/440) ALE, or approved equal, with voltage rating as required.

D. Internal Surge Protective Device:

1. Where shown as internally mounted, a surge suppressor shall be furnished in the Motor Control Center for each normal and emergency service feeder. The surge suppressor shall be UL 1449 Second Edition Listed (1998). Unit shall protect all modes (L-L, L-N, L-G, N-G) applicable. Unit shall have 240kA of surge capacity per phase with a let-thru voltage of less than 1500V L-L and 700V L-G. A disconnecting means shall be provided ahead of the surge suppressor so the unit can be serviced without de-energizing the service.

2. Unit shall be furnished with dry contact alarm outputs to indicate any module failure. Surge suppressor shall have AC tracking filter with EMI/RFI filtering. Each module shall be fused individually, thermally protected, and have LED indication.
3. Unit shall be provided and installed by MCC manufacturer Surge suppressor shall be APT Transient Eliminator XGA Series, or approved equal.

E. External Surge Protective Device:
   1. Where shown as externally mounted from the MCC a surge suppressor shall be provided for each normal and emergency service feeder. The unit shall be Liebert Model S1040277YARDE with integral fused disconnect.

F. Horizontal Wireways:
   1. Adequate conduit entrance space and wire entry room shall be provided at both the top and bottom of each section. The bottom horizontal wireway shall be 12” and the top horizontal wireway shall be 6” and both shall extend through the length and depth of the control center section with openings between sections. Covers over these wireways shall be equipped with captive type screws to prevent loss of hardware during installation. These wireways shall be isolated from the bus bars.

G. Vertical Wireways:
   1. A vertical wire trough located on the right-hand side of each standard section and having a cross-sectional area of not less than 28 sq.in. shall extend from the top horizontal wire trough to the bottom horizontal wire trough for the purpose of routing user’s motor and control wires to the control units. The wire trough shall be isolated from the bus bars to guard against accidental contact. A separately hinged door having captive type screws shall cover the vertical wire trough for safe and easy access to wiring without disturbing control units.

   2. Wire ties shall be furnished in the vertical wire trough to group and securely hold wires in place for a neat, orderly installation.

   3. Where wire access ports between unit spaces and vertical wire trough are open, shutters shall be provided to prevent items, such as a fish tape, from accidentally entering the unit space. Snap-in wire grommets shall be provided in wire access ports for size 2 units and smaller for isolation and added protection of small wires. For larger units, snap-in wire guards shall be provided for added protection of larger wires.

H. Vertical Sections:
   1. Each vertical section shall be divided into compartments, each containing a combination starter or other control assembly as indicated on the Drawings. Power shall be provided to these compartments from the main bus by bus bars extending the full height of the unit. Sections shall also be provided with horizontal spaces at the top and at the bottom, which shall line up with adjacent section to form horizontal wiring raceways along the entire length of the control center.
I. Compartments:

1. Compartments shall be built in interchangeable combinations of modular heights. A full vertical section shall contain six equal NEMA size 1 modular compartments exclusive of top and bottom wiring spaces. Starter compartments shall not be less than 12” high. Only 1/2 and integral multiples of the basic module will be allowed. Compartments for NEMA size 4 and smaller starters shall be draw-out type.

2. Guide rails shall be provided in the structure for supporting and aligning a unit during its removal or replacement. Draw out units shall have pressure type, line disconnecting stabs of high strength alloy and shall be held in place by means of quick acting, captive machine screw fasteners arranged so the units can be removed or remounted readily without access to the rear of the structure. Each compartment whether draw out or stationary, shall be enclosed and effectively baffled to isolate any fault which may occur and shall be covered by an individual door fixed to the structure with a continuous full length piano hinge or two (three for doors over 36” high) semi-concealed, heavy-duty, pin type hinges. Doors shall be secured with captive, quick acting machine screw fasteners and shall be arranged to completely cover all live parts whether the draw out unit is present or not.

J. Bus Bars:

1. Main horizontal bus bars rated as indicated on Drawings but not less than 600 amperes shall be provided at the top or center of the control center and extend its entire length, except when cut and supplied with splice bars to divide the control center for ease in handling or when section is indicated on Drawings to be furnished without bus.

2. Horizontal bus bars of copper shall be mounted edge-to-edge to provide greater mechanical strength.

3. Vertical copper bus bars shall be rated not less than 300 amperes for adequate current carrying capacity in a variety of plug-in applications.

4. Horizontal and vertical bus bars shall be electrolytically tin plated copper. Connections between horizontal and vertical busses shall be joined by bolts, conical spring washers for constant pressure joints and self-clinching nuts to allow joint maintenance from the front.

5. High strength glass reinforced alkyd insulators shall be used as bus supports and as unit plug-in insulators. Bus and plug-in insulators shall be red to indicate the proximity of energized bus parts.

6. The temperature rise, above ambient temperature outside the enclosure, of bus bars and connections shall not exceed 50°C and that of connections to insulated cable shall not exceed 45°C when operated continuously at rated current. Buswork, wiring and equipment shall be rated to withstand short circuits of 65000 rms symmetrical amperes at 480 volts or as noted on the Drawings.
7. A copper ground lug shall be provided in each incoming line vertical section capable of accepting a #8 to 250 MCM cable. A horizontal and vertical copper ground bus shall be provided in each section of the motor control center. Horizontal ground bus shall run continuously throughout the control center except where splits are necessary for ease of shipment and handling; in which case, splice bars shall be provided. Ground bus shall be tin plated copper and have a cross-sectional area of equal to 28% of the main horizontal bus cross-sectional area. Horizontal ground bus shall be located at the bottom of the motor control center.

8. Where required, a full rated tin-plated copper neutral bus shall be provided.

K. Bus Barriers:

1. Insulated horizontal and vertical bus barriers shall be furnished to reduce the hazard of accidental contact. These barriers shall have a red color to indicate proximity to energized busses. Vertical bus barriers shall have interlocking front and back pieces to give added protection on all sides and shall segregate the phases from each other. Small, separate openings in the vertical bus barriers shall permit unit plug-in contacts to pass through and engage the vertical bus bars.

2. Bottom bus covers shall be provided below the vertical bus to protect the ends of this bus from contact with fish tapes or other items entering the bottom of the enclosure. Unused plug-in openings shall have plastic snap-in closing plates.

L. Unit Plug-In:

1. Unit plug-in contacts shall be provided for size 1 through size 5 motor starters and for branch circuit breakers.

2. The plug-in connection shall be 2-point connection for each phase designed to tighten during heavy current surge. The plug-in fingers shall be tin plated to yield a low resistance connection and shall be backed by spring steel clips to provide high-pressure connection points. Contact fingers shall be mounted in their support so these fingers become floating and self-aligning to allow solid seating onto the vertical bus bars.

M. Unit Doors:

1. Each unit shall have a door securely mounted with hinges, which allow the door to swing open a minimum of 112 degrees. Unit doors shall be fastened to the stationary structure so they can be closed to cover the unit space when the units have been temporarily removed. Unit doors shall be held closed with captive type screws, which engage self-aligning cage nuts. These screws shall provide at least 2 threads of engagement to help hold unit doors closed under fault conditions. Removable door panels held captive type screws shall be provided on starter unit doors for mounting push buttons, selector switches or pilot lights. Blank door panels capable of accepting future push button devices shall be furnished when push button devices are not originally specified for starter units. Starter units shall have an external low profile overload reset button.
2. Pilot devices and instruments, including push buttons, reset buttons, and indicating lights, shall be flush mounted in the compartment doors. Equipment shall not be mounted on the rear of draw out units. All equipment within the unit shall be arranged to provide ample electrical clearances and easy access for maintenance. Draw out combination starter unit of a given type and size shall be made interchangeable. Only those items, which are common to all starters, shall be mounted in the unit.

3. Where a spare unit is indicated on the Drawings, it shall be a complete combination starter of the type and size shown.

N. Unit Support Pan:

1. Each plug-in unit shall be supported and guided by a tilt and lift-out removable pan so unit rearrangement is easily accomplished. For easy unit installation and rearrangement, transfer of this unit support pan from one location to another shall be accomplished without the use of tools after the unit and door have been removed.

O. Unit Saddles:

1. Each plug-in unit shall have a sheet steel saddle designed to physically isolate the unit from the bus compartment and adjacent units. Saddles shall be equipped with captive, self-aligning mounting screws, which hold the unit securely in place during shipment and maintain the unit and structure at the same potential. Handholds shall be provided on each plug-in unit to facilitate unit removal.

P. Disconnect Operator:

1. A flange mounted operator handle shall be supplied for each switch or breaker. To prevent false circuit indication, this mechanism shall be engaged with the switch or breaker at all times regardless of unit door position. The operator handle shall have a conventional up-down motion with the down position as ‘OFF.” It shall be possible to lock this handle in the “OFF” position with up to three 3/8” diameter shackle padlocks. The operator handle shall be color coded to display red in the “ON” position and black in the “OFF” position.

2. The operator handle shall be interlocked with the unit door so the disconnect cannot be switched to the “ON” position unless the unit door is closed. It shall be possible to defeat this interlock by a deliberate act of an electrician should he desire to observe the operation of the operator handle assembly. This interlock shall also prevent opening the unit door unless the disconnect is in the “OFF” position. A defeater for this action shall also be provided in the event an electrician must gain access to the unit without interrupting the service.

Q. Starter Units:

1. Starter units shall be completely draw out Type B, sizes as indicated on the Drawings, so units may be withdrawn without disconnecting any wiring. Units over three space units high may be bolt-in type. A positive guidance system shall be provided to assure proper alignment of wedge-shaped power stabs in dead-
front openings in vertical power bus. The screw racking mechanism shall serve as a mechanical advantage to the operator during unit insertion or removal. Stab-in power terminals shall be of a type that will increase contact pressure on short circuits.

2. All starter units shall be rated to withstand short circuits of 65,000 rms symmetrical amperes at 480 volts or as noted on the Drawings.

3. All starter units shall be furnished with start counters.

R. Thermal Magnetic Type Circuit Breakers:

1. Thermal magnetic circuit breakers shall have quick-make, quick-break mechanisms and shall visually indicate whether the breaker is closed, open or tripped.

2. All breakers shall have sufficient interrupting capacity to properly close against and interrupt instantaneously, without damage, the maximum short circuit current available at the breaker. Minimum interrupting capacity of breakers shall be 65,000 amps rms symmetrical at 480 volts. Provide auxiliary contacts on the circuit breakers where indicated on the Drawings.

S. Motor Protection Relay: Motor Protection Relay shall be GE Multilin 469.

1. Connect motor winding/stator RTDs, motor bearing RTDs, pump bearing RTDs, pump casing RTD, and ambient temperature RTD for each motor and pump to their associated Motor Protection Relay.

2. Motor Protection Relays shall be provided with an RJ-45 10baseT Ethernet Port for status communication to the Pump Control Panel via Modbus TCP/IP. Motor Protection Relays shall be integrated into the Pump Control Panel to display the information detailed within Specification 17500 at the Pump Control Panel OIT/HMI and the graphics at the Ashburton TCC.

T. AC Magnetic Starters - Line Voltage Type:

1. Motor starters shall be across-the-line magnetic type, rated in accordance with NEMA standards, sizes and horsepower ratings. Starter sizes shall be as indicated on the Drawings.

2. Across-the-line magnetic starters shall be equipped with double-break, silver alloy contacts. All contacts shall be replaceable without removing power wiring or removing starter from panel.

3. Coils shall be of molded construction and shall operate on 120 volts AC. All coils shall be replaceable from the front without removing the starter from the panel.

4. Overload relays shall be eutectic and ratchet type. Thermal units shall be one-piece construction and interchangeable. The starter shall be inoperative if the thermal unit is removed.
5. All motor starters shall be provided with three phase monitors which shall disconnect the corresponding load during single phasing conditions.

U. Electrical Interlocks:

1. All starters shall be furnished with electrical interlocks as shown on the Drawings plus two spare normally open and two spare normally closed contacts. Arrangements shall be convertible from normally open to normally closed.

V. Control Transformers:

1. Provide a control transformer for each motor starter control circuit as indicated on the Drawings. Control transformers for individual control circuits shall be 480 volts to 120 volts and shall be protected according to code. Size shall be as required plus 50VA spare capacity. Primary fuses shall be Class “CC”.

W. AC Magnetic Relays - 600 Volts - Convertible Contacts:

1. All 600 volt ac magnetic relays shall have convertible contacts and shall be rated for 0-600 volts, inductive, 60 ampere make, 6 ampere break, 10 ampere continuous, with a minimum of 4 poles and provision to add up to 4 poles making a total of 8.

2. Contacts shall be double-break, silver. Contacts shall be convertible from normally open to normally closed or vice versa, without removing the relay from the panel or enclosure. Contacts shall be color coded or engraved with respective normally open or closed symbol to indicate status.

3. Coils shall be molded construction, continuous duty rated, and shall operate on 120 volts AC.

4. Terminals shall be provided with pressure wire connectors.

X. General Control Components:

1. Refer to Section 17200 – Control Panels for general requirements for control panel components. The information below shall supplement the information provided within Division 17.

Y. Switches:

1. Selector switches shall be non-illuminated. Switches shall be 30.5 mm, heavy-duty, oil tight. Switches shall have double-break silver contacts. All switches shall be maintained contact type unless otherwise indicated on Drawings. Provide auxiliary contact blocks as indicated on the Drawings or in the Description of Operation.

2. Emergency stop pushbuttons shall be snap type maintained contact, push to open, pull to close, mushroom style switches. Allen Bradley 800 series, or approved equal.
Z. Push Buttons:

1. Push buttons shall be non-illuminated. They shall be 30.5 mm, heavy-duty, oil tight. Contacts rated for 10 amps minimum. Push buttons shall be normally open or normally closed, as required, momentary contact type, unless otherwise noted on the Drawings.

AA. Pilot Lights:

1. Pilot lights shall be LED, transformer type. They shall be 30.5 mm, heavy-duty, push-to-test, oil tight. Voltage rating shall be 120 volts. Color caps shall be red for “run” and green for “stop” or “off”.

BB. Elapsed Time Meters and Timers:

1. Elapsed time meters shall be time totalizer, non-resettable. They shall have a synchronous motor, which shall drive a set of digit readout wheels to indicate the total time the unit is energized. Readout shall be five-digit including 1/10 digit, Range shall be 0 to 9999.9 hours. Voltage rating shall be 120 volts. Elapsed time meters shall be ENM Company Series T50. Time meters shall be mounted inside the bucket with their display through the front panel so the display can be read on the outside face of the bucket.

2. Repeat cycle timers shall be mounted inside the bucket with their display through the front panel so the display can be read on the outside face of the bucket. Timer shall be Allen Bradley Model 700-HXM66SZ24, or approved equal.

CC. Identification:

1. A control center identification number nameplate describing section catalog numbers and characteristics shall be fastened on the vertical wire trough door of every section. Each control center unit shall have its own identification number nameplate giving unit catalog number fastened to the unit saddle near the upper left-hand corner. These nameplates shall also have suitable references to factory records for efficient communication with supplier. Each control center unit shall also have an engraved Bakelite nameplate fastened to the outside of each unit door.

DD. Wiring:

1. The motor control center shall be wired in accordance with NEMA class and type previously specified and shall be furnished to be interconnected with a programmable controller system.

2. All 120 VAC control wiring shall be red. Wiring for 24 vdc PLC inputs shall be blue. All wiring in each MCC cubicle shall be labeled.

3. Quick separating, pull apart terminals shall be mounted on lift-out brackets in the units. All terminals shall be labeled.
EE. Power Factor Correction Capacitor

1. Provide power factor correction capacitor mounted Variable Frequency Drive sections of the Motor Control Center. Power Factor Correction Capacitor shall be sized to correct the power factor when the pump is operating in Bypass mode to between .9 and .92. The Power Factor Correction Capacitor shall only be engaged in the circuit while the pump is operating in Bypass mode.

FF. Finish:

1. All painted parts shall undergo a phosphatizing prepainting treatment for rust resistance and good paint bond. All painting shall be with enamel, which shall be baked for a durable, hard finish. Unit saddles shall be painted white for easy interior visibility. Removable push button plates, flange mounted operator handles and trim plates, and top horizontal wire trough cover plates shall be painted a contrasting charcoal gray. Other painted parts shall be painted ANSI-49 dark gray.

2. All unpainted parts shall be plated for resistance to corrosion.

2.02 SPARE PARTS

A. Provide the following spare parts for the motor control center:

1. 10 Pilot lights of each color provided with special tool to remove bulb
2. 4 Fuses for each type and size utilized
3. 1 Complete solid State Starter per motor size
4. 1 complete VFD per motor size
5. 1 type of each elapsed time meter
6. 1 of each type of switch contact block
7. 1 of each type of control relay
8. 1 digital meter
9. 2 of each type of Surge Protective Device
10. 2 of each type of disconnect operators
11. 4 Control Power Transformers of each type
12. 4 Switches of each type
13. 10 Pushbuttons of each type
14. 1 Set of overload heater per starter
15. 1 Starter contract kit of each type
16. 1 Current limiter fuse of each type
17. 2 GE Multilin 469 motor protective relays with case.

B. Spare parts shall be packaged individually in boxes that are clearly labeled with part name and manufacturer’s part/stock number.

PART 3 - EXECUTION

3.01 FIELD SERVICES

A. Start-up and Testing:

1. Test the operation of each motor starter and all MCC controls.
2. Program the automatic transfer switch and test the operation of the transfer switch with the dual services or emergency generator as appropriate.
3. All start-up and testing shall be performed in the presence of the Owner and the Engineer.
4. Test the main-tie-main automatic throwover system where provided.

B. Training:

1. Refer to Specification 01735 for training requirements. Training shall include theory of operation, maintenance and troubleshooting procedures, and programming methods. Start-up/testing activities and training activities shall be conducted on different days.

3.02 INSTALLATION

A. Anchor each motor-control center assembly to steel-channel sills arranged and sized according to manufacturer's written instructions. Attach by bolting. Level and grout sills flush with motor-control center mounting surface.

B. Install motor-control centers on concrete bases. Coordinate size and location of concrete bases. Verify structural requirements with Structural Engineer.

END OF SECTION
SECTION 17110

VARIABLE FREQUENCY CONTROLLERS

PART 1 - GENERAL

1.01 REFERENCES

A. The Variable Frequency Controller (Drive) shall be designed to meet the following specifications:
   1. NFPA 70 - US National Electrical Code
   3. NEMA 250 - Enclosures for Electrical Equipment
   4. UL 508A - Underwriters Laboratory
   5. CAN/CSA-C22 No. 14-M91. -Canadian Standards Association,
   6. IEC 146 - International Electrical Code,

B. The Drive shall conform to the following regulatory requirements:
   1. NFPA 70
   2. IEC 146
   3. C-UL marking to provide an approved listing for both United States and Canadian users,
   4. Listed and classified by Underwriter’s Laboratories (UL) as suitable for the purpose specified and indicated,

1.02 QUALIFICATIONS

A. Manufacturer: Only manufacturers with a minimum of 10 years experience specializing in the design and manufacturing of PWM Drives shall be acceptable manufacturers.

B. Support: Only manufacturers who have maintained factory trained and authorized service facilities within 100 miles of the project and have a demonstrated record of service for at least the previous three years shall be acceptable manufacturers. Full-time support personnel shall be employed by the manufacturer.

C. Certification: Only manufacturers certified to ISO-9001 Series of Quality Standards with drive products manufactured in an ISO certified facility to assure all quality and corrective action procedures have been adhered to shall be acceptable manufacturers.
D. Equipment Warranty and Certification Form: In addition to submitting working drawings for the specified equipment, the Contractor shall obtain and submit to the Engineer certification from the equipment manufacturer that the specified equipment meets the requirements of the contract specifications. This certification shall be provided by way of the Equipment Warranty and Certification Form included in Section 01780.

1.03 REGULATORY REQUIREMENTS

A. The Drive shall conform to requirements of NFPA 70.

B. The Manufacturer shall furnish the product as listed and classified by Underwriter’s Laboratories as suitable for the purpose specified and indicated.

C. The Drive shall be identified with the C-UL marking to provide an approved listing for both United States and Canadian users.

D. The Drive shall conform to the requirements of IEC 146.

E. The Drive shall be designed to conform to the EN/CE requirements.

F. The Drive shall conform to the requirements of IEC 801.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Variable Frequency Controllers shall be by Square D with internal 4.3% impedance DC choke and external 5% line reactor, or approved equal by Rockwell Automation or Benshaw.

B. The Variable Frequency Controller with solid-state by-pass starter shall be mounted in the MCC as shown on the drawings and shall meet the full load ampere requirements of the pump motors provided.

C. The Drive shall have manual bypass capability using a solid-state reduced voltage starter with power factor correction. The solid-state reduced voltage starter shall be by Square D, or approved equal by Rockwell Automation or Benshaw.

D. Variable Frequency Controller shall be complete with enclosure, circuit breaker disconnect, control transformer, HOA switch, and associated control components and pilot lights to provide required control.

E. All engineering modifications required to meet the specifications and drawings shall be provided by the manufacturer only. Modifications performed by third parties shall not be accepted.

2.02 DESCRIPTION

A. Only drives suitable for operating the indicated loads shall constitute an acceptable product offering. The Drive shall conform to all requirements of NEMA Specification ICS 3.1. The Drive shall fit in the space shown on the drawings.
2.03 RATINGS

A. The Drive shall accept an input voltage plus or minus 10 percent.

B. For drives rated greater than five (5) horsepower, the displacement power factor shall range between 1.0 and 0.95, lagging, over the entire speed range.

C. Efficiency: minimum of 97% at full load and speed.

D. Environmental Ratings
   1. Storage ambient temperature range: -40 C to 70 C (-40 to 158 F).
   2. Operating ambient temperature range: 0 C to 40 C (0 to 109 F) without derating.
   3. The relative humidity range is 5% to 95% non-condensing.
   4. Operating elevation: up to 1000 Meters (3,300ft) without derating.

E. Output power Ratings
   1. The output voltage shall be adjustable from 0 to rated motor voltage.
   2. The output frequency range shall adjustable from 0 to 60Hz.
   3. The inverter section shall produce a pulse width modulated (PWM) waveform using latest generation IGBTs.

F. Sizing
   1. Loads shall be as required to serve the equipment provided.
   2. Normal duty shall provide 110 percent overload capability for up to one minute and 150 percent overload capability for up to three seconds.
   3. Heavy duty shall provide 150 percent overload capability for up to one minute and 200 percent overload capability for up to three seconds.
   4. Normal duty shall be provided unless otherwise indicated.

G. Definitions
   1. The Drive Unit shall refer to the actual drive that will be mounted within the specified enclosure.
   2. The Drive System shall refer to the drive unit and all items specified under Drive System Options.
2.04 DRIVE UNIT DESIGN

A. Hardware
1. Utilize diode or fully gated bridge on the input.
2. Utilize line reactor on all ratings.
3. Utilize switching logic power supply operating from the DC bus.
4. Incorporate phase to phase and phase to ground MOV protection.
5. Utilize gold plated plug-in connections on printed circuit boards.
6. Microprocessor based inverter logic shall be isolated from power circuits.
7. Utilize latest generation IGBT inverter section.
8. Inverter section shall not require commutation capacitors.
9. Employ interface common for all horsepower ratings. Interface shall include a LCD digital display, programming keypad and operator key options.
10. Main Control Board shall be common for all ratings.
11. Control connection shall be common for all ratings.
12. Common Node Capacitors available on all frames.
13. The drive shall be provided with a module to allow DeviceNet communications.

B. Control Logic
1. Ability to operate a drive with motor disconnected.
2. Provide a controlled shut down, when properly fused, with no component failure in the event of an output phase to phase or phase to ground short circuit. Provide annunciation of the fault condition.
3. Utilize an adjustable PWM carrier frequency within a range of 0-60kHz.
4. Provide either Selectable Sensorless Vector or V/Hz modes.
5. The drive shall be suitable for use on normal duty loads. If specified for normal duty, the drive shall provide 110 percent overload capability for up to one minute and 150 percent overload capability for up to three seconds. Provide multiple programmable stop modes including — Ramp, Coast, DC-Brake, Ramp-to-Hold and S-Curve.
6. Provide multiple acceleration and deceleration rates.
7. All adjustments shall be made with the door closed.
8. The drive shall have an adjustable output frequency up to 60Hz.

C. Power Conditioning

1. The drive shall be designed to operate on an AC line which may contain line notching and up to 10% harmonic distortion.

2. An input isolation transformer shall not be required for protection from normal line transients. If line conditions dictate the use of a transformer, the K factor shall be 4.0 or less.

2.05 DRIVE UNIT FEATURES

A. Control Mode

1. Selectable sensorless vector or V/Hz mode selectable through programming.

2. The sensorless vector mode shall use motor nameplate data plus motor operating data such as IR drop, nominal flux current and flux up time.

3. The volts per hertz mode shall be programmable for programmed fan curve, straight line or full custom patterns.

B. Current Limit

1. Programmable current limit from 0.1 amps to 150% of drive rated amps.

2. Current limit shall be active for all drive states: accelerating, constant speed and decelerating.

3. The drive shall employ PI regulation with an adjustable gain for smooth transition in and out of current limit.

C. Acceleration / Deceleration

1. Accel/Decel settings shall provide separate adjustments to allow either setting to be adjusted from 0 seconds to 3600 seconds.

2. A second set of remotely selectable Accel/Decel settings shall be accessible through digital inputs.

D. Speed Regulation Modes

1. Open Loop

2. Slip Compensation with speed regulation from 0.1 to 0.5 percent

3. Process PI control
E. Speed Profiles

1. Programming capability shall allow the user to produce speed profiles with linear acceleration/deceleration or “S-Curve” profiles that provide changing accel/decel rates.

2. S-Curve profiles shall be adjustable.

F. Adjustments

1. A digital interface shall be used for all set-up, operation and adjustment settings.

2. All adjustments shall be stored in nonvolatile memory (EEPROM).

3. No potentiometer adjustments shall be required.

4. The drive shall provide EEPROM memory for factory default values.

G. Process PI Control

1. The drive shall incorporate an internal process PI regulator with proportional and integral gain adjustments as well as error inversion and output clamping functions.

2. The feedback shall be configurable for normal or square root functions. If the feedback indicates that the process is moving away from the setpoint, the regulator shall adjust the drive output until the feedback equals the reference.

3. Process control shall be capable of being enabled or disabled with a hardwire input. Transitioning in and out of process control shall be capable of being tuned for faster response by preloading the integrator.

4. Protection shall be provided for a loss of feedback or reference signal.

H. Fault Reset/Run

1. The drive shall provide up to nine automatic fault reset and restarts following a fault condition before locking out and requiring manual restart,

2. The automatic mode shall not be applicable to a ground fault, shorted output faults and other internal microprocessor faults,

3. The time between restarts shall be adjustable from continuous to 3 hours.

I. Skip Frequencies

1. Three adjustable set points that lock out continuous operation at frequencies which may produce mechanical resonance shall be provided.

2. The set points shall have a bandwidth adjustable from 0Hz to 60Hz.
J. Run on Power Up

1. A user programmable restart function shall be provided to automatically restart the equipment after restoration of power after an outage.

K. Inertial Ride Through

1. The drive shall respond to a loss of AC input power by adjusting the output frequency to create a regenerative situation in the motor.
2. The regenerated energy shall recapture the mechanical energy and convert it to electrical energy that shall power the drive logic during the power outage.
3. The drive shall retain control of the motor during the power outage.
4. The performance shall be based upon the amount of system inertia and the length of the outage.
5. The amount of voltage drop required to trigger inertia ride through and the level at which regulation occurs shall be adjustable.
6. Inertial Ride Through shall be capable of being enabled or disabled via programming.

L. Fault Memory

1. The last eight (8) fault codes with respective time shall be stored in a fault buffer.
2. Information about the drives condition at the time of the last fault such as operating frequency, output current, dc bus voltage and twenty-eight other status conditions shall be stored.
3. A power up marker shall be provided at each power up time to aid in analyzing fault data.
4. The last eight alarm codes shall be stored, without time stamp, for additional troubleshooting reference.

M. Overload Protection

1. The drive shall provide internal Class 10 or 20 motor overload protection investigated by UL to comply with N.E.C. Article 430.
2. Overload protection shall be speed sensitive and adjustable.
3. A viewable parameter shall store the overload usage.

N. Auto Economizer

1. An auto economizer feature shall be available to automatically reduce the output voltage when the drive is operating in an idle mode (drive output current less than programmed motor FLA). The voltage shall be reduced to minimize flux current in a lightly loaded motor thus reducing kW usage.
2. When the load increases, the drive shall automatically return to normal operation.

O. Terminal Blocks

1. Separate terminal blocks shall be provided for control and power wiring.

P. Flying Start

1. The drive shall be capable of determining the speed and direction of a spinning motor and adjust its output to “pick-up” the motor at the rotating speed.

Q. Inputs and Outputs

1. The standard Input /Output board shall consist of both analog and digital I/O.

2. No jumpers or switches shall be required to configure inputs and outputs. All functions shall be fully programmable.

3. The Input / Output board shall have the following analog inputs as standard:

   a. Minimum quantity or two (2) differentially isolated plus or minus 10V (bi-polar) / 20mA, 9 bit plus sign, by common mode noise rejection. One input shall be provided from the Primary PLC and one input shall be provided from the Secondary PLC. A discrete input shall be provided, as detailed below, to allow for selection of one of the above signals to be used for speed reference / control.

   b. Analog inputs shall be user programmable for a variety of uses including frequency command and process loop input. Analog inputs shall be user programmable for function scaling (including invert), offset, signal loss detect and square root.

4. The Input / Output board shall have the following analog outputs as standard:

   a. Quantity two (2) differentially isolated plus or minus 10V (bi-polar) / 20mA, 9 bit plus sign. One output shall be provided to the Primary PLC and one output shall be provided to the Secondary PLC.

   b. The analog output shall be user programmable to be proportional to one of fourteen process parameters including output frequency, output current, encoder feedback, output power.

   c. Programming shall be available to select either absolute or signed values of these parameters.

5. The Input / Output board shall have the following digital inputs as standard:

   a. Quantity of six (6) digital inputs rated 115Vac

   b. All inputs shall be individually programmable for functions from a list of thirty-one (31) that includes Start, Run, Stop, External Fault, Speed Select, Jog and Process PI functions.
c. One input shall be provided and programmed to allow for selection of the speed reference / control signal from either the Primary PLC or the Secondary PLC as detailed above.

6. The Input / Output board shall have the following digital outputs as standard:
   a. Quantity of two (2) relay outputs, form C (1 N.O. — 1 N.C.)
   b. Contact output ratings shall be 250Vac / 30Vdc (2.0 Amps maximum), resistive or inductive.
   c. Relays shall be programmable to twenty-eight (28) different conditions including Fault, Alarm, At Speed, Drive Ready and PI Excess Error.
   d. Timers shall be available for each output to control the amount of time, after the occurring event, that the output relay actually changes state.

R. Reference Signals

1. The drive shall be capable of using the following input reference signals:
   a. Analog inputs
   b. Preset speeds
   c. Remote potentiometer
   d. Digital MOP
   e. Human Interface
   f. Communication module commands

S. Loss of Reference

1. The drive shall be capable of sensing the following reference loss conditions.

2. In the event of loss of the reference signal, the drive shall be user programmable to the following:
   a. Fault the drive
   b. Alarm and maintain last reference
   c. Alarm and go to preset speed
   d. Alarm and go to minimum speed
   e. Alarm and go to maximum speed .Alarm and maintain last output frequency
T. Metering

1. The following parameters shall be accessible through the Human Interface:
   a. Output Current in Amps
   b. Output Voltage in Volts
   c. Output Power in kW
   d. Elapsed MWh
   e. DC Bus Voltage
   f. Output Frequency
   g. Last eight (8) faults
   h. Elapsed Run Time

U. Faults

1. Fault information shall be accessible through the Human Interface.

2. At a minimum the following faults shall be displayed:
   a. Power Loss
   b. Undervoltage
   c. Overvoltage
   d. Motor Overload
   e. Heat Sink Over-temperature
   f. Maximum Retries
   g. Phase to Phase and Phase to Ground Faults

2.06 DRIVE SYSTEM OPTIONS

A. Enclosure

1. NEMA 1G with washable metal mesh filters on the outside of the enclosure door and over all other vented openings.

2. Paint: Manufacturer’s standard.

3. Top entry and bottom exit for power cables.
4. Provide a 6.25” x 2” door mounted white lamacoid nameplate with black letters (message to be defined during submittal).

5. UL Label for UL panel recognition.

B. Drive System Input Circuit Breaker

1. Provide a door interlocked motor circuit protector disconnect.

2. Operator Handles:
   a. Provide flange mounted operator handles for free standing units.
   b. Provide through the door operating handles for wall mounted units.
   c. Handles shall be pad lockable.

C. Drive Input Line Reactor

1. Provide a drive input line reactor mounted within the drive system enclosure.

2. The line reactor shall meet the following specifications:
   a. The construction shall be iron core with an impedance of (3) percent.
   b. The winding shall be copper wound.
   c. The insulation shall be Class H with a 115 degree C rise.
   d. The unit shall be rated for system voltage and frequency.

D. Manual Bypass with Reduced Voltage Starting

1. Provide means to manually switch a single motor from drive control to bypass (across the line) operation with soft start.

2. Provide Allen-Bradley SMC Flex solid state motor controller to provide soft start and smooth acceleration capability when first switching to bypass operation and smooth deceleration when stopping in bypass.
   a. Microcomputer shall analyze the motor variables and generate control commands that control the motor to reduce the possibility of surges occurring in the system.
   b. The starting time shall be adjustable from 2 to 30 seconds.
   c. The stopping time shall be adjustable from 2 to 120 seconds.

3. Provide separate contactors for drive output, 5MG Flex output and total bypass. The total bypass contactor shall be utilized to bypass the SMC Flex once the motor is up to speed and shall be capable of starting and operating the motor if so wired in the field. The contactors shall be electrically interlocked.
4. Provide a door-mounted VFD/Bypass selector switch and pilots lights for indication of VFD and Bypass modes of operation.

5. Provide a Class 10 overload for motor protection while operating in the bypass mode.

E. Control Power Transformer

1. Provide a control power transformer mounted and wired inside of the drive system enclosure to supply sufficient control power for the VFD, the bypass controller and auxiliary instruments (pressure switches, etc.), as shown on the drawings.

2. The transformer shall be rated for drive, bypass and auxiliary instrument power plus 250VA spare capacity for future customer use.

F. Common Mode Choke

1. Provide a common mode choke at the drive output to help, in conjunction with the proper grounding techniques, reduce or eliminate interference with sensitive electronic equipment or communication devices installed in the same system.

G. Auxiliary Relays

1. Provide relays for Drive Alarm, Drive Fault and Drive Run.

2. Provide (2) additional relays to be wired per custom requirements.

3. The relays shall be Allen-Bradley 700HC24A1 relays (2 form C contacts, 2N.O. & 2N.C.). The relay contacts shall be rated for 115VAC/30V DC, 5.0 Amp resistive, 5.0 Amp inductive.

H. Control Interface

1. The control terminals shall be rated for 115V AC.

2. Inputs shall be optically isolated from the drive control logic.

3. The control interface card shall provide input terminals for access to fixed drive functions that include start, stop, external fault, speed, and enable.

I. Hand-Off-Auto Selector Switch

1. Provide a “Hand/Off/Auto” selector switch for start-stop control.

2. Provide pilot lights for indication of the “Hand” and “Auto” modes.

3. The devices shall be Allen-Bradley Bulletin 800T pilot devices (30mm, NEMA Type 4/4X/13) mounted on the drive system enclosure door.
J. Pilot Lights

1. Provide pilot lights, mounted on the enclosure door, for indication of Control Power On, Run, Stop and Drive Fault.

2. Pilot lights shall be LED illumination type, heavy duty, 30.5mm with push-to-test lamp test option provided and wired. Pilot lights shall be suitable for use with universal 12-130V DC/AC power, and provided with translucent shrouds to allow for configuration of the light in the appropriate color. Generally, color caps shall be red for “run” and green for “stop” or “off”. Unused colored shrouds shall be provided to the County to allow for future customization and configuration of pilot light colors as desired or required by the County.

3. Pilot Lights shall be Allen-Bradley Bulletin 800T, NEMA Type 4 or 4X as required, or approved equal.

K. Motor Run Time Meter and Event Counter

1. Provide a digital, non-resettable, door-mounted elapsed time meter.

2. The meter shall be electrically interlocked with the Drive Run relay and Bypass contactor (if required) to indicate actual motor operating hours.

3. Provide resettable door mounted event counter.

L. Human Interface Module

1. Provide a door mounted Human Interface Module with integral display, operating keys and programming keys.

2. The Human Interface shall be rated IP66 / UL Type 4X, 12.

3. The display portion shall have the following features:

   a. The display shall be a seven (7) line by twenty-one (21) character backlit LCD display with graphics capability.

   b. The display shall show drive operating conditions, adjustments and fault indications.

   c. The display shall be configured to display in three distinct sections.

      1) The first section shall be a status display for direction, status, fault / alarm conditions and Auto / Manual mode.

      2) The second section shall display drive output frequency.

      3) The third section shall be configurable as a display for either programming menus / information or as a two-line user display for two additional values utilizing scaled units.
4. The Human Interface shall provide digital speed control.

5. The keypad shall include programming keys, drive operating keys (Start, Stop, Direction, Jog and Speed Control), and numeric keys for direct entry.

6. All programming interfaces, including but not limited to the panel mounted HMI, shall be password protected to prevent unauthorized use of programming keys. Password criteria shall be coordinated with the County and City.

PART 3 - EXECUTION

3.01 QUALITY CONTROL

A. The vendor’s manufacturing facility shall be certified to the ISO-9001 series of standards from the International Standards Organization.

B. Incoming material shall be inspected and/or tested for conformance to all specifications. The manufacturer shall employ a vendor certification program to assure the quality of incoming materials.

C. All subassemblies shall be inspected and/or tested for conformance to specifications.

D. All control printed circuit boards shall be dynamically tested for a minimum of 22 hours while heat cycled one hour at each temperature setting from 0 degrees C {32 degrees F} to 60 degrees C {140 degrees F}.

E. All drives shall be subjected to a Run-In Test with a properly sized motor and operated under cycling load conditions on a dynamometer. The Drive shall be subjected to a Run-In Test that brings the Drive to full rated temperature.

F. All drives shall be Qualification Tested and must meet at least minimum testing for shorted output, capacitive coupling, chattering relay and showering arc.

G. The drives shall carry an all-inclusive, five-year parts and labor warranty from the manufacturer, and the warranty shall include travel and all other miscellaneous expenses.

3.02 COMMISSIONING

A. Start-Up Commissioning Services

1. Start-up will be performed at the user’s site. The service division of the VFD manufacturer shall perform all start-up services. VFD manufacture shall provide a minimum of two (2) days of on-site start-up service for each VFD. The use of third party supplier start-up personnel is not acceptable.

2. The installation contractor shall coordinate with the supplier to provide the following:

   a. A pre-installation meeting with the user to review:
1) Review site ready condition checklist provided by the VFD manufacturer and completed by the installation contractor.

2) The start-up plan

3) The start-up schedule

4) The drives installation requirements

b. Inspect the drives mechanical and electrical devices enclosed.

c. Perform a tug test on all internal connections within the drive and verify wiring.

d. Verify critical mechanical connections for proper torque requirements.

e. Verify and adjust mechanical interlocks for permanent location.

f. Confirm all sectional wiring is connected properly.

g. Re-verify control wiring from any external control devices.

h. Set up all drive internal power supplies and thyristor control circuits.

i. Verification of proper phasing from isolation transformer to drive.

j. Confirm cabling of drive to motor, isolation transformer and line feed.

k. Perform Megger test.

l. Apply voltage to the drive and perform operational checks.

m. Bump motor and tune drive to the system attributes. (If the load is unable to handle any movement in the reverse direction, the load should be uncoupled prior to bumping the motor for directional testing.)

n. Run the drive motor system throughout the operational range to verify proper performance.

3.03 STANDARD TESTING

A. The following tests shall be carried out in accordance with applicable requirements and/or specifications of Canadian Standards Association (CSA), Underwriters Laboratories (UL), National Electrical Manufacturers Association (NEMA), European Standard (EN), and International Electrotechnical Commission (IEC).

B. Functional checks shall be performed wherever possible; otherwise, inspection and continuity checks shall be made.

C. Component devices shall be functionally operated in circuits as shown on electrical diagrams or as called for by specific test instructions.
D. Instruments, meters, protective devices and associated controls shall be functionally tested by applying the specified control signals, current and/or voltages.

E. Drives shall be inspected for the following:

1. Control power failure test.
2. Rectifier gating checks.
3. Inverter gating checks.
4. Line converter tests.
5. Machine converter tests.
6. Load tests.
   a. Drives shall be accelerated to the test motor’s nominal frequency, under load, decelerated to 10 Hz, then accelerated back to test motors nominal frequency, with a ramp time of approximately ten seconds. This cycle shall be repeated continuously for up to one hour.
   b. Drives shall be tested under load at the test motor’s nominal frequency.

3.04 PHYSICAL INSPECTION

A. The product must meet all applicable engineering and workmanship standards and specifications. All components shall be verified against engineering documentation to be present and correctly installed.

B. Warning plates, isolation barriers, and mechanical interlocks must provide sufficient safety/isolation for personnel and equipment.

1. Warning labels and nameplates must be present and in their specified positions to advise personnel of possible hazards.

2. Isolation barriers must be in place within the cabinet. Such barriers protect personnel from touching live components in an area that otherwise does not have power supplied to it.

3. Operation of isolation switch handle and door interlocks must be verified. The interlocking prevents the opening of any medium voltage door on a medium voltage cabinet when the isolation switch handle has been moved to the full ON position.

C. All bus and bus connections shall be checked for proper clearance, creepage, phasing, and torque.
3.05 WITNESS TESTING

A. VFD supplier shall make the VFD available for witness testing by the Owner’s representatives. Witness test shall include a drive system run test that shall consist of operating the variable frequency drive connected to a dynamometer. During the testing of the drive, a demonstration of the operator interface and functionally will be provided as well as demonstration of the operation of the drive. The drive will be tested up to rated horsepower at both steady state and varying speeds. VFD supplier shall notify the County and Engineer (8) weeks in advance of testing date. At the conclusion of testing, the owner’s representative will convene with the VFD manufacturers Application Engineer or Project Manager to discuss any concerns or issues that arose during the test. Any modifications or changes requested by the Owner will be addressed at this meeting.

B. A review of the electrical and mechanical drawings for the purchased equipment shall be done with the Suppliers Application Engineer or Project Manager prior to commencing the tests. Any questions or clarifications, prior to commencing the test, will be addressed at this time.

C. A Certified Test Report shall be issued to the Purchaser at the conclusion of the testing.

3.06 SPARE PARTS

A. Spare Parts
   
The following spare parts shall be included in the bid and supplied to the County. Also, the address of the supplier’s closest parts stocking location to the County shall be provided.

   VFD QUANTITY: 2 complete spare VFD unit
   VFD KEYPAD QUANTITY: 1 per furnished VFD
   VFD CONTROL BOARD QUANTITY: 1 per furnished VFD
   EACH FUSE TYPE USED QUANTITY: 6 per furnished VFD
   MANUFACTURER’S SOFTWARE QUANTITY: 2 copies of software and 1 spare cable for each type of communication device
   HUMAN INTERFACE MODULE QUANTITY: 2 per furnished VFD
   DRIVE SYSTEM INPUT BREAKERS QUANTITY: 3 per furnished VFD
   DRIVE INPUT LINE REACTORS QUANTITY: 3 per furnished VFD
   CONTROL POWER TRANSFORMER QUANTITY: 3 per furnished VFD
   AUXILLIARY RELAYS QUANTITY: 3 per furnished VFD
   HAND-OFF-AUTO SELECTOR SWITCH QUANTITY: 1 per furnished VFD
<table>
<thead>
<tr>
<th>Equipment</th>
<th>Quantity</th>
</tr>
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<tbody>
<tr>
<td>PILOT LIGHTS</td>
<td>4 per furnished VFD</td>
</tr>
<tr>
<td>MOTOR-RUN-TIME METER</td>
<td>1 per furnished VFD</td>
</tr>
<tr>
<td>EVENT COUNTER</td>
<td>1 per furnished VFD</td>
</tr>
</tbody>
</table>

END OF SECTION
SECTION 17200

CONTROL PANELS

PART 1 - GENERAL

1.01 DESCRIPTION

A. In so far as the requirements are applicable, all control panels, control panel components, and control panel modifications performed under this Contract shall be provided in accordance with this specification. Unless otherwise indicated, all control panels and control panel modifications shall be provided by the System Integrator as defined within Specification 17010 and shall be complete and include all components and wiring as shown on the Drawings and specified herein.

1. New control panels to be provided under this Contract include, but are not limited to, the following:

a. Pump Control Panel
b. Remote Tank Control Panel
c. Telephony Equipment Panel.
d. Data Logging Panel.
e. Cone Valve Control Panels.
f. Control components provided integral to the MCC.

2. The existing Pump and Remote Tank Control Panels shall be removed and turned over to the City.

3. Work to the Pump Control Panel include, but are not limited to:

a. Development of programming for the PLC, associated OIT/HMI, and communication modems.
b. Installation of PLC CPU unit
c. Provision of Ethernet Switch for integration of the Multilin 469 Motor Protection Relays into the PLC.
d. Provision of 24 VDC Power Supply, UPS unit, and associated Batteries.
e. Provision and programming of communication modems and integration of the new Verizon wireless telephony equipment into the new modems/routers.
f. Integration of signals for the Pumps, VFDs, and Cone Valves from new MCC into the PLC and Auxiliary Operation Control Loops.

g. Integration of limit switches for the elevated storage tank altitude valve.

4. Work to the Remote Tank Control Panel include, but are not limited to:

a. Development of programming for the PLC and communication modems.

b. Installation of PLC CPU unit


d. Provision and programming of communication modems and integration of the new Verizon wireless telephony equipment into the new modems/routers.

e. Integration of SCADA communication with the Sparks Water PS.

B. Requirements of control components identified in this section apply to the entire project and not limited to any particular local control panel. Request for substitutions shall conform to requirements as identified in Section 01000.

C. Furnish all labor and materials required for providing remote access and I/O communication between the stations as shown within the Contract Documents. Data links are currently provided between the Sparks Elevated Storage Tank, the Sparks Pumping Station, and the Telemetry Control Center at the Ashburton Water Filtration Plant. The Contractor is responsible for the configuration of the modems and coordination with the telecom provider to ensure that all modems are correctly configured and installed to provide transmission and reception of all currently existing I/O and all additionally specified I/O.

1.02 QUALITY ASSURANCE

A. Regulations and Standards:

UL Underwriters’ Laboratories
NEC National Electrical Code
NEMA National Electrical Manufacturers Association
ANSI American National Standards Institute
IEEE Institute of Electrical and Electronic Engineers
ISA Instrument Society of America

B. The control panel components shall be of the most current and proven design. Specifications and Drawings call attention to certain features but do not purport to cover all details entering into the design of the control panels. The components provided by the System Supplier shall be compatible with the functions required and shall form a complete working system.

C. The control panels shall be UL listed as a complete assembly in accordance with UL-508A.
D. Guarantee

1. Control panels shall be guaranteed in writing for defects in materials and workmanship for a period of two years from the date of substantial completion. The warranty shall be comprehensive, and shall include all parts, labor, travel and other miscellaneous expenses.

1.03 SUBMITTALS

A. General:

1. Submit in accordance with Section 01000.

B. Shop Drawings:

1. Submit shop drawings on the control panels in accordance with the requirements of Section 01000, 16010 and 17010. Shop drawings shall be complete in all respects and shall include a complete bill of material, catalog information, descriptive literature for all components, UPS load studies, wiring diagrams, and panel layout drawings showing dimensions to all devices.

PART 2 - PRODUCTS

2.01 CONTROL COMPONENTS

A. Programmable Logic Controller

1. The new CPU shall be M580 processor with hot standby process from Modicon/AEG Schneider Automation. No substitutions shall be allowed. Refer to specification section 17400 for additional requirements for the PLCs and OITs.

2. Prior to being installed or implemented on field equipment, the final modified program shall be simulated on the new PLC CPU. Complete closed loop checks shall be performed for all I/O to verify complete functionality of the new PLC CPU. Following installation and field testing, the final program shall be copied onto the spare PLC CPU which will then be turned over to the City.

B. Control Panel Enclosure:

1. Control panel enclosures shall be designed and sized in accordance with the requirements of the Drawings and as specified herein.

2. Where required, additional freestanding enclosures shall be NEMA 12, constructed of Type 316 stainless steel with continuously welded seams. Panel shall have piano type hinged, overlapping doors with neoprene gasket. Enclosure doors shall be equipped with a heavy-duty 3-point latching mechanism operated by a padlocking handle.

3. Where required, additional wall mounted enclosures shall be NEMA 12, constructed of 14 gauge Type 316 stainless steel with continuously welded seams. Panel shall have piano type hinged doors with neoprene gasket.
4. The control panel components shall be properly identified with an engraved nameplate mounted on the inside of the panel. All components not mounted on the front of the panel shall be mounted to a subpanel. All wiring shall be installed in a neat workmanlike manner and shall be grouped, bundled, supported and routed horizontally and vertically to provide a neat appearance. All wires leaving the panel shall be terminated at the terminal strips inside the enclosure. Terminals and wires shall be identified in accordance with the Supplier’s panel wiring diagrams.

5. Provide a copper grounding plate inside the control panel for terminating all ground wires.

6. Provide a plastic data pocket inside the control panel.

C. Enclosure Light Fixture:

1. Light fixture(s) shall be low profile LED light strip design with the appropriate location and quantity of light fixtures to ensure adequate and full illumination of enclosed components but no less than what is required to span across two-thirds width of the panel. Individual light fixtures shall have an operating temperature of -22 to 140 degrees Fahrenheit, provide 900 LM illumination, and have 5 watt power draw. The light fixture shall be Hoffman Part Number LED24V15 with appropriate power supply for installation in unclassified environments or Hoffman Product Series LEDHL24V for installation in classified environments or approved equal.

D. Enclosure Cooling Fan and Exhaust Grills:

1. Provide a cooling package for the control panel. The cooling system shall be sized to keep the panel temperature below the maximum operating temperature of the equipment housed. A thermostat located in the control panel shall control the cooling system. The cooling system shall be Hoffman, or approved equal.

E. Control Circuit Breakers:

1. Circuit breakers shall be quick-make, quick-break thermal magnetic molded case type individually mounted and identified. Circuit breakers shall be Allen-Bradley Bulletin 1492-CB, or approved equal by Moeller.

F. 120 VAC Uninterruptible Power Supply (UPS):

1. Provide 120VAC Tower UPS units for the Pump Control Panel and Remote Tank Control Panel.

2. UPS units shall be furnished with an alarm contacts to indicate when the UPS is operating on battery power and when the UPS has failed or requires maintenance. Alarms shall be monitored by the PLC’s.

3. UPS units shall have built-in USB port and six (6) built in UPS supported outlets. UPS units shall include the optional bypass (PDU) that enables replacing the UPS with a ‘hot-swappable’ replacement unit with no disruption to connected equipment.
4. The UPS shall be Tripp Lite Model BCPRO. No substitutions shall be accepted.

G. 24 VDC Uninterruptible Power Supply (UPS) and Batteries:

   1. Provide 24 VDC UPS units as indicated for each group of equipment on the drawings and as specified within the individual equipment specifications.

   2. The UPS shall be din-rail mounted and furnished with an alarm contact to indicate when the UPS is operating on battery power and when the UPS has failed or requires maintenance. Alarms shall be monitored by the Pump Control Panel PLC’s.

   3. UPS Batteries shall be valve regulated, spill proof construction, allowing safe operation in any position. Batteries shall have rugged impact resistant ABS case and cover (UL94-HB) and shall be UL recognized.

   4. UPS shall be rated for 0 Amps to 15 Amps output current at 24 VDC. Batteries shall be 12 VDC with 40 Amp-Hours of capacity.

   5. The UPS shall be rated for 0°C to 60°C and batteries shall be rated for up to 0°C to 50°C.

   6. The UPS shall be SITOP 24 VDC UPS, Model 6EP1 931-2EC42 by Siemens with high temperature battery. Batteries shall be PS-12400 by Power-Sonic Corporation.

H. Unmanaged Ethernet Switch

   1. Provide an unmanaged DIN rail mounted Ethernet switch for installation in the Pump Control Panel to expand the number of available RJ-45 Ethernet ports and allow for integration of the Multilin 469 Motor Protection Relay provided for Pump C and power monitoring components provided as part of the Automatic Transfer Switch and the MCC into the PLC at the existing Pump Control Panel. Switches shall have the following characteristics:

      a. Input Power: Redundant 10-30 VDC
      b. Humidity: 10% to 95% (Non Condensing)
      c. Operating & Storage Temperature: -40°C to 85°C
      d. Mean Time Between Failure: >2 Million Hours
      e. Ports: Sixteen (16) 10/100BaseTX RJ-45 Ports.
      f. Humidity: 10% to 95% (Non Condensing)
      g. Operating & Storage Temperature: -40DegC to 85DegC
2. Switch shall have IEEE 802.3 Compliance, ESD and Surge Protection on all Built-in Ports, and have Autosensing 10/100BaseTX, Duplex, and MDIX. Switch shall be provided with a serial configuration port and shall have Bi-Color Status LEDs For Link, Speed, Activity & Duplex. Switch shall be the N-TRON 316TX-N 16-Port Unmanaged Industrial Ethernet Switch by Redlion or approved equal.

I. Selector Switches:
   1. Selector switches shall be 30.5mm heavy-duty non-illuminated. Switches shall have double-break silver contacts. Switches shall be maintained contact type unless otherwise indicated on the Drawings. Provide auxiliary contact blocks on switches where indicated on the Drawings or in the Description of Operation. Provide a gray legend plate for each switch with white marking as indicated on the Drawings. Selector switches shall be Allen-Bradley Bulletin 800T NEMA Type 4.

J. Push Buttons:
   1. Push buttons shall be 30.5mm, heavy-duty, non-illuminated. Push buttons shall have double-break silver contacts. Push buttons shall be momentary contact type) color-coded as indicated on the Drawings. Push buttons shall have flush heads. Provide a gray legend plate for each push button with white marking as indicated on the Drawings. Push buttons shall be Allen-Bradley Bulletin 800T, NEMA Type 4.

K. Pilot Lights
   1. Pilot lights shall be LED illumination type, heavy duty with push-to-test lamp test option provided and wired. Pilot lights shall be suitable for use with universal 12-130V DC/AC power, and provided with translucent shrouds to allow for configuration of the light in the appropriate color. Pilot lights shall have a nominal diameter of 30mm for installation in 30.5mm openings. Unused colored shrouds shall be provided to the County with each control panel to allow for future customization and configuration of pilot light colors as desired or required by the County.

   2. Pilot Lights shall be Allen-Bradley Bulletin 800T, NEMA Type 4/4X and 13 as required, or approved equal.

   3. Pilot Lights for installation in NFPA defined hazardous locations and classified areas shall be Allen-Bradley Bulletin 800H, Type 4, 7, & 9, or approved equal.

L. Relays:
   1. Relays shall be heavy-duty general-purpose type with 10 amp contacts. Relays shall have terminals, which plug-in to a socket, mounted to the inside of the panel enclosure. Terminals for relays having AC coils shall be pin type, and terminals for relays having DC coils shall be blade type with number of poles as required.
2. Relay coils shall operate on 120 volts AC, unless indicated otherwise on the Drawings. Relays shall have an indicator light to indicate the relay coil is energized. Relays shall be Idec RR Series.

3. All main input relays for field devices shall be four pole with outputs assigned as shown on the drawings.

4. All relay inputs, including coil wiring, shall be wired through terminal blocks. All outputs shall be 24 volts to interposing relays. No direct wiring shall be allowed to relays or PLC output cards.

M. Intrinsically Safe Relays:

1. Provide intrinsically safe relays as required by applicable electrical codes.

2. The intrinsically safe relay shall be a single channel repeater with a DPDT set of output contacts and shall operate on 120 volts AC.

3. The intrinsically safe relays shall be Stahl I.S., Isolators Type 9170.

N. Intrinsically Safe Barriers:

1. Provide an intrinsically safe barrier in the control panel as required by applicable electrical codes. The intrinsically safe barriers shall be Stahl, or approved equal.

O. 24 Volt DC Power Supplies;

1. The new 24VDC power supply for the Pump Control Panel shall be DIN rail mounted and shall be integrated with the new UPS and batteries specified above to provide battery backed up 24VDC to the components within the Pump Control Panel. Power Supply shall be capable of receiving 85-132 / 176-264 VAC power (115/230 VAC, Auto Selecting) and providing 24 DC at 10 Amps (240W). Power supply shall be rated for operation from -10°C to 60°C and have a mean time between failures of greater than 600,000 hours. 24 VDC power supply for the Pump Control Panel shall be Model SDN-10-24-100P by Sola or approved equal.

P. Single Level Terminal Blocks:

1. Terminal blocks shall be provided in each control panel for terminating field wiring. All terminal blocks shall be rated for 600 volts AC, and shall be identified with a permanent machine printed marking in accordance with the terminal numbers shown on the panel wiring diagrams.

2. Terminal blocks for 24vdc inputs shall be blue.

3. Provide 20% spare terminal blocks in the control panel.

4. Terminal blocks shall be Allen-Bradley Bulletin 1492-W4, or approved equal.
Q. Two Level Terminal Blocks:

1. Terminal blocks shall be provided in each control panel for terminating field wiring. All terminal blocks shall be rated for 300 volts AC, and shall be identified with a permanent machine printed marking in accordance with the terminal numbers shown on the panel wiring diagrams.

2. Provide 20% spare terminal blocks in the control panel.

3. Terminal blocks shall be Allen-Bradley Bulletin 1492-JD3, or approved equal.

R. Three Level Terminal Blocks:

1. Terminal blocks shall be provided in each control panel for terminating field wiring. All terminal blocks shall be rated for 300 volts AC, and shall be identified with a permanent machine printed marking in accordance with the terminal numbers shown on the panel wiring diagrams.

2. Provide 20% spare terminal blocks in the control panel.

3. Terminal blocks shall be Allen-Bradley Bulletin 1492-JT3M, or approved equal.

S. Fuse Holders

1. Fuse holders shall be provided in each control panel as required. All fuse holders shall be rated for 300 volts AC, and shall be identified with a permanent machine printed marking in accordance with the terminal numbers shown on the panel wiring diagrams.

2. Provide 20% spare fuse holders in the control panel.

3. Fuse holders shall be Allen-Bradley Bulletin 1492-H6, or approved equal.

T. Grounding Blocks:

1. Grounding blocks shall be provided in each control panel as required. All grounding blocks shall be identified with a permanent machine printed marking in accordance with the terminal numbers shown on the panel wiring diagrams.

2. Provide 20% spare grounding blocks in the control panel.


U. Wiring Ducts:

1. Wiring ducts shall be provided to manage path of wire and cable inside the enclosures.

2. Snap-back wire retention to trap wires during installation.
3. UL 94V-0 Flammability Rating, UL Component Recognized.

V. 120VAC TVSS:

1. Surge Suppressors shall be Allen Bradley, or approved equal with the following features:
   a. Max Surge Current: 40 kA/phase.
   c. Connection Method: Parallel, #10 AWG Stranded Wire.
   d. Provided with thermal fusing.
   e. Diagnostics: Green Status LED, Audible Alarm.
   f. UL 1449 2nd Edition Listed.

2. Mount Surge Suppressor inside all control panels.

W. Alarm Lights:

1. Alarm lights shall be continuous intensity, amber, and sealed in a watertight enclosure.

2. Alarm lights shall be Patlite model PS-24 with a rubber gasket, or approved equal.

X. General-Purpose Signal Multiplier

1. General-purpose signal multiplier shall provide isolated input, 2 outputs, and power supply. Device shall split the input signal into 2 output signals. The device shall have the following features: DIN rail mounted, green power LED to indicate that the supply voltage is present; accepts #14-#24 AWG solid or stranded wiring; requires 18-30VDC power supply; and provides 4-20mA input and 2 sets of 4-20mA outputs.

2. General-purpose signal multiplier shall be a Phoenix Contact MCR signal multiplier, or approved equal.

Y. Industrial Backup PSTN and Leased Line Modem

1. Modem shall have the following ports:
   a. One (1) Public Switched Telephone Network (PSTN) Port
   b. One (1) Leased Line (LL) Port
   c. One (1) RS-422/485 Port
d. One (1) RS-232 Port

2. Modem shall be rated for a temperature range of -13° to +158°F and relative humidity, non-condensing range of 5 to 95%.

3. Modem shall be designed to operate from 12 to 48 VDC or 12 to 27 VAC power source.

4. Modem shall provide data rates up to 33.6 kbits/s over both PSTN and 2- or 4-wire lease line circuits and data rates up to 115.2 kbits/s over the RS-422/485 and RS-232 protocols.

5. The Industrial backup PSTN and Leased Line Modem shall be Westermo TD-36 485, LV (Low Voltage) or approved equal.

Z. Wiring:


2. All wiring shall be stranded copper. Control wiring shall be 14 gauge, 600 volt, Type MTW. Power wiring shall be 600 volt, Type MTW, sized as required, splices are not permitted.

3. All analog signal wiring shall be 18 gauge twisted pairs with foil shield and drain wire, with 600 volt, 90°C insulation. Drain wires shall be grounded at one end only.

4. All wiring and terminal strips shall be isolated by voltage levels to the greatest extent possible.

5. All wiring shall conform to the following color code:

   a. 120 volt, 1 phase: Black, White.

   b. 24 vdc: Blue.

   c. 120 VAC Control Wires: Red.

   d. Interlock control circuits energized from external source: Yellow.

   e. Ground Wires: Green.

6. 120 VAC control wires energized from a source external to the control panel power source shall be yellow.

7. Wiring for intrinsically safe circuits shall be purple.

8. All control wiring shall be tagged at each end with a legible permanent coded wire-marking sleeve. Sleeves shall be white PVC tubing with machine printed black marking. Markings shall be in accordance with the wire numbers shown on the control wiring diagrams, and shall match terminal strip numbers.
9. In panels where foreign voltages exist, furnish a highly visible warning label outside the panel with the following words:

   “WARNING: POWER FROM OTHER SOURCES EXIST IN THIS PANEL. THEY ARE IDENTIFIED BY YELLOW WIRE COLOR.”

   Warning label shall be red with white lettering.

AA. Nameplates:

   1. Provide laminated phenolic nameplates on the front of each control panel. Nameplates shall be black with white engraved letters. Engraving shall be as indicated on the Drawings. Minimum size of engraving shall be ¼”.

BB. Spare Parts:

   1. The Contractor shall provide the following spare parts.

      a. Six (6) Selector Switches of each type and model specified and provided.

      b. Ten (10) pushbuttons of each type and model specified and provided.

      c. Ten (10) pilot lights of each type and model specified and provided.

      d. Six (6) Relays and associated sockets of each type and model specified and provided.

      e. Fifty (50) terminal blocks of each type and model specified and provided.

      f. Ten (10) fuses and fuse blocks / holders of each type and model specified and provided.

   2. Provide the following PLC spare parts. Parts shall be used for Factory Acceptance Testing as detailed elsewhere after which they shall be packaged for long term storage, with itemized labels, and then turned over to the City. The Contractor is responsible for protection of any parts and equipment used for testing. Any parts that are damaged or show excessive wear shall be replaced with new equipment at no additional cost or time.

      a. One (1) M580 processor by Schneider Electric.

      b. One (1) 19” Harmony GTU – Smart Display with processing box module by Schneider Electric.

      c. One (1) 24vdc Model 140CPS21400 by Schneider Electric.

      d. One (1) Ethernet 10/100 Model 140NOE77101 by Schneider Electric.

      e. Three (3) 24vdc In Model 140DDI35300 by Schneider Electric.
f. Three (3) Relay out Model 140DRA84000 by Schneider Electric.
g. Three (3) Analog in Model 140ACI03000 by Schneider Electric.
h. Four (4) Analog Out Model 140ACO02000 by Schneider Electric.
i. One (1) Backplane Model 140XBP01600 by Schneider Electric
j. One (1) 16 Port Ethernet Switch Model 316TX-N by N-Tron.
k. Two (2) Modems Model TD36-485 by Westermo.
l. One (1) Bridge/mux Model NWBM8500 by Schneider Automation.

END OF SECTION
SECTION 17300
FIELD METERS AND INSTRUMENTATION

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Furnish and install all instrumentation as specified herein or as indicated on the Drawings. The Supplier shall provide all materials, equipment and appurtenances necessary for the complete and satisfactory installation of all meters and instrumentation.

2. Instrumentation in Division 17 shall be provided by the System Integrator (SI).

3. In addition, the SI shall be responsible for supervising installation, start-up and for implementing all control functions of various other instruments specified to be provided in other sections of this specification. All installed instrumentation is the responsibility of the SI with regard to calibration and control functions.

4. Instrumentation systems shall be furnished and installed complete with all auxiliary power supplies, transformers, resistors, converters, and other accessories required to transmit signals to the various receivers and controllers. Instrumentation systems shall be wired, and all components shall be provided, to enable receivers to be readily taken out of service without affecting signals to other receivers and without the need to install auxiliary resistors.

B. Refer to the P&ID drawings for additional requirements for analog and digital inputs and outputs, and digital communications.

1.02 QUALITY ASSURANCE

A. Regulations and Standards:

UL Underwriters Laboratories
NEC National Electrical Code
NEMA National Electrical Manufacturers Association
ANSI American National Standards Institute
IEEE Institute of Electrical and Electronic Engineers
ISA International Society of Automation

B. All instrumentation equipment supplied shall be of the most current and proven design. Specifications and drawings call attention to certain features but do not purport to cover all details entering into the design of the instrumentation equipment. The equipment provided by the System Supplier shall be compatible with the functions required for the Pump Control System.
C. All necessary fuses and cables required for instrumentation shall be provided with the equipment.

1.03 SUBMITTALS

A. General:
   1. Submit in accordance with Section 01000 and requirements as specified herein.

B. Shop Drawings:
   1. Submit shop drawings on all instrumentation in accordance with the requirements of Section 17010. Shop drawings shall be complete in all respects and shall indicate all dimensions, installation methods, size, weight, capacity, ratings, integral controls and types of materials, elevations, and sections. Submittals shall include a complete bill of material, catalog information, descriptive literature of all components and wiring diagrams.

   2. Deviations from the specifications shall be explicitly identified with the shop drawing. Failure to identify deviations shall be cause for shop drawing to be rejected.

C. Operation and Maintenance Manuals
   1. The Contractor shall provide complete O&M manuals for each type of equipment specified herein, with sufficient content to fully describe the equipment operation and maintenance, including but not limited to, operating data, recommended maintenance schedules, spare parts, replacement parts, start-up procedures, and troubleshooting guides.

D. Certificates
   1. The Supplier shall furnish the Owner with Manufacturer's Certificates certifying that each metering and instrumentation system has been installed and loop tested in a complete and satisfactory manner ready for operation.

   2. Each manufacturer’s representative shall issue a calibration certificate to the Owner and the Engineer for each instrument certifying that the instrument has been calibrated and is ready to be placed into service. The calibration certificates shall indicate the calibrated range or setpoint for each instrument.

1.04 INSTRUMENT TAGGING

A. All field meters and instruments shall be tagged with lamacoid labels prior to shipment from the factory to the site. Untagged instruments shall be shipped back to the manufacturer at the Contractor’s expense.

B. Provide a laminated phenolic nameplate for each instrument. The nameplates shall be black with white engraved letters, and they shall be mounted on the front of each instrument or instrument enclosure, or where applicable attached to the instrument with a plastic wire tie. An instrument nameplate schedule shall be submitted to the Engineer for approval prior to performing any engraving.
PART 2 – PRODUCTS

2.01 SODIUM HYPOCHLORITE FEED SYSTEM

A. A chlorine residual analyzer shall be provided to monitor the free residual chlorine in the station discharge. See Specification Section 15260 – Sodium Hypochlorite Supply System for additional analyzer requirements.

B. Two ultrasonic level sensors and remote mounted transmitters shall be provided, one for each chemical storage tank, to measure the remaining chemical quantity and to allow for triggering of a high tank level alarm. See Specification Section 15260 – Sodium Hypochlorite Supply System for additional level sensor and transmitter requirements.

C. Two high level sensors shall be provided, one in each chemical storage tank, to provide a redundant alarm on high level. See Specification Section 15260 – Sodium Hypochlorite Supply System for additional tank high level sensor requirements.

D. Two leak detection sensors shall be provided, one in each chemical tank containment basin, to alarm upon contact with collected liquid. See Specification Section 15260 – Sodium Hypochlorite Supply System for additional tank leak sensor requirements.

E. A high level float is provided in the secondary containment sump to alarm on sump high level. See Specification Section 15260 – Sodium Hypochlorite Supply System for additional tank high level float sensor requirements.

F. One flow meter shall be provided on the chemical feed pump common discharge to provide confirmation of the chemical feed pump discharge rate and alarm when pumps are running but flow falls below a certain threshold. See Specification Section 15260 – Sodium Hypochlorite Supply System and the below section(s) for additional chemical system flow meter requirements.

2.02 CHART RECORDERS

A. Chart recorders (flow, level, pressure, and chlorine residual) shall be suitable for panel or wall mounting as shown on contract drawings. Chart recorder shall be paper less digital graphic recorder type. Each recorder shall have an intuitive, touch screen display to enable operators to clearly view process data in varying formats. Each Input channels shall be configurable to suit process requirements. All have onboard Flash data storage capability, Ethernet communication and choice of Compact Flash or SD card. Data shall be stored in a tamper-resistant binary format that can be used for secure, long term records of process.

B. Chart recorders features shall include the following:

1. 5.5” ¼ VGA, Color TFT LCD with cold cathode backlight, fitted with resistive, analogue, Touch-Panel

2. Minimum six (6) 4-20 mA input capability and two 4-20 mA output capability
3. Recorders shall have internal Flash memory for secure data storage. 96MB of non-volatile flash memory in local controller. Recorder shall have various removable media types (Compact Flash, SD card or USB memory stick). Data stored within the internal memory can be archived to the removable media on demand or at preset intervals.

4. 125ms parallel sampling

5. Compact Flash or Secure Digital card

6. Ethernet TCP/IP communication capability

7. Power: 120VAC

8. Environmental performance
   1) Operation Temperature limits: 0 to +50°C
   2) Relative Humidity (Operation): 5% to 80% RH

9. Sleeve: IP20

10. Approval: UL approved

C. Industrial Chart Recorder shall be Invensys Eurotherm – model 6100A or approved equal.

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<tr>
<th>Chart No.</th>
<th>Description</th>
<th>Range</th>
<th>Units</th>
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<tbody>
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<td>1</td>
<td>Suction and Discharge Pressures</td>
<td>0-100</td>
<td>PSI</td>
</tr>
<tr>
<td>2</td>
<td>Discharge Flow</td>
<td>0-5.0</td>
<td>MGD</td>
</tr>
<tr>
<td>3</td>
<td>Elevated Storage Tank Level</td>
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<td>FT</td>
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<tr>
<td>4</td>
<td>Free Residual Chlorine</td>
<td>0-3</td>
<td>mg/L</td>
</tr>
</tbody>
</table>

D. Provide the services of a factory technician to perform startup, calibration and training for the chart recorders. Refer to Specification 01735 for training requirements.

2.03 MULTI-CHANNEL DATA RECORDER

A. Provide a multi-channel data recorder for the electronic recording of each of the signals to be recorded on a chart recorder as listed in the Chart Recorder requirements within this specification section. Provide the required multi-channel data recorders in a NEMA 4X, 316 stainless steel enclosure. Provide a battery backup unit to allow for 24 hours of continuous recording in the event that station power is lost.

B. Recorder channels: 6 (pulse/event), 8 (analog), and 16 (alarm/event)

C. Memory: Dynamically allocate memory among active channels; 459,000 (pulse), 614,000 (analog), 152,995 (event)

D. Battery Type: 9-volt lithium battery pack with MTA connector
E. Battery Life: 4 months

F. Local Communication:
   1. Type: RS-232 compatible; optically isolated
   2. Connector: DB-9 compatible with Telog C-ATC cable

G. Environmental:
   1. Clock accuracy: 0.01% (+/-)
   2. Operating temperature: -4 to 140 deg F

H. Data logger shall be Model R3330 by Telog, or approved equal.

2.04 CURRENT LOOP RECORDER

A. Provide single-channel current loop recorder(s) for recording the flow(s) listed in the Chart Recorder requirements within this specification section. Mount data recorder(s) via secure, but easily releasable, mountings located on the interior of the Pump Control Panel door.

B. Range: 1-50 mA standard

C. Resolution: 0.025% of full scale (12 bits)

D. Accuracy: +/- 0.15% of full scale (-25 to 60°C)

E. Loop Voltage Drop: 0.5 volts.

F. Recording:
   1. Sample rate: 4 per second to 1 per 8 hours; programmable
   2. Memory: 128 kbytes; 80,000 data values

G. Communication:
   1. Local RS-232
   2. Via Telog Data Transfer Unit (DTU)
   3. Auto-selected baud rate to 19.2K

H. Battery: 3.6V, 2.1 Ahr AA Lithium, user replaceable.

I. Enclosure:
   1. Material: Polycarbonate
2. Temperature: -40 to 70 C

3. Rating: NEMA 4x (IP65)

J. Current Loop Recorders shall be Model iLR-31 by Telog, or approved equal.

2.05 PRESSURE SENSORS AND TRANSMITTERS

A. A pressure tube (suction and discharge side) shall be drawn from each pump combined to a common manifold as shown on contract drawings. Pressure sensors shall be used for sensing the suction and discharge pressure of each common manifold. Pressure sensors / transmitters shall have the following features:

1. Conduit entries shall be provided and coordinated by the Contractor to allow for leak tight termination of all signal and power cabling.

2. Sensor shall have the following characteristics:
   a. Process Fitting(s): 316L Stainless Steel, ½” NPT
   b. Isolating Diaphragm: 316L Stainless Steel
   c. Sensor Fill Fluid: Silicone
   d. Output Signal: 2-wire, 4–20 mA with Digital Signal Based on HART Protocol
   e. Total Performance Accuracy: 0.14% of span
   f. Range: -14.70 PSIG to 150 PSIG*
   g. Overpressure Limit: 1500 PSI
   h. Ambient Temperature: -40 DegF to 176 DegF
   i. Humidity: 0 to 100% relative humidity
   j. Housing: Low-copper aluminum, NEMA 4X and IP 66/67/68

*Final range to be confirmed in-field and with the product manufacturers. Range shall be indicated for approval within the submittal.

3. Pressure sensor shall have an LCD display, Local Configuration Buttons, and a Local Operator Interface to allow for local configuration and calibration of the unit.

4. Pressure transmitter shall be Model 3051 pressure transmitter by Rosemount, or approved equal. Sensors shall be provided with stainless steel wall mount.
B. Pressure sensor shall be equipped with a bourdon tube pressure gauge with a range approximately twice the design operating pressure:

1. Nominal size = 4½” diameter case
2. Solid front, blow out back, black phenolic turret case.
3. 316-stainless steel bourdon tube & socket.
4. ANSI grade AA accuracy.
5. White dial with black lettering.
7. Liquid filled hermetically sealed case.
8. Acrylic lens.
9. Micrometer adjustable pointer.
10. Teflon coated 400 series rotary movement.
11. Ashcroft # 45-1279SSI-04L or equal.

C. Start up: A factory authorized representative shall be available for the training and start up services as specified in previous sections.

2.06 PRESSURE/LEVEL SENSOR AND TRANSMITTER

A. Contractor shall provide a pressure/level sensor and transmitter in the Altitude Valve Vault at the Sparks Elevated Storage Tank site for measuring the tank level in feet.

B. Conduit entries shall be provided and coordinated by the Contractor to allow for leak tight termination of all signal and power cabling.

C. Sensor shall have 316L Stainless Steel, ½” NPT process fitting and be installed as shown on details in the Contract Drawings.

D. The transmitter shall be a 2-wire, high-performance piezoresistive pressure transmitter with digital communications capabilities including HART.

E. Measure capacitance changes in the sensor as pressure varies and produces a linear 4-20mA DC output proportional to the pressure. The unit shall have self-diagnostic capability and a non-volatile memory.

F. Display shall be an integrally mounted 4-line LCD scaled with engineering units.

G. Transmitter shall have a static pressure limit at least 1.5 times the nominal pressure range. Unit shall use DC loop-power supply 10.5 to 45 VDC with self-diagnostic capability and a non-volatile memory.
H. Sensor shall be a piezoresistive, oil-filled element with metal process diaphragm.

I. The unit shall be rated for process temperature of minus 40°F to 275°F and an ambient environment of minus 40 degrees F to 185 degrees F.

J. Reference accuracy shall be +/- .15% of calibrated span including non-linearity hysteresis and non-reproducibility in accordance with IEC 60770. Total performance accuracy including non-linearity hysteresis and non-reproducibility in addition to thermal change of the zero point shall be +/- .2% URL.

K. Safety:
   
   1. All electrical equipment shall meet the requirements of ANSI/NFPA 70, NATIONAL ELECTRIC CODE, latest edition.
   
   2. All devices shall be certified for use in hazardous areas: Class I, II, III Div. 1, 2, Groups A-G; temperature rating T6 (85° C)
   
   3. Electrical equipment housing shall conform to NEMA 4x/6p classification. Sensor shall also be rated IP68.

L. Pressure/Level sensor and transmitter shall be as manufactured by Endress Hauser, Emerson/Rosemount, or approved equal.

2.07 PRESSURE GAUGES

A. Provide and install pressure gauges on each pump suction and discharge piping.

B. The pressure gauge shall be liquid filled with a process media operating temperature range of -40 degrees F to 220 degrees F. The gauge shall be mounted with 1/2 inch NPT connection.

C. Suction pressure gauges shall be compound type. Discharge pressure gauge shall meet requirements of this section. Pressure gauges shall be installed with a 316 stainless steel, silicone-filled diaphragm seal with flushing connection. Diaphragm seal shall be provided for both suction and discharge gauges and shall be Ashcroft Type 201, or approved equal.

D. General

<table>
<thead>
<tr>
<th></th>
<th>Pump Suction</th>
<th>Pump Discharge</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Size:</td>
<td>4.5” dia.</td>
<td>4.5” dia.</td>
</tr>
<tr>
<td>2. Operating Temperature:</td>
<td>40 to 90 deg. F</td>
<td>40 to 90 deg. F</td>
</tr>
<tr>
<td>3. Operating Pressure:</td>
<td>0 psi to 100 psi</td>
<td>0 to 160 psi</td>
</tr>
<tr>
<td>4. Figure Intervals</td>
<td>10 psi</td>
<td>20 psi</td>
</tr>
<tr>
<td>5. Intermediate Graduations</td>
<td>1 psi</td>
<td>2 psi</td>
</tr>
</tbody>
</table>
E. Pressure gauge shall be ANSI Grade 1A accuracy.

F. Pressure gauge shall be 316 stainless steel as manufactured by Ashcroft Type 1279 with XLL option, or approved equal.

2.08 PRESSURE SWITCHES

A. Provide and install pressure switches as shown on contract drawings. Pressure switches shall be Square D Class 9012, fully adjustable, Type G industrial, diaphragm type or approved equal. Pressure ranges shall be provided for the different applications as listed below. Final range to be confirmed in-field and with the product manufacturers. Range shall be indicated for approval within the submittal.

1. A pressure switch shall be provided for each pump mounted on the piping between the water pumps and cone valves to sense pump discharge pressure and initiate operation of the four-way solenoid valve that is part of the cone valve control system. Pressure Switch Range shall be 3 PSI to 150 PSI.

2. A pressure switch shall be provided on the suction pressure manifold adjacent to the suction pressure manifold pressure transmitter as detailed on the drawings. Pressure Switch Range shall be 3 PSI to 150 PSI.

3. A pressure switch shall be provided on the discharge pressure manifold adjacent to the discharge pressure manifold pressure transmitter as detailed on the drawings. Pressure Switch Range shall be 3 PSI to 150 PSI.

B. Switches shall have the following characteristics:

1. Repeat Accuracy: +/- 0.1% to +/- 1.0%

2. Drift: +/-1.0% of the adjustable range over 1 million operations

3. Process Fitting(s): ½” NPT

4. Contacts Double Pole Double Throw (2 N.O. and 2 N.C.), rated for a minimum of 10 Amps

5. Enclosure: NEMA 4, 4X, and 13

6. Pressure Range: Field Adjustable, Selected Individually for the Applications listed above.

2.09 ELEVATED TANK OVERFLOW SENSOR

A. Overflow sensor shall be provided to detect tank overflows within the elevated tank overflow pipe. Sensor shall be capable of being mounted on a flanged outlet on the overflow piping as indicated on the Drawings.
B. Sensor shall be Endress and Hauser Liquifant FTL51, or approved equal. Part number shall be FTL51-QGM2CB4E5A, or approved equal, where the CB designates the required custom probe length. Provide the services of a factory technician to perform startup, calibration and training for the overflow sensor. Sensor shall be installed to extend to centerline of the overflow pipe.

C. Where the overflow probe is unable to be flange mounted, the remote head version shall be used. The remote electronics shall be located in a probe junction box near the tank center column, or as otherwise directed in the field by the County or Engineer.

D. The sensor shall be mounted as indicated on the mounting detail shown on the drawings. The Contractor shall be responsible for determining in the field the required length of the probe which connects the sensor to the transmitter and verifying the length with the County and Engineer prior to ordering the probe.

2.10 ULTRASONIC LEVEL SENSOR

A. General:

1. The Contractor shall provide ultrasonic level measurement system consisting of transmitters, transducers, and mounting brackets.

2. Provide the services of a factory technician to perform programming, startup, calibration, and training for the transducers.

3. Ultrasonic transducer shall be non-contacting, impervious to dust, moisture, vibration, flooding, and high temperatures. Transducer shall be suitable for sodium hypochloride application and have the capability of being fully immersed and resistant to steam and corrosive chemicals.

4. The Contractor shall ensure that instruments shall be tagged and calibrated in accordance with PID diagrams.

B. Product:

1. Ultrasonic Controller Enclosure shall have rating of NEMA 4X/IP65 polycarbonate.

2. Transmitter shall have an accuracy of 0.25% full span with temperature compensation within 6mm. Range of measurement shall be dependent on the transducer. The resolution shall be 0.1% of the measurement.

3. Temperature: Operating temperature shall be at minimum -4F to 122F. Temperature compensation shall be at minimum -40 to 80C (-40 to 176F). Temperature sensor shall be integrated with transducer. Temperature compensation shall be over the temperature range of the sensor.

4. Power supply: Transmitter shall be powered with 24VDC power (standard) or AC Power 100-230 VAC+/- 15% at 50/60Hz (where indicated or required).
5. Output: Transmitter shall have a minimum of 5 relays. The transmitter shall have two (2) 4-20mA output signals to two (2) different locations based on one (1) level instrument input.

6. Communication: 4-20mA with HART digital signal for communication and configuration of Transmitters.

7. Accessories: Hand-held programmer where required for configuration and calibration of the instrument.

8. Transmitter display shall be multi block LCD with backlighting. Transmitter shall have wall mounting capabilities and at minimum four (4) M20 cable gland entries. Transmitter shall be FM approved for hazardous area classifications or provided within an enclosure suitable for installation and allowing for operation within a Class I, Division 2, Group D.

9. Ultrasonic Transducer shall operate using acoustic impulse emitted from it and is reflected back from the material surface to the ultrasonic transducer. The transit time from generated pulse to the returned echo shall be measured.

10. Material for the transducers shall be potted/encapsulated in a Kynar or other chemical and corrosion-resistant housing.

11. The surface of transducers shall be Teflon-coated where mounted on chemical tanks and exposed to vapors in the tanks that are not compatible with the transducer material.

12. Transducers shall be suitable for surface, pipe, or flange mounting. Appropriate mounting shall be provided. Flanges and hardware shall be resistant to attack by the medium being metered or, where required, shall be protected by corrosion-resistant coatings and facings.

13. Beam angle shall be 6 degrees.

14. Cable: The Manufacturer shall provide all necessary cables, conductors and wires to ensure proper and complete connectivity to the Ultrasonic Transmitter.

15. The ultrasonic level transducer shall be FM rated from Class I, Division 1, Group A, B, C, D area classifications. Sensor shall be IP 68 rated.

C. Manufacturers:

1. Ultrasonic Level Transmitter shall be Model HydroRanger 200 by Siemens Milltronic Process Instruments Inc, or approved equal.

2. Ultrasonic Level Sensor shall be Model Echomax XPS 15F by Siemens Milltronic Process Instruments Inc, or approved equal.
2.11 MAGNETIC FLOW MEASURING SYSTEM

A. General:

1. The magnetic flowmeter shall measure, indicate, and transmit flow rates to within (+/-) 0.5% of actual flow from a flow velocity of 0.5 feet per second to 30 feet per second.

2. Accuracy shall not be affected by changes in percent solids or changes in fluid density, temperature, or viscosity. Accuracy shall not be affected by the presence of air bubbles to a greater extent than the fluid volume represented by such air bubbles.

3. The equipment shall meet the materials and operational details specified herein.

4. The meter shall be rated IP68 for continuous submergence.

B. Flow Element:

1. Flow element shall be a magnetic flow tube low frequency electromagnetic induction type and shall produce a DC pulsed signal directly proportional and linear to the liquid flow rate.

2. Flow tube shall have ANSI Class 150 flanged ends.

3. Flow tube for the station discharge flow meter shall be provided with stainless steel grounding rings.

4. Flow tube for the sodium hypochlorite discharge flow meter shall be provided with hastelloy grounding rings.

5. Flow tube housing shall be 304 stainless steel.

6. Flow tube for the station discharge flow meter shall be lined with hard rubber (suitable for potable water application) and be supplied with Type 316 SS electrodes.

7. Flow tube for the sodium hypochlorite discharge flow meter shall be lined with PTFE (suitable for 12.5% Sodium Hypochlorite application) and be supplied with Hastelloy electrodes and rings.

8. Flow tube housing shall be IP 68 / NEMA 6P rated where installed in facility dry wells, in below grade structures, in valve vaults, and in locations susceptible to flooding and submergence.

9. Flow tube housing shall be NEMA 4X, suitable for permanent outdoor service. It shall be capable of accidental submergence in up to 30 feet of water for up to 48 hours without damage to the electronics or interruption of the flow measurement.
C. Flow Transmitter:

1. The electronics portion of the magnetic flow meter shall include both a magnet driver to power the magnet coils and a signal converter.

2. Signal converter shall be remotely mounted to mounting panel, and shall be housed in a NEMA 4X enclosure. The Contractor shall refer to Contract drawings for remote mounting location.

3. Interconnecting cable between the sensor and converter shall be furnished by the meter supplier.

4. Terminal strips for electrical connections shall be supplied.

5. An integral display to the converter electronics shall be as follows:
   
   a. Maintain two (2) rows of 16 alphanumeric characters for simultaneous view of both:
      
      1) Instantaneous rate of flow readings in percent or direct engineering units and;
      
      2) Totalization capability.

   b. The display shall be back lighted with a matrix-type liquid crystal display (LCD) for easy viewing.

6. Transmitter shall be provided with integral display unless specified otherwise.
   
   a. Transmitters specified without integral display shall be mounted directly above the flow element.

   b. Transmitters requiring integral display shall be mounted remotely to mounting panel as shown on Contract Drawings.

D. Transmitter (Converter) Electronic Characteristics:

1. The electronics shall be of the solid state, feedback type and utilize integrated circuitry.

2. Use Smart Transmitter with ability to remotely save parameter, configuration data via Laptop or remotely.

3. The input span of the signal converter shall be continuously adjustable between 0 to 1 and 0 to 31 feet per second and the range adjustment shall be direct reading.

4. Complete zero stability shall be an inherent characteristic of the meter system to eliminate the need to zero adjust the system with a full pipe at zero flow.

5. The converter shall not be affected by quadrature noise nor shall it require zero adjustment or special tools for startup.

6. Input and output signals shall be fully isolated.
7. The converter output shall be provided with two 4 to 20 mA outputs.

8. The electronics shall be designed for operation on 24 VDC or 120 volt AC (+10%), 60 hertz (+5%).

9. The converter shall also include:
   a. Integral zero return to provide a constant zero output signal in response to an external dry contact closure.
   b. Direct adjustment of scaling factor in engineering units.
   c. Integral calibration self-test feature to verify proper operation at the electronics.
   d. Local direct reading indicator calibrated in gallons per day or gallons per minute or as directed by the Engineer.
   e. Filtering circuitry for pulsating flows up to 80 pulses per minute.

E. Testing:

1. The magmeter model shall be hydraulically calibrated at a facility traceable to the National Institute of Standards and Technology (NIST) or EN45001. The calibrations procedure shall be minimum 5-point, and conform to the requirements of ANSI/NCSL Z540-1. Calibration data shall be submitted for approval prior to shipment of the meters. The manufacturer’s facility must be certified to be in compliance with the quality requirements of ISO Standard 9001. Contractor shall provide a minimum 14 day notice of calibration and testing to allow for witnessing of testing if desired.

F. Accessories: The following accessories shall be provided:

1. Shielded cable assemblies of sufficient length for connection between flowtube and transmitter electronics. Refer to Contract drawings to estimate required cable length.

2. 316 stainless steel grounding straps and grounding wires for the station discharge flow meter.

3. Hastelloy grounding straps and grounding wires for the sodium hypochlorite discharge flow meter.

4. NEMA 4X rated stainless steel SPST ON-OFF manual disconnect switch shall be provided for the 120 VAC or 24 VDC input power to transmitter and driver electronics.

5. Spool piece for replacement of each different size flow tube where no bypass piping is provided.

G. Magnetic Flow Measuring System shall be Watermaster as manufactured by ABB, Promag 400 or 53 as manufactured by Endress+Hauser, or approved equal.
2.12 FLOOD SENSOR
A. A dry well float switch shall be provided in the dry well to detect high water level in the drywell representing flooding condition.
B. The switch shall be normally opened and close on a rising liquid level.
C. The float switch shall be the Roto-Flo® Suspended Float Switch (Normally Open), available as USA Blue Book Item 47732, or approved equal. Provide stainless steel wall bracket for mounting, available as USA Blue Book Item 47754, or approved equal.
D. Cable length on the float switch shall be provided in sufficient length to be installed to the required termination location without splicing.

2.13 SPARE PARTS
A. The Contractor shall provide the following spare parts:
   1. One (1) chart recorder of the model specified and provided.
   2. One (1) multi-channel data recorder.
   3. One (1) current loop recorder.
   4. One (1) pressure sensor and transmitter of each type specified and provided.
   5. Two (2) pressure gauges of each type specified and provided.
   6. Two (2) pressure switches of each type specified and provided.

PART 3 – EXECUTION

3.01 INSTALLATION ASSISTANCE AND INSPECTION
A. Provide the services of manufacturer’s service representatives to assist in installation for all instrumentation specified herein, and all instrumentation specified elsewhere in these specifications, including but not limited to pressure sensors, transmitters, overflow sensors and chart recorders.
B. Each manufacturer’s representative shall inspect the installation of each of their instruments, and shall issue an installation certificate to the Owner and the Engineer for each instrument certifying that the instrument has been installed in accordance with the manufacturer’s recommendation.

3.02 CALIBRATION
A. Provide the services of manufacturer’s service representatives to calibrate all instrumentation provided. All calibration shall be performed in the presence of the Owner and the Engineer. The calibration of each instrument shall be performed after the instrument installation certificate has been issued. Provide calibration sheets of all instrumentation provided under this contract.

END OF SECTION
SECTION 17400

PROGRAMMABLE LOGIC CONTROLLER AND OPERATOR INTERFACE TERMINAL

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes the requirements for furnishing all labor, materials, equipment and appurtenances for the complete and satisfactory installation of the Sparks Water Pump Station (PS) PLCs, associated PLC rack, I/O and network cards, cellular router and communications, PLC software and Operator Interface Terminal (OIT) hardware and software as indicated on the Contract Drawings and specified herein. The equipment and controls described herein shall be furnished by the Systems Integrator. Programming of the PLCs and OIT shall be performed to provide a complete operable, functional system, and to comply with the requirements of the control strategies as described in the contract documents.

B. In addition to the improvements at the Sparks Water PS and Elevated Storage Tank, the Contractor and System Integrator is responsible for modifications to the existing SCADA system graphic display program and corresponding database to add the PS and Sparks Storage Tank monitoring and control capability at the City’s existing Telemetry Control Center (TCC) located within the Ashburton Water Filtration Plant. Modifications shall include the provision of necessary hardware and software as well as addition of graphic display screens for monitoring of the PS and Sparks Storage Tank, as well as providing new database points for monitoring and control of the PS and tank systems, and interfacing with the new graphic displays. Modifications shall also include deleting the existing PS and tank graphic displays and existing PS and tank database points after the new displays and database points have been tested, verified and accepted.

C. Contractor System Integrator shall procure and install a cellular router and coordinate the service with the City’s Municipal Telephone Exchange (MTE). MTE will provide the cellular service and a cellular router SIM card that will be provided to the contractor.

1.02 QUALITY ASSURANCE

A. Substitutions for named equipment will not be permitted if “or equal” is not stated.

1.03 SUBMITTALS

A. Submittals described in this section shall be incorporated into the control panel submittals and shall comply with the requirements described in Specification 17200.

B. Submit the following Shop Drawings in accordance with Section 01000:

1. Catalog cuts and detailed specifications for all devices and all associated instrumentation.

2. Dimensional drawings for all devices and instrumentation.
3. Wiring diagrams for all electrical items.

4. Loop drawings showing all terminations.

5. Written description of the attributes of programming developed for installation in the PLCs including procedures for modifications, testing, downloading, and programmer operation.

6. Overall architecture as provided for the project.

7. Provide an updated version of the control strategy at the end of construction. The updated version shall incorporate all changes made to the control strategy during construction.

8. Information on software licenses for the project.

9. Submit samples of program documentation for the PLC program, the OIT program and the TCC Work Station graphics display program.

10. Submit colored print examples of the OIT and HMI graphic displays indicating the various color schemes to be used for equipment display, background, process piping, electrical equipment and network communication lines. Submit colored prints of all of the draft OIT and HMI graphic display screens. Submit proposed color scheme for the various equipment, pipelines, processes and background displays.

C. Submit Operation and Maintenance Manuals for the PLCs, OIT, and associated PLC equipment, software licenses and copies of PLC and OIT programs. PLC and OIT programs shall include detailed program documentation. O&M Manual shall include copy of the final approved version of all PLC and OIT shop drawings, color copies of the final approved OIT graphic displays, and final approved control strategy.

D. Submit color copies of the graphic display screens to be added to the TCC work station for monitoring and control of the PS and Elevated Tank. Submit final copies of screens with final updated database for the TCC, to include the new portion of the database for the PS with the old existing database for the PS deleted. This shall be submitted in the form of an Operations and Maintenance Manual.

E. Submit manufacturers’ certification that the PLCs have been installed in accordance with manufacturers’ instructions and requirements.

PART 2 -MATERIALS

2.01 ELECTRICAL REQUIREMENTS

A. Unless otherwise specified or shown, PLC and OIT equipment shall be capable of operation on a 24 VDC power source.
B. Input and output cards for discrete inputs to PLCs and outputs to PLCs shall be rated for 24 VDC. Discrete outputs shall be provided with and connected to interposing relays with 24 VDC operating coil and relay contacts rated for a minimum of 5 amperes at 120 VAC.

C. Analog input cards for accepting analog input signals to the PLC shall be rated for 4-20 mA signals, with power obtained from 24 VDC power supplies.

D. All electrical work in connection with equipment specified in this Section of the Specification shall be performed in accordance with the requirement of Division 16 of the Contract Specifications.

E. Electrical circuits shall be provided for the various systems specified in this section whether or not they are shown on the Contract Drawings. Additional contacts, relays, wires, conduits, fuses and other accessories required for the proper operation of equipment furnished shall be provided and installed whether or not shown or specified.

2.02 WARRANTY

A. The PLCs, OIT and associated control system and its components shall be warranted in writing to be free from defects in workmanship or material for a period of two (2) years following final acceptance of the complete programmable controller system. If during said warranty period, any parts prove to be defective in workmanship or material under normal use and service, they will be replaced or repaired free of charge, inclusive of freight and labor. The warranty shall provide (a) a minimum of next-day, on-site service, and (b) replacement of the defective component within one week if repairs cannot be effected within that time. Work under the warranty shall be provided by the System Integrator responsible for the system.

2.03 SERVICE MANUALS

A. The System Integrator shall provide service manuals for the PLC systems and shall be included in the Operations and Maintenance Manuals required to be submitted for the respective control panels.

Operator’s Manuals

1. Operator’s manuals shall be provided for use and reference by City’s operators and shall contain all information required by the operator to perform all necessary duties and functions relevant to the programmable controller system and modification to the operator interface and data acquisition system. These manuals shall be available in their complete and final form for operator training. The manuals shall contain, but not be limited to, the following:

   a. Overall narrative of the system function and operation.

   b. Simple pictorial representations of system and process interaction, including block diagrams and references from text.
c. Descriptions of the operator controls and function for the operator interface. All manual panel controls shall be listed and a functional description given for each.

d. Step-by-step procedures for each action to be performed in system operation, including start/stop procedures, control mode changes, set point controls, emergency procedures, etc. Also, procedures shall be given for software “housekeeping”, diagnostics, etc.

e. Glossary of technical terminology used in the Operator’s Manual.

f. Equipment list of all components of the programmable controller system, including manufacturer’s part numbers.

g. All standard hardware manuals which may accompany the system components.

h. Procedures for system start/stop and reset, system configuration and basic troubleshooting.

i. Pictorial representation of component interaction and function.

j. Narrative description of all system programming, indicating program and subprogram function and organization. A summary listing and description of all global and local program variables shall be included.

k. Listings of the programmable controller system input/output, data recording and operator interface data base or real time data structure, including memory address numbers if applicable.

l. Listings of all system programming. Listings shall include comments denoting, at a minimum, program execution branches and decision statements, variable definitions, calculation instructions and input/output operations.

m. A program flow chart for system programming, showing the arrangement and interaction of all subprograms.

n. Tabulation of all equations or formulae used in programming, with subprogram and line number reference.

o. Listing of all files used for input or output during program execution.


q. Two spare copies of all system programming on the appropriate magnetic media.

r. Backup program and instructions on loading.

s. Equipment needed to load spare modules.
2.04 CONTROL SYSTEM REQUIREMENTS

A. It shall be the System Integrator’s responsibility to furnish a complete and functional integrated process measurement and control system and all devices necessary to interface to the PSCP PLC and OIT, and to the associated PS control system. Control systems shall also be interfaced to the City SCADA (located at Ashburton WFP - TCC) system. Addressing of data and preparation of data register areas in the PLC shall be provided to allow the City SCADA system to easily access status points, alarms and analog signals.

B. System Integrator responsibility shall include review of all appropriate drawings and specification sections for this entire project. This shall include review of specifications for all mechanical equipment, analytical instruments, electrical contract drawings and specifications, and any other equipment interfacing to the instrumentation and computer systems, as required to provide necessary point-to-point wiring schematics and compliance with the functional requirements of these Contract Specifications.

2.05 PUMP STATION CONTROL PANEL (PSCP), CONTROL SYSTEM HARDWARE AND COMPONENTS

A. General:

1. The PLC and related equipment shall be the product of one manufacturer and components shall be completely compatible.

2. The PLC shall have downward compatibility, whereby all new module designs are capable of being interchanged with similar modules to reduce obsolescence.

3. The PLC shall be designed and tested to operate in industrial, high electrical noise environments. The system shall be provided with RFI protected shields and barriers to prevent interference with other electrical systems.

B. PLCs

1. The PLC control system shall be mounted in the respective control panels at the pumping station and at the Elevated Storage Tank site. The PLCs shall communicate with the existing City SCADA System via a new Verizon 4G Wireless Service communication link service. The PLC shall monitor and control the facility operation and associated power and instrumentation equipment.

C. PLC Components

1. All components of the PLC control systems shall be suitable for operation in an industrial environment, with a temperature range of 0º C to 60º C, with 5% to 95% relative humidity non-condensing, with no external forced ventilation required.
2. The PLC programs for the PLCs shall be developed by the System Integrator and shall be developed using software compatible with the PLCs. Programming language shall consist of a software package suitable for use on a standard, commercially available personal computer (PC) provided with the latest version of MS Windows operating system. The PLC programming software shall be a manufacturer’s standard product and shall be provided with the means to transfer programs to the PLCs. PLC programming, programming software and corresponding software license shall be furnished by the SI. Software and licensing provided on the project shall be turned over to County at the completion of construction. All software and licensing shall be the manufacturer’s most current version at the time of substantial completion and turnover of the facilities to the City. PLC programming software shall be one of the following:

a. Modicon Unity Pro software by AEG/Schneider Automation

3. The System Integrator shall utilize the PLC products of the following manufacturer:

a. M580 processor - BMEH582040 with hot standby processor from Modicon /AEG Schneider Automation at the Sparks pumping station

b. M580 processor - BMEH582040 from Modicon /AEG Schneider Automation at the Sparks Elevated Storage Tank

4. All PLC products shall be furnished by the same manufacturer.

5. The PLC processors shall be Unity Hot-standby series by Modicon, or approved equal at the Sparks pumping station. Hot-standby is not necessary at the Elevated Storage Tank site. PLC shall be provided with a minimum user memory of 4 MB, RJ-45 Ethernet port – Ethernet TCP/IP port 10/100 BASE-T, USB port, and Modbus TCP-IP communication ports. Provide minimum of 25% spare programming memory to allow for future additions. Provide Ethernet ports or communication cards, power supplies, RIO heads and receptors as required and shown on the Contract Drawings.

6. The PLC processor shall be provided with SD type memory card to back up processor memory. The SD memory module shall be provided with the processor module. The PLC processor shall be capable of expanding by up to four additional racks.

7. The PLCs, RIO and I/O cards shall be mounted in a PLC chassis. The chassis and PLC components shall be mounted in the respective control panels as shown on the Contract Drawings and as specified. Chassis shall be compatible with I/O modules and PLC processors being provided.

8. The PLCs shall include a minimum of one communication port for access from a portable laptop PC for programming and maintenance.
9. Provide 24 VDC input/output modules. Combination input/output modules shall not be utilized. All modules shall be tongue-and-groove backplane type and shall be compatible with the PLC processor I/O structure. Each module shall be provided with a removable wiring terminal block and manufacturer pre-assembled wiring harness to connect panel wiring to the module. The modules shall be UL-508 listed. The PLC input/output devices shall be as follows:

   a. Discrete Inputs: Provide 16 point, 24 V cards. Provide 120 V – 24 V power supply for connection of discrete inputs to DI cards. Provide primary and secondary fuses on power supply. In addition, provide one fuse for each set of inputs to an I/O card.

   b. Discrete Outputs: Provide 19-30 VDC/200-264 VAC, 8 point output (relay) modules suitable for use with interposing relays. Modules shall have a separate fuse protected common power for each group of 8 outputs. The modules shall be configured to reset in the event of a module fault. Provide one spare connected DO module installed in each PLC control panel in addition to the required 25% spares. Each discrete output points shall be provided with an interposing 24 VDC relay interface for active, future, and spare points. Control relays shall be rated for use with PLC outputs and not falsely trigger on leaking current. All active, future, and spare output points shall be connected to a 24 VDC interposing PLC relays and contacts from the interposing relays shall be wired to field terminal strips.

   c. Analog Inputs: Provide module with 8 isolated analog input channels to convert signals to proportional 16-bit binary values. The modules shall accept at a minimum 4-20mA signals from field devices. The modules shall be suitable for either 2, 3, or 4 wire systems. The input power for each signal shall be derived from a DC power supply external to the module. The accuracy of the module shall be +/- 0.2% of full scale at 25 deg C.

   d. Analog Outputs: Provide module that convert 16-bit binary values to 4 individual analog output channel signals. The modules shall output a 4-20mA DC signal to field devices. The analog output shall be capable of driving a 0-600 ohm load without adjustment. The system power shall be provided through the I/O backplane.

   e. Ethernet Modules: RJ-45 connection on Ethernet port.

   f. Cord set: For each I/O module, Contractor shall provide a 3m, 20 way terminal cord set with one end flying leads.

10. PLC chassis shall be provided with a minimum of 12 slots, and larger if required.

11. The PLC I/O modules shall be provided with a minimum 20% of spare I/O’s for each type of I/O provided.
12. All spare I/O shall be wired to terminal blocks for future use. Spare discrete outputs shall be provided with interposing relays wired to the respective discrete output, and to the respective terminal block.

13. Provide a minimum of two (2) spare slots in PLC rack for future expansion. Provide all spare slots with slot fillers.

D. PLC Rack

1. Provide a minimum 12-slot mounting rack for the PLC CPU, Power Supply and I/O modules. Rack shall be made by same manufacturer as PLC and I/O.

2. All unused and unoccupied rack slots shall have a protective cover installed.

3. Mounting Rack shall have an operational temperature range from minus 25° C to plus 70° C and a relative humidity range of 10% to 95% without condensation.

4. Mounting Rack shall have a conformal coating Humiseal 1A33 TC.

5. Mounting racks shall be sized to provide a minimum of two empty slots above the required installed spares. Provide expansion or extension racks with power supplies, cables and communications adapters as required to meet the installed spare card and empty slot requirements.

E. Refer to Instrumentation Drawings for the PLC hardwire IO and OIT software IOs requirement for the project.

F. Instrumentation Power Supplies

1. The System Integrator shall furnish and install inside the control panels power supplies for all instrumentation equipment that require 24 VDC power. The power supply devices shall be suitable to operate on a 120 V, 1 phase, 60 hertz electrical service. Units shall be suitable for rack mounting. Provided redundant power module for 24VDC power. Redundant 24vdc Power supply module/controller should provide hardwire alarm to PLC when any one of the two Power supply module fails.

2. All instrumentation and control equipment shall be operated on the 120 VAC supply power from the UPS.

3. The power supplies shall be sized by the manufacturer to provide sufficient backplane current to power the entire I/O module train. The power supplies shall be provided with a minimum of 25% spare capacity in addition to the total calculated backplane current for existing and future modules.

4. Power supplies shall be provided with input fusing, surge protection and shall provide isolation from the incoming source. The power supply shall be provided with integral status indicators.

5. Power supply shall have a conformal coating Humiseal 1A33 TC.
G. Operator Interface Terminal (OIT)

1. OIT hardware at the Sparks pumping station shall be 19” Harmony GTU – Smart Display with processing box module by Schneider Electric, or approved equal. Smart display shall be Schneider Electric Part No. HMIDT952, or approved equal.

2. OIT hardware at the Sparks Elevated Storage Tank site shall be 9” Harmony GTU – Smart Display with processing box module by Schneider Electric, or approved equal. OIT shall be suitable for interior mounting in the control panel.

3. OIT software shall be Vijeo Designer, EcoStruxure Operator Terminal Expert, and EcoStruxure Machine SCADA Expert, compatible with OIT provided, by Schneider Electric or approved equal.

H. Cellular Router

1. Provide industrial rated, DIN rail mounted cellular router in separate Verizon communication panel with power supply for establishing wireless communication with the local control panel to the City SCADA network.

2. RTU Characteristics:
   a. 8-30 V-DC power input
   b. Wireless Interface Carrier: As directed by Baltimore City’s Telephone Exchange (MTE)
      1) 4G LTE cellular with 3G fallback
      2) Active GPS for device location
   c. Protocol Gateway
      1) I/O Controller
      2) Modbus ROUTER/TCP/ASCII
      3) DNP3 – slave
   d. Tunneling: IPsec and SSL
   e. IP
      1) NAT, port forwarding, dynamic DNS, DHCP
      2) Stateful inspection firewall, IP transparency
   f. (1) 10/100 RJ-45 autosensing port
   g. (1) RS-332 Serial DB9 115200bps port
3. All cellular router must be provided from the same manufacturer. Router must be model RAM 6900 series, as manufactured by Red Lion.

PART 3 -EXECUTION

3.01 INSTALLATION

A. The Contractor shall install the PLC and OIT equipment and associated control system, and all appurtenances in accordance with the manufacturer’s recommendations.

B. Routine preventive maintenance that is suggested or required by the manufacturer for the control panel, PLC, hardware and components shall be performed by the System Integrator and the Contractor until the satisfactory completion of the operational demonstration test as specified hereinafter.

3.02 TESTING

A. The PLCs and corresponding control panels, including programming, shall be assembled and tested at the System Integrator’s facility prior to shipment to the job site to verify that all system components function properly and perform as specified.

B. Testing of the PLC and OIT hardware, software and programs shall be performed in conjunction with the testing requirements specified in other Division 17 specification sections.

3.03 TRAINING

A. Training of County and City personnel on the operation and maintenance of the PLC and OIT hardware and programs shall be provided in conjunction with the training requirements specified in Section 01735.

3.04 CONTROL STRATEGY

A. General

1. This portion of the specification includes the minimum requirements for configuration and programming of the primary and hot standby PLC and the OIT, and the TCC Work Station graphic displays program and database (also known as the Master Control Station for the City’s existing water distribution SCADA system), henceforth defined as the Human Machine Interface (HMI) for brevity.

2. Included herein is a brief description of the equipment and processes to be monitored and controlled by the pump station control system and the City’s existing SCADA system. Also included are general programming requirements, a brief description of the control systems depicted on the Contract Drawings, a brief description of the data communications to be used for data transfer via the existing SCADA system, and interface requirements.
B. Abbreviations

The following definitions and abbreviations are used in this specification section:

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>AI</td>
<td>Analog Input to PLC</td>
</tr>
<tr>
<td>AO</td>
<td>Analog Output from PLC</td>
</tr>
<tr>
<td>CV</td>
<td>Cone Valve</td>
</tr>
<tr>
<td>DI</td>
<td>Discrete (Digital) Input to PLC</td>
</tr>
<tr>
<td>DO</td>
<td>Discrete (Digital) Output from PLC</td>
</tr>
<tr>
<td>DTA</td>
<td>Data Transfer Area</td>
</tr>
<tr>
<td>EG</td>
<td>Emergency Generator</td>
</tr>
<tr>
<td>HMI</td>
<td>Human Machine Interface (defined herein as the program, database and graphic displays within the Master Control Station and Work Station associated with the City’s existing water SCADA system; located at the TCC)</td>
</tr>
<tr>
<td>HS</td>
<td>Hot Standby</td>
</tr>
<tr>
<td>I/O</td>
<td>Input/Output</td>
</tr>
<tr>
<td>LOR</td>
<td>Local – Off - Remote</td>
</tr>
<tr>
<td>OIT</td>
<td>Operator Interface Terminal (to be installed on the PSCP)</td>
</tr>
<tr>
<td>P&amp;IDs</td>
<td>Process and Instrumentation Diagrams</td>
</tr>
<tr>
<td>PLC</td>
<td>Programmable Logic Controller</td>
</tr>
<tr>
<td>PMT</td>
<td>Power Monitoring Transmitter</td>
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<tr>
<td>PS</td>
<td>Sparks Water Pump Station</td>
</tr>
<tr>
<td>PSCP</td>
<td>Pump Station Control Panel</td>
</tr>
<tr>
<td>SCADA</td>
<td>Supervisory Control and Data Acquisition</td>
</tr>
<tr>
<td>SG</td>
<td>Switchgear</td>
</tr>
<tr>
<td>TCC</td>
<td>Telemetry Control Center (location of the HMI and associated PLC, network and data communications hardware at the City’s Ashburton Water Filtration Plant)</td>
</tr>
<tr>
<td>UPS</td>
<td>Uninterruptible Power Supply</td>
</tr>
</tbody>
</table>
C. Description of Systems and Equipment

1. General

This project involves the renovation of an existing water pumping station and elevated storage tank owned and operated by the City. Renovations include replacement of three (3) water distribution pumps, modifications to the power distribution system and emergency power system, addition of three (3) VFDs to enhance flexibility in the output of the PS, complete renovation of the pump station monitoring and control system, replacement of various field instrumentation, the addition of a sodium hypochlorite storage and feed system, the addition of an on-site emergency power generator, structural and architectural modifications mainly to support the process and electrical modifications and for building enhancement, miscellaneous facility modifications, and improvements to the off-site elevated storage tank.

2. Pumping System

The three (3) existing water pumps (Pumps A, B, C) and corresponding discharge control valves (CVs) are being replaced with new pumps and discharge side CVs. The approximate design capacity of the pumps is the same as existing. The existing pumps are controlled using full voltage, constant speed motor starters. The new pumps are controlled using new VFDs. Pumps A and B are 30 hp, and Pump C is 60 hp. All pump motors operate on 480V, 3 phase power.

3. Sodium Hypochlorite System

A new sodium hypochlorite storage and feed system is located in the chlorination room and provides chlorination to the water distribution system, and operates when at least one of the pumps is operating. A flow signal is output from the PLC to the sodium hypochlorite feed system control panel to allow for flow pacing of the sodium hypochlorite feed.

4. Emergency Generator System

A new outdoor, emergency generator provides standby power for the PS in the event of a power outage. A subbase fuel storage tank mounted directly below the generator stores diesel fuel upon which the generator operates.
5. Pump Station Monitoring and Control System

A new PSCP with primary and hot standby (HS) PLCs and an OIT provide the monitoring of process and building equipment, and provide the data interface to the various process and building equipment, and to the existing SCADA system. The OIT shall be mounted on the face of the panel and provides operator interface for monitoring of the various process and building equipment. The PLCs shall also generate alarms for display on the panel face mounted OIT.

The HS PLC configuration shall allow for the HS PLC to take over monitoring of the PS and transmission of data to the SCADA system immediately upon failure of the primary PLC.

6. Emergency Pressure Control System

Pressure switches mounted in the suction and discharge headers of the water pumping system to provide low suction and high discharge pressure signals for shutting down the pumps. The pressure switches are wired to relays mounted in the PSCP, and the corresponding shutdown signals are wired directly to the pump VFDs; they are not wired through the PLC. A selector switch mounted on the PSCP allows for disabling of the emergency pressure control system.

7. Elevated Storage Tank

The pump station discharges to the Sparks Elevated Storage Tank. The tank level is communicated to the City SCADA network for use in pumping control.

D. Overview of Pump Station Controls

1. The PS controls consist of controls for the three (3) water distribution pumps and related equipment. Each water pump VFD is provided with a LOR selector switch to allow selection of the mode of control for the pump. In “Local” mode, the pump start/stop and speed is controlled locally at the VFD. In “Remote” mode, the pump start/stop and speed are controlled via manual inputs from the HMI via the SCADA system.

2. Local pump control can be performed at the local OIT mounted on the Pump Station Control Panel (PSCP). The control of the CVs and the sodium hypochlorite feed are all controlled locally from the VFD or at the specific equipment, and are not controlled via the PLC/OIT or the SCADA system.

3. The PSCP and PLC shall only allow the HMI to control the water pump start/stop and speed of the pumps and VFDs if the RTU Enable/Disable selector switch mounted on the PSCP is selected for “Enable”

E. General Programming Requirements

1. Detailed Documentation

Each program shall contain detailed documentation of the program code and shall be consistent with the approved sample documentation submitted.
2. Data Transfer Area

The PLC program shall contain a DTA which shall consist of a separate, easily accessible area of contiguous data registers that are used by the SCADA system to access data that is to be transmitted to the TCC.

3. Bumpless Transfer

The PLC shall monitor the speed of each of the water pump VFDs. If and when a switch is made from Local to Remote control mode, the PLC shall force the speed control signal to automatically match the speed setting that the VFD was operating at, regardless of the setting received from the HMI. Once this transfer of control modes is achieved, the speed of the VFD shall gradually be adjusted by the PLC to the speed setting set at the HMI. In this fashion, a “bump” in the speed adjustment shall be avoided.

F. Graphic Display Screens – OIT

1. List of Screens: The following screens, as a minimum, shall be provided on the OIT graphics display:

   a. Main Menu – List of Screens
   b. Network Architecture Schematic
   c. PS Flow Monitoring
   d. Water Distribution Pumps
   e. Sodium Hypochlorite System
   f. Surge Vault Status
   g. Power Distribution System
   h. Elevated Storage Tank
   i. Emergency Generator System
   j. Control Modes
   k. List of Active Alarms
   l. List of Analog Values
   m. List of Calculated Values
   n. Flow Trending
   o. Pressure Trending
   p. Critical status (Virtual Annunciator)
2. General Requirements

a. Graphic displays shall be used for monitoring of the PS equipment, status and analog values, control mode selections and equipment data. The System Integrator shall utilize the approved OIT graphics display software for developing the screens.

b. Graphic displays for processes shall in general follow the physical configuration indicated on the P&IDs depicted on the Contract Drawings. Graphic displays for power distribution system and network configuration shall in general follow the schematics for such systems depicted on the Contract Drawings.

c. Color schemes for operating and idle process equipment, open and closed valves, backgrounds, pipelines, electrical equipment and communications equipment shall follow the color schemes approved during the submittal process, unless otherwise authorized.

d. Displays shall be touch screen type, with ease of moving from one screen to another, and to select sub-screens to obtain detailed equipment information.

e. Process equipment and piping displays shall include depiction of manual, electronic and hydraulic operated valves with valve status of all monitored valves. Displays shall include depiction of field instruments with corresponding analog values and engineering units.

f. Each graphic display screen shall display a running tab or ribbon at the bottom of the screen indicating active alarms.

g. It is not intended to have any equipment or system controls or commands originating at the OIT; the OIT shall be used for monitoring only.

h. Acknowledgement and resetting of alarms shall not be employed on the OIT graphic displays. Alarms shall remain active until the particular alarm condition ceases.

3. Description of Screens

a. Main Menu - screen shall include a list of the graphic display screens

b. Network System Architecture – screen shall depict the communications and network equipment and arrangement displaying each type of network, and status of each Ethernet switch, and color coding indicating failure of a particular communications link, and indication of primary or backup communications currently being used. Operation using the PLC or HS PLC shall also be indicated.
c. PS Flow Monitoring – screen shall depict site piping layout with flow meters labeled and direction of water flow indicated. Analog values for each flow meter shall be depicted indicating the actual flow through each meter. Pop-up sub-screens shall be created for each flow meter indicating meter manufacturer and model number, serial number, range and calibrated span with engineering units.

d. Water Distribution Pumps – screen shall depict pumps with piping layout inside station, including suction and discharge headers, valves, pump and valve status indicated by color scheme, field instrumentation with analog values, or status for switches. Pop-up windows shall be provided for individual pumps indicating pump manufacturer and model, design specifications, current status and speed, control mode and any alarms associated with pump. Pop-up windows for pressure switches and transmitters shall also be provided. Control mode of pump/VFD as well as speed setting in Remote control mode shall be displayed on the main graphic display as well as the sub-screens.

e. Sodium Hypochlorite System – screen shall depict the sodium hypochlorite storage tanks, residual chlorine level, pumps, piping, valves, and flows. Pop-up windows shall be provided for each pump, pressure switch, flow switch and flow meter.

f. Emergency Generator (EG) System Status – screen shall depict the general arrangement of the systems, with pop-up window for the EG indicating manufacturer, model number, status, alarms and ratings.

g. Elevated Tank – screen shall depict general Elevated Tank arrangement and level status. Screen shall include low level, high level, and overflow elevation set points.

h. Other Screens – screens for alarms, analog and calculated values are self-explanatory. Flow trending screens shall depict the trends, in graphical form, of each of the flow signals and the total flow. Suction and discharge header pressure signals shall be trended on the pressure trending screen. Any calculated values such as pump run time, energy usage, etc. shall be displayed on the list of calculated values.

i. Critical Status (Virtual Annunciator): Provide the following statuses:

- Pump A Lockout
- Pump B Lockout
- Pump C Lockout
- Low Station Voltage
- PLC Failure
- Sparks Tank Communication Failure
- Low Suction Pressure Shutdown
- Emergency Pressure Transfer
- Chlorination Water Supply Failure
- PLC On-Board Battery Failure
• Sparks Tank Level Transmitter Failure  
• Sparks to TCC Communication Failure  
• Chlorination Room Low Temperature  
• Burglar Alarm  
• High Discharge Pressure  
• Low Discharge Pressure  
• Sodium Hypochlorite Tank Leak Alarm  
• Generator Running  
• Generator Low Fuel  
• Generator Fail  
• Generator Low Battery  
• Generator Low Oil  
• Generator Fuel Leak  
• High Coolant Temp  
• High Lubrication Oil Temp  
• Station on Generator Power

4. Additional Display Screens

In addition to the graphic display screens described, provide an additional two (2) graphic display screens for the OIT. Content of the additional screens shall be identified by the City during construction.

G. Graphic Display Screens – HMI at TCC

1. List of Screens

The screens to be added to the existing HMI shall be developed by the System Integrator using a copy of the existing software furnished by the City to the Contractor. In general, the screens shall be the same as those provided for the OIT, with the exception of the additional screens described herein.

2. Screen Requirements

   a. Graphic display screens developed for the HMI shall match the color coding scheme, symbols and general configuration as is utilized on the existing HMI graphic display screens.

   b. Pump start/stop and speed setting commands shall be made available on the water pump pop-up screen for each water pump. Speed adjustment shall be limited to a range of 50-100% maximum speed.

   c. Alarm configuration and display shall match existing, including acknowledgement and resetting of alarms.

3. Additional Display Screens

In addition the graphic display screens described, provide an additional two (2) graphic display screens for the HMI. Content of the additional screens shall be identified by the City during construction, and may or may not match the additional screens for the OIT display.
H. Monitoring and Control of Pump Station Systems

1. Monitoring Requirements
   a. The primary PLC (PLC) shall monitor the status and analog signals received as inputs as depicted on the P&IDs and the I/O list. All status and analog signals shall be available for display on the OIT as well as stored in the DTA for access by the SCADA system.
   
   b. The PLC shall monitor communications links with all of the networked equipment, as well as monitor the network equipment and the UPS located in the PSCP. Alarms shall be displayed for communication link failures and equipment failures. Each alarm shall be provided with an individual timing function within the PLC program for delaying the alarm generation. Alarms shall be generated for water pump fail to start, fail to stop, and for speed variations from set point when a pump VFD is selected for Remote control and commands are received from the SCADA system and re-transmitted to the particular pump VFD.
   
   c. Alarms shall also be generated when analog signals fall outside their normal 4-20 mA range by a pre-set value.
   
   d. Alarms shall also be generated for PLC and HS PLC failure.

2. Operator Inputs and Selections
   a. From the HMI, the operator shall be capable of starting and stopping the water pumps as well as manually select the operating speed within a range of 50-100%. This shall only occur when the VFD is selected for Remote control mode and the RTU Enable/Disable selector switch is selected for Enable.
   
   b. The operator shall be capable of resetting PLC calculated values such as pump run time, total flow, etc. only from the OIT graphics display.
   
   c. The operator shall be capable of initiating a test of the primary PLC failure and transfer of functions to the HS PLC, and also initiate a transfer back to normal operation, from the OIT only.

3. Automatic and Manual Control

   No automatic control functions for equipment and systems shall be performed by the PLC. Operator initiated commands shall be manually input at the HMI or remote signal from the TCC only.

4. Calculated Values: Values shall be calculated by the PLC and shall include the following:
   a. Pump run times for water pumps, lubrication pumps and sodium hypochlorite feed pumps.
b. PS Total Discharge Flow

c. PS Total Discharge Flow Volume

d. Sodium Hypochlorite Flow Volume (gallons)

e. PS Energy Used (KWH)

f. EG Fuel Used

5. Hot Standby Configuration

The HS PLC and PLC configuration shall follow manufacturers installation instructions and requirements. Upon failure of the PLC, the HS PLC shall take over the functions of the PS, including interface with the OIT and the SCADA system. Once the PLC has been restored, the PS functions shall be transferred back to the PLC. Hot Standby is required at the Sparks pumping station site.

6. SCADA Communications

Primary communications between the PS and Tank site to the TCC shall be accomplished using the new Verizon 4G wireless network.

I. Additional Programming Allowance

The System Integrator shall provide contingent hours for programming in accordance with Specification 01020.

END OF SECTION
SECTION 17500
PROCESS CONTROL STRATEGIES

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section includes general information regarding control strategies that shall be implemented under this project. The information is provided so that the Contractor and the contract System Integrator can verify the intended function of the equipment and instruments to be installed under this project and fully integrate the functionality with the PLC control system.

B. Refer to the P&ID drawings for the schematic of the process as well as additional requirements for analog and digital inputs and outputs, and digital communications.

1.02 SUBMITTALS

A. General:

1. Submit in accordance with Section 01000 and requirements as specified herein.

B. Shop Drawings:

1. Shop drawings shall include, but not be limited to, complete instrumentation loop wiring diagrams corresponding to the loops provided by the contract documents.

2. Loop drawings shall be in accordance with ISA standard 5.4 which verify the physical connections between the field hardware, associated I/O terminals, and field instrumentation and accessories as indicated on the P&ID’s. Where applicable, the source of the signal loop power shall be shown.

3. Deviations from the specifications shall be explicitly identified with the shop drawing. Failure to identify deviations shall be cause for shop drawing to be rejected.

1.03 GENERAL DESIGN REQUIREMENTS

A. The control strategies are written descriptions of regulatory and sequential control of the unit processes as shown on the P&ID’s. Control strategies shall reside in the memory of the designated processor.

B. Control Hierarchy:

1. LOCAL MODE: This mode is selected by placing the Hand/Off/Auto (HOA) switch serving a piece of equipment in HAND mode. PCS control is disabled in this mode; however, all status and alarm inputs are received and displayed.
2. REMOTE MODE: This mode is selected by placing the HOA switch serving a piece of equipment in AUTO mode. There are two ways to operate in AUTO:
   
a. PCS REMOTE MANUAL: This mode is selected by placing the equipment PCS MANUAL/AUTO selection in MANUAL. Remote control of individual piece of equipment is permitted in this mode.
   
b. PCS AUTOMATIC: This mode is provided for fully automatic operation of the process controls and is selected by placing the PCS MANUAL/AUTO selection in AUTO. This is the normal mode of operation.
   
3. PROTECTIVE INTERLOCKS: Equipment protective, hardwired interlocks shall remain in effect in all control modes, including LOCAL mode.

C. Process Control Functions:
   
1. Process control function shall be structured to permit the realization of all control strategy requirements. In addition, each control function shall be designed so that bump-less, balance free transfers are obtained during operating mode changeover and initialization. Where applicable, user-changeable parameters shall be automatically defaulted to a preset value if a specific value is not given during system generation.
   
2. Process control functions shall be programmed into the designated processors. No backup, hardwired, local control logic shall be provided.
   
3. The combination of the representation on the P&ID’s and the requirements specified herein provides the required process and equipment control information for the system. The P&ID’s do not show all the required internal diagnostic indications.

PART 2 – PRODUCTS
(Not Used)

PART 3 – EXECUTION

3.01 CENTRIFUGAL PUMP CONTROLS

A. Process Overview
   
1. There are three centrifugal pumps at the Sparks Pumping Station– Pumps A, B, and C, respectively.
   
2. Each pump is equipped with suction and discharge isolation valves, as well as a discharge cone valve.
   
3. Normal Start/Stop operation and speed control of each pump is via remote, manual control from the Telemetry Control Center (TCC) at the Ashburton Water Treatment Plant to maintain the level in the Sparks Elevated Storage Tank.
4. Remote, automatic start/stop and speed control of each pump from the TCC at the Ashburton Water Treatment Plant to maintain pressure or flow setpoint should be developed, programmed, and tested at the TCC and available for future use.

5. To allow for local control at the MCC, Contractor shall provide the START and STOP push buttons at the MCC for each pump.

6. The Sparks Pumping Station is also equipped with an existing Emergency Pressure Control Panel (EPCP) System which shut the pumps down in sequence when the station reaches preset pressure settings for either low suction pressure or high discharge pressure.

B. Description of Operation

1. **Local (MCC) Operation**: The pump can be started or stopped by using the LOR switch mounted on the MCC. The pump will start when the LOR switch is placed in the LOCAL (START) position and the operator presses the START button. Pump will stop when the LOR switch is placed in the OFF (STOP) position or if the operator presses the STOP button. This mode is operational regardless of the position of the RTU Enable/Disable selector switch located on the Pump Station Control Panel (PSCP).

   a. To enable pump speed control, the VFD / RVSS switch must be in the VFD position. The Pump speed is then able to be controlled via a speed control knob located on the front of the MCC. Pump speed shall be displayed on the associated VFD HMI.

   b. The pumps are able to be run at full speed via Reduced Voltage Solid State Soft Starters in the event that the VFDs fail. To enable full speed pump operation independent of the VFD the VFD / RVSS switch shall be placed in the RVSS position. The Pump will then run at full speed when started as detailed above. A “Pump in RVSS” alarm will be generated when RVSS is selected.

2. **Local (PCP HMI) Operation**: In this mode, the pump can be started or stopped manually from the PCP (Pump Control Panel) HMI. For this mode of operation, the LOR switch on the MCC must be in the REMOTE (PLC) position, the RTU Enable/Disable selector switch mounted on the PSCP must be selected for ENABLE, and the virtual MANUAL (PLC) button on the PCP HMI must be selected. The pump shall start running when the operator presses the START button on the PCP HMI. The pump shall stop running when the STOP button is selected on the PCP HMI. Momentary signals shall be used for Start/Stop control of the pumps.

   a. To enable pump speed control, the VFD / RVSS switch must be in the VFD position. When started as detailed above, the pump speed shall be controlled from the PCP HMI. Pump speed shall be controlled and displayed as a percentage of full speed.
b. The pumps are able to be run at full speed via Reduced Voltage Solid State Soft Starters in the event that the VFDs fail. To enable full speed pump operation independent of the VFD the VFD / RVSS switch shall be placed in the RVSS position. The Pump will then run at full speed when started as detailed above. A “Pump in RVSS” alarm will be generated when RVSS is selected.

3. Remote (TCC HMI) Operation: In this mode, the pump can be started and stopped via control signals received from the TCC at the Ashburton Water Treatment Plant. For this mode of operation, the LOR switch on the MCC must be in REMOTE, the RTU Enable/Disable selector switch mounted on the PSCP must be selected for ENABLE, and the virtual AUTOMATIC (TCC) button on the PCP HMI must be selected. The pumps will then start or stop and change speed when called by the TCC PLC(s). The PLC(s) and HMI(s) at the TCC and the PLC and HMI at the PCP shall be configured and programmed to allow for remote selection and execution of the following operational modes.

a. Remote, Manual (TCC HMI) Operation: After Remote Automatic (TCC) operation is enabled on the local MCC and PCP HMI as detailed above, the pumps shall be able to be controlled manually via the HMI(s) and PLC(s) at the TCC. For this mode of operation, the pump shall start running when the virtual START button is selected on the TCC HMI(s). The pump will stop running when the virtual STOP button is selected on the TCC HMI(s).

1) To enable pump speed control the VFD / RVSS switch must be in the VFD position. When started as detailed above, the pump speed shall be controlled via virtual INCREASE and DECREASE buttons and a virtual NUMBER KEYPAD on the TCC HMI. Pump speed shall be controlled and displayed as a percentage of full speed.

2) The pumps are able to be run at full speed via Reduced Voltage Solid State Soft Starters in the event that the VFDs fail. To enable full speed pump operation independent of the VFD the VFD / RVSS switch on the associated MCC bucket shall be placed in the RVSS position. The Pump will then run at full speed when started as detailed above. A “Pump in RVSS” alarm will be generated when RVSS is selected.

b. Remote, Automatic (TCC HMI) Operation – Maintain Pressure Set Point: After AUTOMATIC (TCC) operation is enabled on the local MCC and PCP HMI as detailed above, the pumps shall be able to be controlled by the PCP PLC and the TCC PLC(s) to automatically maintain a pressure set point as configured at the HMI(s) and PLC(s) at the TCC. For this mode of operation, the VFD / RVSS switch on the MCC must be in the VFD position and the virtual AUTOMATICALLY MAINTAIN PRESSURE button shall be selected on the TCC HMI(s). The pumps shall then be automatically turned on and off and shall have their speed(s) automatically adjusted to maintain the pressure set point based on the monitored station discharge pressure. Pressure set point shall be manually set by the operator.
at the TCC. Pressure shall be controlled and displayed as PSI or system FT H2O (above sea level). Control loops shall be configured locally as needed to maintain the appropriate sample rate and latency required for this operational mode; however, this operational mode shall only be capable of being selected from the TCC HMI(s).

c. **Automatic (TCC HMI) Operation – Maintain Flow Set Point:** After AUTOMATIC (TCC) operation is enabled on the local MCC and PCP HMI as detailed above, the pumps shall be able to be controlled by the PCP PLC and the TCC PLC(s) to automatically maintain a discharge flow set point as configured at the HMI(s) and PLC(s) at the TCC. For this model of operation, the VFD / RVSS switch on the MCC must be in the VFD position and the virtual AUTOMATICALLY MAINTAIN FLOW button shall be selected on the TCC HMI(s). The pumps shall then be automatically turned on and off and shall have their speed(s) automatically adjusted to maintain the configured discharge flow rate set point based on the monitored station discharge flow. Flow rate set point shall be manually set by the operator at the TCC. Flow shall be controlled and displayed as MGD or GPM. Control loops shall be configured locally as needed to maintain the appropriate sample rate and latency needed to allow for this operational mode; however, this operational mode shall only be capable of being selected from the TCC HMI(s).

4. **Alarms and Controls:**

a. The following indications shall be provided for each pump and shall be integrated in the PCP PLC cabinet, and utilized on graphics depicting the pumping operation on both the PCP HMI and the TCC HMI(s):

1) Pump in Remote
2) Pump in Local
3) Pump Lockout
4) Pump Running
5) Pump Start
6) Pump Stop
7) Pump in RVSS
8) VFD fail
9) Pump in RVSS
10) Pump Speed Feedback
11) Pump Speed Control
b. The following input/output communication shall be provided for each pump and shall be integrated with the associated cone valve control:

1) OPEN cone valve
2) CLOSE cone valve (emergency)
3) Cone valve CLOSED
4) Cone valve OPENED
5) Cone valve 95% CLOSED
6) Status Signals for the following shall be integrated into the PCP HMI and at the TCC HMI(s).
   a) Cone Valve Open
   b) Cone Valve Closed

c. The information available from the Multilin 469 Motor Protection Relays provided for each pump shall be integrated into the PLC cabinet, and utilized on graphics depicting the pumping operation. This information, in addition to the other status information available for the pumps shall be utilized and integrated to display the following information at the PCP HMI and on the individual Pump dashboards at the TCC HMI(s).

1) Motor Alarms
   a) Remote Alarm Status
   b) Pressure Switch Alarm Status
   c) Digital Counter Alarm Status
   d) General Switch A Alarm Status
   e) General Switch B Alarm Status
   f) General Switch C Alarm Status
   g) General Switch D Alarm Status
   h) Thermal Capacity Alarm
   i) Overload Alarm Status
   j) Current Unbalance Alarm Status
   k) Ground Fault Alarm Status
   l) RTD #1 Alarm Status
m) RTD #2 Alarm Status
n) RTD #3 Alarm Status
o) RTD #4 Alarm Status
p) RTD #5 Alarm Status
q) RTD #6 Alarm Status
r) RTD #7 Alarm Status
s) RTD #8 Alarm Status
t) RTD #9 Alarm Status
u) RTD #10 Alarm Status
v) RTD #11 Alarm Status
w) RTD #12 Alarm Status
x) Open RTD Sensor Alarm Status
y) Short Sensor / Low Temperature Alarm
z) Under Voltage Alarm Status
aa) Overvoltage Alarm Status
bb) System Frequency Alarm Status
cc) Power Factor Alarm Status
dd) Reactive Power Alarm Status
ee) Under Power Alarm Status
ff) Trip Counter Alarm Status
gg) Starter Failure Status
hh) Current Demand Alarm Status
ii) kW Demand Alarm Status
jj) kVAR Demand Alarm Status
kk) Vibration Alarm Status
ll) Analog Input 2 Alarm Status
mm) Analog Input 3 Alarm Status
nn) Analog Input 4 Alarm Status
oo) Reverse Power Alarm Status
pp) RTD #1 High Alarm Status
qq) RTD #2 High Alarm Status
rr) RTD #3 High Alarm Status
ss) RTD #4 High Alarm Status
tt) RTD #5 High Alarm Status
uu) RTD #6 High Alarm Status
vv) RTD #7 High Alarm Status
ww) RTD #8 High Alarm Status
xx) RTD #9 High Alarm Status
yy) RTD #10 High Alarm Status
zz) RTD #11 High Alarm Status
aaa) RTD #12 High Alarm Status
bbb) Over Torque Alarm Status

2) Current Metering
a) Phase A Current (Amps)
b) Phase B Current (Amps)
c) Phase C Current (Amps)
d) Average Phase Current (Amps)
e) Motor Load (FLA)
f) Current Unbalance (%)
g) Equivalent Motor Load (FLA)
h) Ground Current (Amps)
3) Temperatures
   a) Hottest Stator RTD (DegF)
   b) RTD #1 Temp (DegF)
   c) RTD #2 Temp (DegF)
   d) RTD #3 Temp (DegF)
   e) RTD #4 Temp (DegF)
   f) RTD #5 Temp (DegF)
   g) RTD #6 Temp (DegF)
   h) RTD #7 Temp (DegF)
   i) RTD #8 Temp (DegF)
   j) RTD #9 Temp (DegF)
   k) RTD #10 Temp (DegF)
   l) RTD #11 Temp (DegF)
   m) RTD #12 Temp (DegF)

4) Voltage Metering
   a) Vab (V)
   b) Vbc (V)
   c) Vca (V)
   d) Frequency (Hz)

5) Power Metering
   a) Power Factor
   b) Real Power (kW)
   c) Real Power (HP)
   d) Reactive Power (kVAR)
   e) Apparent Power (kVA)
Sparks Water Pumping Station & Elevated Tank Improvements
J.O. 231-203-0035-0514

6) Miscellaneous Multilin Information
   a) Relay in Service
   b) Active Trip
   c) Active Alarm
   d) Motor Stopped
   e) Motor Starting
   f) Motor Running
   g) Overload Pickup
   h) Unbalance Pickup
   i) Ground Pickup
   j) Hot RTD
   k) Loss of Load

5. Interlocks and Permissives:
   a. EPS emergency stop: The Contractor shall provide hardwired interlock, under both HAND/LOCAL and AUTO/REMOTE conditions, from the existing EPS panel to the MCC to shut down the pump when low suction pressure or high discharge pressure settings are reached.
   b. Cone valve closed: Under both HAND/LOCAL and AUTO/REMOTE conditions, the pump can only start with positive indication that the cone valve is closed.
   c. Cone valve failed to open: Upon pump start and when the discharge pressure has reached a preset setting, the pump will call the cone valve to open. If the pump control logic does not receive positive indication that the cone valve has opened after a preset time delay, the pump shall shut down.
   d. Cone valve 95% closed: Upon call for pump to shut down, the pump will call the cone valve to close. When the cone valve has reached 95% closed position, the pump shall shut down.
   e. Cone valve emergency closed: Upon loss of power or pump failure, the MCC shall call on the cone valve to close immediately under emergency condition.
3.02 UTILITY FEEDER AND GENERATOR

A. Status signals shall be provided from the auxiliary contacts for the ATS (Automatic Transfer Switch).

B. The information available from the Power Monitor provided for the Main BGE feeder shall be integrated to display the following information on new graphics at the PLC HMI and at the Ashburton TCC.

1. General Alarms
   a. Remote Alarm Status
   b. Digital Counter Alarm Status
   c. Thermal Capacity Alarm
   d. Overload Alarm Status
   e. Current Unbalance Alarm Status
   f. Ground Fault Alarm Status
   g. Under Voltage Alarm Status
   h. Overvoltage Alarm Status
   i. System Frequency Alarm Status
   j. Power Factor Alarm Status
   k. Reactive Power Alarm Status
   l. Under Power Alarm Status
   m. Trip Counter Alarm Status
   n. Current Demand Alarm Status
   o. kW Demand Alarm Status
   p. kVAR Demand Alarm Status
   q. Reverse Power Alarm Status

2. Current Metering
   a. Phase A Current (Amps)
   b. Phase B Current (Amps)
   c. Phase C Current (Amps)
d. Average Phase Current (Amps)

e. Motor Load (FLA)

f. Current Unbalance (%)

g. Equivalent Motor Load (FLA)

h. Ground Current (Amps)

3. Voltage Metering

a. Vab (V)

b. Vbc (V)

c. Vca (V)

d. Frequency (Hz)

4. Power Metering

a. Power Factor

b. Real Power (kW)

c. Real Power (HP)

d. Reactive Power (kVAR)

e. Apparent Power (kVA)

C. The hardwired alarm signals for the Generator shall be integrated from the Annunciator Panel into the PLC cabinet and used to display the following information on new graphics at the PLC HMI and at the Ashburton TCC.

1. Generator Running

2. Generator Low Fuel

3. Generator Fail

4. Generator Low Battery

5. Generator Low Oil

6. Generator Fuel Leak

7. Generator High Temp
3.03 SODIUM HYPOCHLORITE FEED SYSTEM

A. Process Overview

1. Components of the sodium hypochlorite supply system shall include, but not be limited to a Chemical Metering Pump Skid, Hypo Feed System Control Panel, Fill Station Control Panel, Chemical Feed System Flow Meter, Chlorine Residual Analyzer, Microprocessor-Based Compound Loop Controller, Fiberglass Storage Tanks as well as level indicators, leak detector units, float switches and other accessories necessary to provide a complete and operable sodium hypochlorite feed system. Sodium hypochlorite feed system operational descriptions and component functionality is provided under Specification Section 15260. The information herein is intended to supplement the information provided under the Sodium Hypochlorite Specification Section.

2. Two single walled Sodium Hypochlorite Storage Tanks shall be provided for chemical storage. Each tank shall be provided with a level sensor, associated transmitter, and a high level switch. The tanks are located over individual containment basins which are located within a concrete secondary containment sump. Each containment basin shall be provided with a leak detection sensor to indicate a leak in a particular tank. The secondary containment sump is provided with a float switch to indicate liquid within the sump.

3. Two feed pumps shall be provided to allow for controlled dosing of sodium hypochlorite to the potable water distribution system. Each pump shall be provided with an integral controller and HMI to allow for local control of the pumps. Each pump shall also be provided with remote control capabilities. The pump controller shall accept a discharge flow rate analog control signal, a discharge flow rate analog feedback signal, start and stop discrete control signals, and failure, tubing leak, and pump running discrete indication signals.

4. One total residual chlorine analyzer shall be provided to monitor the free residual chlorine in the station effluent flow. This shall be transmitted to the compound loop controller to maintain the residual chlorine at the configured set point, recorded on a dedicated chart recorder, and transmitted to the Telemetry Control Center via the station Pump Control Panel.

5. A compound loop controller shall be provided to allow for automatic dosing of sodium hypochlorite. Controller shall accept inputs for station discharge flow and free residual chlorine and shall provide outputs for pump start/stop and pump speed/dosage control.

6. A Hypo Feed System Control Panel shall be provided to allow for monitoring and control of the two hypo feed pumps and chemical storage tanks. The panel shall allow for the selection of one of the two feed pumps for automatic control via the start/stop and pump speed/dosage control provided from the compound loop controller.
7. A Hypo Fill Station Panel shall be provided to allow for monitoring of the tank levels and remaining chemicals from the delivery connections on the exterior wall of the pump station. Panel shall also monitor for high level in either of the associated tanks and provide visual and auditory alarms should the level in the tanks approach the overflow elevation.

B. Description of Operation:

1. **Local Manual Operation:** For this mode of operation the controller integral to each pump must be placed in LOCAL control. The pump can then be started, stopped, and speed adjusted using the controls integral to each pump.

2. **Remote Manual Operation:** For this mode of operation the controller integral to each pump must be placed in REMOTE control and the HAND/OFF/AUTO switch for the associated pump on the Hypo Feed System Control Panel must be placed in HAND. The pump will then start running and the speed can be controlled via a knob on the Hypo Feed System Control Panel. To stop the pump the HAND/OFF/AUTO switch must be placed in OFF.

3. **Remote Automatic Operation:** For this mode of operation the controller integral to each pump must be placed in REMOTE control, the HAND/OFF/AUTO switch for the associated pump on the Hypo System Control Panel must be placed in AUTO, and the PRIMARY PUMP SELECT switch must be placed in the pump selected for operation (P1 or P2). The Compound Loop Controller shall turn on and off the selected pump and adjust the associated dosage rate, using signals received for the station discharge flow and the effluent free residual chlorine, to maintain the station effluent chlorine at the set point configured on the Compound Loop Controller.

4. There is no remote control from the TCC for the Hypo System.

5. **Interlocks and Permissives:**
   a. **Centrifugal Pumps Running:** The Contractor shall provide hardwired interlocks, under AUTO conditions, that prohibit the chemical feed pumps from running when all centrifugal pumps are off.
   b. **No Flow:** When the pumps are called to run, a flow meter monitors the discharge flow from the chemical metering skid. If the flow meter does not detect flow above a certain threshold for an adjustable period of time a low flow condition is detected and the pump(s) are shut down.

END OF SECTION
SECTION IV

Permits
This permit authorizes Baltimore County Department of Public Works to install a water chlorination system and rehabilitation of water pumping station along with elevated water tank together with all appurtenances, at the site of 14010 and 14501 York Road, Sparks, Baltimore County, in accordance with an application dated February 18, 2020 and received by the Maryland Department of the Environment on February 27, 2020 titled in part:

SPARKS WATER PUMPING STATION AND
ELEVATED WATER STORAGE TANK IMPROVEMENTS
BALTIMORE COUNTY, MARYLAND
SHEET NO 1- 71 AND
TECHNICAL SPECIFICATIONS

THIS PERMIT IS ISSUED SUBJECT TO THE ATTACHED FOLLOWING CONDITIONS:

Note: This permit may be suspended or revoked upon a final, unreviewable determination that the permittee lacks, or is in violation of federal, state or local approval necessary to conduct the activity authorized by this permit.

Walid Saffouri, P.E., Program Administrator
Engineering & Capital Projects Program

Terri Wilson, Director
Office of Budget & Infrastructure Financing
GENERAL CONDITIONS FOR WATER OR SEWERAGE CONSTRUCTION PERMIT

- The structural adequacy and expected performance characteristics of the various components are not certified by this permit.

- This permit is not transferable.

- A copy of this permit must be posted at the work site during construction.

- This permit will expire, if not specifically extended, unless the construction authorized under this permit has been initiated. The permit will then remain valid for the remainder of construction for a period of up to five years from the start of construction.

- If any provision of this permit shall be held invalid for any reason, the remaining provisions shall remain in full force and effect, and such invalid provision shall be considered severed and deleted from this permit.

- Persons violating the requirements of this permit are subject to penalties of up to $1000 per day as set forth in Environment Article 9-268 and 9-334 through 9-342, Annotated Code of Maryland.

- A copy of the plans and specifications, authorized for use under this permit, shall be made available at the work site during construction of this project. A revised construction permit in accordance with COMAR 26.03.12 is required prior to making substantive changes or material alteration to the construction authorized under this permit.

- The owner shall secure all Federal, State or local permits, including approval of Sedimentation and Erosion Control Plans that may be required before starting the construction of the project.

- The owner shall insure that this project is inspected during the progress of construction to assure substantial compliance with the approved plans and specifications. A log and construction records shall be maintained by the inspector and may be requested for review at any time by this office.

- The project engineer of the Maryland Department of the Environment (the ‘Department’) shall be notified prior to the start of construction.

- Inspectors of the Department shall be afforded access to the project site, at reasonable times and upon presentation of credentials:
  a. to inspect construction authorized under this permit and to determine compliance with applicable regulations;
  b. to have access to and copy any records required to be kept by this permit and by applicable regulations; and
  c. to obtain any photographic documentation or evidence.

- Within 60 days after completion of construction, a copy of as-built drawings and the attached construction completion certificate (page 3 of this permit) shall be submitted to the Department. Where construction was completed in accordance with the original plans approved under this permit, the submittal of as-built drawings will not be required.

- The owner shall maintain a permanent record of the as-built drawings, or the original plans if as-built drawings are not required.

4/2014
GENERAL CONDITIONS (CONTINUED)

Approval must be obtained from the Department before this project may be placed into service. Any exception allowing partial use of this project shall have the prior written approval of the Department. Approval may be obtained pursuant to the following procedure:

a. Where large political subdivisions, commissions, authorities etc. have their own inspection capabilities (satisfactory to the Department), the attached construction completion certificate shall be completed by the director of Public Works or similar responsible person and submitted to the Department.

b. Where an acceptable local construction inspection program does not exist, the attached construction completion certification shall be completed by a Professional Engineer licensed to practice in the State of Maryland (preferably the same engineer whose seal and signature appear on the plans approved under this permit) and submitted to the Department.

c. Upon receipt of the signed certificate, the Department shall, within (30) working days of the receipt, 1) issue an approval, 2) require further review and on-site inspection or 3) reject the construction certification. Approval shall be automatic for projects that have not received some form of written notification from the Department within (30) working days of receipt of the signed certificate.

20:13:14:16:1022

Preeti Shrestha
Project Engineer
Engineering & Capital Projects Program

WATER AND SEWER CONSTRUCTION COMPLETION CERTIFICATION

The undersigned certifies that the construction authorized by this permit has been completed and inspected and that it substantially meets the terms of Environment Article 9-204, Annotated Code of Maryland.

Signature  Title  Date

The above project has been accepted by the Department within the terms of Environment Article 9-204, Annotated Code of Maryland.

Authorized Official  Date

Complete this certificate and return to:
Maryland Department of the Environment
Engineering & Capital Projects Program (ECPP)
Office of Budget and Infrastructure Financing
1800 Washington Boulevard
Baltimore, MD 21230

10/13/2010
To: Permittee of Water and/or Sewerage Construction Permits

From: Walid Saffouri, Program Administrator
      Engineering and Capital Projects Program
      Office of Budget and Infrastructure Financing

Date Effective: January 1, 2001

GENERAL CONDITIONS FOR WATER OR SEWERAGE CONSTRUCTION PERMIT

Pursuant to Labor & Employment Article 9-201, the owner shall ensure that the contractor and subcontractors involved in the construction of this project must carry workers’ compensation insurance for their employees. If the owner determines to perform the project construction by his/her labor force, the owner shall provide the same.

If the entity, undertaking the project construction, is not covered by a workers’ compensation policy, a Certificate of Compliance shall be submitted and approved by the Workers’ Compensation Commission before initiation of the construction.
NOTICE

Prior to starting construction, please notify Preeti Shrestha, Project Engineer at (410) 537-3151. Upon completion of the project, the construction must be certified with the signed permit returned to this office along with a set of as-built drawings.

Should you have any questions concerning the permit or its conditions, please contact me at (410) 537-3757.

Sincerely,

[Signature]

Walid Saffouri, Program Administrator
Engineering and Capital Projects Program
Office of Budget and Infrastructure Financing
BALTIMORE COUNTY SOIL CONSERVATION DISTRICT
SEDIMENT AND EROSION CONTROL STANDARD PLAN
FOR AREAS NOT TO EXCEED 20,000 SQUARE FEET

LOCATION OF PROJECT: SPARKS PUMPING STATION
(address and/or detailed description of location)
14010 YORK ROAD, SPARKS MD 21152

Election District: 8C3 Road Map Coordinates, Page: 12 Block: H12-13

This Standard Plan for Sediment and Erosion Control is to be used for construction of PUMPING STATION RENOVATION

________________________________________ at the above location.

I hereby certify that this project meets the specified limitations and that all requirements for this Standard Plan, as indicated on page 2 of 2, will be met and that all grading and construction will be done according to the requirements and guidelines for Standard plans.

Agency Name (If applicable): Baltimore County Department of Public Works
Bureau of Engineering and Construction

Signature of Responsible Individual: Michael Mazurek

Printed name Responsible Individual: Michael J. Mazurek, PE. Chief Water Design Section

Address: 111 W Chesapeake Avenue, Towson MD 21204

Date: 02/16/2021 Phone: 410-887-3783

Baltimore County Soil Conservation District
APPROVED FOR SEDIMENT CONTROL 12-15-20
DISTRICT OFFICIAL 156-COUNTY-20
DATE PLAN NO.

This plan approval will expire three (3) years from the approval date.

This plan is not valid for issue after 12-31-21.

Date completed copy sent to SCD

IF ANY OF THE LIMITATIONS FOR THE USE OF A STANDARD PLAN CANNOT BE MET, A STANDARD PLAN CANNOT BE USED. IN ADDITION, THIS PLAN MAY BE TERMINATED AT ANYTIME BY THE DISTRICT WITH SIXTY (60) DAYS ADVANCE NOTICE. (THIS STANDARD PLAN IS NOT A PERMIT - SEE ITEM B., SHEET 2 OF 2.)
LIMITATIONS - This Standard Plan is valid only for construction projects which do not exceed any of the following limitations:

1. Work will not exceed 20,000 square feet of disturbed area.
2. Total volume of earth disturbance shall not exceed 1,000 cubic yards of cut or fill material.
3. Cut and/or fills will not exceed 10 feet in depth after final grading.
4. No slope shall be steeper than 2:1 for commercial land use and 3:1 for all other land uses after final grading.
5. No grading or construction shall take place within 100 feet or greater as may be required of a water body, stream and/or wetlands as designated by Baltimore County or State of Maryland.
6. Site does not require any of the following state permits: 1) Waterway Construction Permit, 2) Wetland Construction Permit.
7. Proposed construction will not include any forest removal within the designated Chesapeake Bay critical area, unless a variance has been granted by Baltimore County.
8. No concurrent construction may exist or be undertaken on adjoining lots, unless there is no drainage from one lot to the other.

SEDIMENT CONTROL REQUIREMENTS FOR USE OF STANDARD PLAN

A. All sediment control practices will be based on criteria from the 2011 MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL, or as amended by the District. (Super silt fence E.7, super fence diversion C.27, standard inlet protection E.24 & E.25, curb inlet protection E.27, and combination inlet protection E.30 & E.31 have been amended.)

B. Building and/or Grading permit, to be issued by Baltimore County Department of Permits, Approvals and Inspections, Division of Permits and Licenses @ (410) 887-3900, shall be required. (If the disturbance is less than 5,000 square feet, no grading permit is required.)

C. Should you have any questions about this plan, please call Baltimore County Department of Permits, Approvals and Inspections, Sediment Control at (410) 887-3226.

D. Following initial soil disturbance or redisturbance, permanent or temporary stabilization shall be completed within 3 calendar days on surface areas of all perimeter sediment control measures and/or steep slopes greater than 3:1; and 7 calendar days on all other disturbed or graded areas on the project site not under active grading.

E. Topsoil will be stockpiled within the limits of the site and the area down slope protected by silt fence.

F. All clearing and grading shall be completed in the following sequence:
   1. Clear and grub for the installation of stabilized construction entrance, silt fence and other sediment control practices.
   2. Install stabilized construction entrance, silt fence, and any other sediment control practices.
   3. Clear and grub remainder of site, grade and/or construct any structures, paving and/ or utilities.
   4. Stabilize the site according to the seeding or sodding specifications (minimum stabilization by seeding and mulching).
   5. Additional stabilization methods may be required at the discretion of the Sediment Control Inspector.
      After site has been stabilized with established vegetation, and with the permission of the Sediment Control Inspector, remove sediment control practices and stabilize remaining disturbed areas.

G. Access to the site will be available at all times to the District and Baltimore County personnel.

H. Any sediment or erosion control features installed by a developer which are damaged or disturbed during construction shall be restored or repaired before the end of each working day.

I. The sediment control measures will be employed in such a manner that down-slope undisturbed areas will not be contaminated by sediment.

J. Pumping of sediment laden water offsite is illegal. Dewatering must be accomplished by use of approved dewatering methods (Portable Sediment Tank, Sump pit, etc.).

K. A site plan must be provided showing all information, such as location, type of sediment control devices, etc.
Baltimore County Soil Conservation District

Sediment and Erosion Control Standard Plan
For Areas Not to Exceed 20,000 Square Feet

Location of Project: SPARKS ELEVATED STORAGE TANK
14501 YORK ROAD, SPARKS MD 21152

Election District: 8C3
Road Map Coordinates, Page: 12
Block: H-10

This Standard Plan for Sediment and Erosion Control is to be used for construction of ELEVATED STORAGE TANK RENOVATION at the above location.

I hereby certify that this project meets the specified limitations and that all requirements for this Standard Plan, as indicated on page 2 of 2, will be met and that all grading and construction will be done according to the requirements and guidelines for Standard plans.

Agency Name (If applicable): Baltimore County Department of Public Works
Bureau of Engineering and Construction

Signature of Responsible Individual: Michael J. Mazurek
Printed name Responsible Individual: Michael J. Mazurek, PE. Chief Water Design Section
Address: 111 W Chesapeake Avenue, Towson MD 21204
Date: 02/16/2021
Phone: 410-887-3783

This plan approval will expire three (3) years from the approval date.

This plan is not valid for issue after 12-31-21.

Date completed copy sent to SCD

IF ANY OF THE LIMITATIONS FOR THE USE OF A STANDARD PLAN CANNOT BE MET, A STANDARD PLAN CANNOT BE USED. IN ADDITION, THIS PLAN MAY BE TERMINATED AT ANY TIME BY THE DISTRICT WITH SIXTY (60) DAYS ADVANCE NOTICE. (THIS STANDARD PLAN IS NOT A PERMIT – SEE ITEM B., SHEET 2 OF 2.)
LIMITATIONS - This Standard Plan is valid only for construction projects which do not exceed any of the following limitations:

1. Work will not exceed 20,000 square feet of disturbed area.
2. Total volume of earth disturbance shall not exceed 1,000 cubic yards of cut or fill material.
3. Cut and/or fills will not exceed 10 feet in depth after final grading.
4. No slope shall be steeper than 2:1 for commercial land use and 3:1 for all other land uses after final grading.
5. No grading or construction shall take place within 100 feet or greater as may be required of a water body, stream and/or wetlands as designated by Baltimore County or State of Maryland.
6. Site does not require any of the following state permits:
7. Proposed construction will not include any forest removal within the designated Chesapeake Bay critical area, unless a variance has been granted by Baltimore County.
8. No concurrent construction may exist or be undertaken on adjoining lots, unless there is no drainage from one lot to the other.

SEDIMENT CONTROL REQUIREMENTS FOR USE OF STANDARD PLAN

A. All sediment control practices will be based on criteria from the 2011 MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL, or as amended by the District. (Super silt fence E.7, super fence diversion C.27, standard inlet protection E.24 & E.25, curb inlet protection E.27, and combination inlet protection E.30 & E.31 have been amended.)

B. Building and/or Grading permit, to be issued by Baltimore County Department of Permits, Approvals and Inspections, Division of Permits and Licenses @ (410) 887-3900, shall be required. (If the disturbance is less than 5,000 square feet, no grading permit is required.)

C. Should you have any questions about this plan, please call Baltimore County Department of Permits, Approvals and Inspections, Sediment Control at (410) 887-3226.

D. Following initial soil disturbance or redisturbance, permanent or temporary stabilization shall be completed within 3 calendar days on surface areas of all perimeter sediment control measures and/or steep slopes greater than 3:1; and 7 calendar days on all other disturbed or graded areas on the project site not under active grading.

E. Topsoil will be stockpiled within the limits of the site and the area down slope protected by silt fence.

F. All clearing and grading shall be completed in the following sequence:
   1. Clear and grub for the installation of stabilized construction entrance, silt fence and other sediment control practices.
   2. Install stabilized construction entrance, silt fence, and any other sediment control practices.
   3. Clear and grub remainder of site, grade and/or construct any structures, paving and/or utilities.
   4. Stabilize the site according to the seeding or sodding specifications (minimum stabilization by seeding and mulching).
   5. Additional stabilization methods may be required at the discretion of the Sediment Control Inspector.
       After site has been stabilized with established vegetation, and with the permission of the Sediment Control Inspector, remove sediment control practices and stabilize remaining disturbed areas.

G. Access to the site will be available at all times to the District and Baltimore County personnel.

H. Any sediment or erosion control features installed by a developer which are damaged or disturbed during construction shall be restored or repaired before the end of each working day.

I. The sediment control measures will be employed in such a manner that down-slope undisturbed areas will not be contaminated by sediment.

J. Pumping of sediment laden water offsite is illegal. Dewatering must be accomplished by use of approved dewatering methods (Portable Sediment Tank, Sump pit, etc.).

K. A site plan must be provided showing all information, such as location, type of sediment control devices, etc.
SECTION V

Proposal

This Section to be
Completed by Time of Bid
SECTION-V
PROPOSAL

DESCRIPTION OF WORK

Bid Opening via Teleconference WebEx Thursday, August 5, 2021 at 10:45 a.m. EST via Webex teleconference Phone Number 1-415-655-0001 Access Code: 172 348 4616.

Begin Work within Fifteen (15) Days after NOTICE TO PROCEED.

Working Days for Completion TWO HUNDRED SIXTY (260) WORKING DAYS

Liquidated and Other Damages: TWO HUNDRED (200) WORKING DAYS

Cost Group “F ($5,000,001 to $10,000,000” (Prequalified contractors with a Cost Group restriction must bid within the dollar amount stated on their Certificate of Prequalification).

Work Classification: G-2 with pre-qualified H and F-2 subcontractors

TO BALTIMORE COUNTY, MARYLAND: To provide a fully finished and operable pumping station facility including miscellaneous items and operations. The work also includes all specified, indicated and shown civil site work, plumbing, structural, mechanical and electrical equipment, appliances, appurtenances, furnishings, instrumentation and controls, accessories, tests and sundry parts and material as shall be necessary and required for a completely operable installation. Sparks–District 8c3.

The following listed Drawing Number(s) are collectively the “Drawings”, and are hereby incorporated in the Contract.

<table>
<thead>
<tr>
<th>Job Order No.</th>
<th>Drawing Number’s</th>
</tr>
</thead>
<tbody>
<tr>
<td>231-203-0035-0514</td>
<td>2020-0428 through 2020-0498</td>
</tr>
</tbody>
</table>

A pre-bid meeting will be held on Wednesday, July 14, 2021 at 9:00 A.M. EST via teleconference WebEx phone number: 1-415-655-0001 and the access code number is 172 721 9414.

Note: No successful bidder may withdraw their bid within NINETY (90) days after the opening thereof.

The Contractor hereby declares that it has carefully examined the solicitation, plans and specifications, form of contract, Special Provisions and Drawings (collectively the “Contract Documents”). The Contractor also hereby declares that it has carefully examined the February 2000 “Standard Specifications for Construction and Materials” and “Standard Details for Construction,” collectively the “Applicable County Law” and any and all Department of Public Works revisions thereto as of the date of advertisement. The Contract Documents, the Applicable County Law and the Department of Public Works revisions thereto are collectively the “Specifications” and are incorporated herein. Copies of any and all Department of Public Works revisions including but not limited to Addendum No. 3 and General Conditions Building Projects, are on file and available in the Division of Construction Contracts Administration, County Office Building, Towson, Maryland, and can be downloaded and printed from the internet using Acrobat Reader at: http://www.baltimorecountymd.gov/Agencies/publicworks/standardsandspecs/specsanddetails.html

Also, the Contractor has, to its satisfaction, examined the locality of the proposed work and agrees to furnish all labor, tools, materials, machinery, equipment, and other means of construction called for in the manner provided in the Specifications for the prices shown on the next page(s) and as evidenced by Contractor’s signature on the last page thereof.

SCHEDULE OF PRICES

NOTE: The Bidder shall fill out this Proposal, write in the unit prices in clear numerals, and make the extensions.

For complete information concerning these items, see Specifications and contract forms.
## Contract Proposal

**Contract Number:** 20094WX0  
**Job Order Number:** 203-0035-0514  
**Election District Number:** 8 C3  
**Estimate of Working Days:** 260

### Project Description
SPARKS PUMPING STATION AND ELEVATED TANK REHABILITATION  
**Drawing Numbers:** 2020-0428 Through 2020-0498

<table>
<thead>
<tr>
<th>Contractor Name</th>
<th>Prequal. No.</th>
<th>Vendor No.</th>
<th>Telephone</th>
<th>Bid/Alt.</th>
<th>Description of Item</th>
<th>Unit of Measure</th>
<th>Estimated Quantity</th>
<th>Unit Price</th>
<th>Estimate Total Price</th>
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<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
<td>1</td>
<td>SPARKS WATER PUMPING STATION IMPROVEMENTS</td>
<td>LS</td>
<td>--N/A--</td>
<td>--N/A--</td>
<td>--N/A--</td>
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<td></td>
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<td></td>
<td>2</td>
<td>ELEVATED TANK IMPROVEMENTS</td>
<td>LS</td>
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<td>--N/A--</td>
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<td></td>
<td>3</td>
<td>SITE FENCING IMPROVEMENTS - PUMPING STATION</td>
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<td>CONTINGENT CLASS 3 EXCAVATION AND SELECT BACKFILL</td>
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<td>150</td>
<td>130.00</td>
<td>19,500.00</td>
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<td>6 C</td>
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C - Indicates Contingent Items  
20094WX0  
Page - 1  
* - If no cents, write no-cents  
* - Two digit cents in Unit & Total Prices Only.
<table>
<thead>
<tr>
<th>BID/ALT ITEM</th>
<th>DESCRIPTION OF ITEM</th>
<th>UNIT OF MEASURE</th>
<th>ESTIMATED QUANTITY</th>
<th>BID ESTIMATE</th>
<th>TOTAL PRICE</th>
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<td>7 C</td>
<td>CONTINGENT TANK REHABILITATION WELDING</td>
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<td>8 C</td>
<td>CONTINGENT PIT FILLING AND SURFACING</td>
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>>> TOTAL COST FOR CONTRACT --- 20094WX0

$ -------------- <
<table>
<thead>
<tr>
<th>BID/ALT</th>
<th>DESCRIPTION OF ITEM</th>
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</table>

TOTAL COST FOR CONTRACT IN WORDS

Dollars and __________/100

OFFICER SIGNATURE

__________________________

TITLE

C - INDICATES CONTINGENT ITEMS  

* - IF NO CENTS, WRITE NO-CENTS  

* - TWO DIGIT CENTS IN UNIT & TOTAL PRICES ONLY.
PROPOSAL AFFIDAVIT

1. AUTHORIZED REPRESENTATIVE

I HEREBY AFFIRM THAT:

I am the [title, _________________] and the duly authorized representative of [business] (the "Business") and that I possess the legal authority to make this Affidavit on behalf of myself and the Business for which I am acting.

2. PROPOSAL CERTIFICATION

THE UNDERSIGNED HEREBY ACKNOWLEDGES receipt of the following Addenda (list by number and date):

Accompanying this Proposal is a Bid Bond in an amount of 5% of the bid, the exact amount to be determined by the difference between the low bid and the next lowest bid, if two or more bids are received, or 5% of the bid if one bid is received. This guarantees payment to Baltimore County of the amount thus determined as liquidated damages in case of default in any matter specified as required before award or in any matter resulting in failure to execute and deliver an Agreement, together with Payment and Performance Bonds, after award.

3. AFFIRMATION REGARDING BRIBERY CONVICTIONS

I FURTHER AFFIRM THAT:

Neither I, nor to the best of my knowledge, information, and belief, the Business, nor any of its officers, directors, partners, or any of its employees directly involved in obtaining or performing contracts with public bodies (as is defined in Section 16-101(f) of the State Finance and Procurement Article of the Annotated Code of Maryland), has been convicted of, or has had probation before judgment imposed pursuant to Section 6-225 of the Criminal Procedure Article of the Annotated Code of Maryland, or has pleaded nolo contendere to a charge of, bribery, attempted bribery, or conspiracy to bribe in violation of Maryland law, or of the law of any other state or federal law, except as follows [indicate the reasons why the affirmation cannot be given and list any conviction, plea, or imposition of probation before judgment with the date, court, official or administrative body, the sentence or disposition, the name(s) of person(s) involved, and their current positions and responsibilities with the Business]:

4. AFFIRMATION REGARDING OTHER CONVICTIONS

I FURTHER AFFIRM THAT:

Neither I, nor to the best of my knowledge, information, and belief, the Business, nor any of its officers, directors, partners, or any of its employees directly involved in obtaining or performing contracts with public bodies, has:

(1) Been convicted under state or federal statute of a criminal offense incident to obtaining, attempting to obtain, or performing a public or private contract, fraud, embezzlement, theft, forgery, falsification or destruction of records, or receiving stolen property;
(2) Been convicted of any criminal violation of a state or federal antitrust statute;

(3) Been convicted under the provisions of Title 18 of the United States Code for violation of the Racketeer Influenced and Corrupt Organization Act, 18 U.S.C. §1961, et seq., or the Mail Fraud Act, 18 U.S.C. §1341, et seq., for acts arising out of the submission of bids or proposals for a public or private contract;

(4) Been convicted of a violation of the State Minority Business Enterprise Law, Section 14-308 of the State Finance and Procurement Article of the Annotated Code of Maryland;

(5) Been convicted of conspiracy to commit any act or omission that would constitute grounds for conviction or liability under any law or statute described in subsection (1), (2), (3), or (4) above;

(6) Been found civilly liable under a state or federal antitrust statute for acts or omissions in connection with the submission of bids or proposals for a public or private contract;

(7) Admitted in writing or under oath, during the course of an official investigation or other proceedings, acts or omissions that would constitute grounds for conviction or liability under any law or statute described above, except as follows [indicate reasons why the affirmations cannot be given, and list any conviction, plea, or imposition of probation before judgment with the date, court, official or administrative body, the sentence or disposition, the name(s) of the person(s) involved and their current positions and responsibilities with the Business, and the status of any debarment]:

5. AFFIRMATION REGARDING DEBARMENT

I FURTHER AFFIRM THAT:

Neither I, nor to the best of my knowledge, information, and belief, the Business, nor any of its officers, directors, partners, or any of its employees directly involved in obtaining or performing contracts with public bodies, has ever been suspended or debarred (including being issued a limited denial of participation) by any public entity, except as follows [list each debarment or suspension providing the dates of the suspension or debarment, the name of the public entity and the status of the proceeding, the name(s) of the person(s) involved and their current positions and responsibilities with the Business, the grounds of the debarment or suspension, and the details of each person’s involvement in any activity that formed the grounds of the debarment or suspension]:

6. AFFIRMATION REGARDING DEBARMENT OF RELATED ENTITIES

I FURTHER AFFIRM THAT:

(1) The Business was not established and it does not operate in a manner designed to evade the application of or defeat the purpose of debarment pursuant to Sections 16-101, et seq., of the State Finance and Procurement Article of the Annotated Code of Maryland; and

(2) The Business is not a successor, assignee, subsidiary, or affiliate of a suspended or debarred business, except as follows: [you must indicate the reasons why the affirmations cannot be given without qualification]:

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7. **SUB-CONTRACT AFFIRMATION**

I FURTHER AFFIRM THAT:

Neither I, nor to the best of my knowledge, information, and belief, the Business, has knowingly entered into a contract with a public body under which a person debarred or suspended under Title 16 of the State Finance and Procurement Article of the Annotated Code of Maryland will provide, directly or indirectly, supplies, services, architectural services, construction related services, leases of real property, or construction.

8. **AFFIRMATION REGARDING COLLUSION**

I FURTHER AFFIRM THAT:

Neither I, nor to the best of my knowledge, information, and belief, the Business, nor any of its officers, directors, members or partners, nor any of its employees, have in any way:

(1) Agreed, conspired, connived, or colluded to produce a deceptive show of competition in the compilation of the accompanying bid or offer that is being submitted;

(2) In any manner, directly or indirectly, entered into any agreement of any kind to fix the bid price or price proposal of the bidder or offeror or of any competitor, or otherwise take any action in restraint of free competitive bidding in connection with the contract for which the accompanying bid or offer is submitted;

(3) Colluded with anyone to obtain information concerning the bid that would give the Business an unfair advantage over others.

9. **POLITICAL CONTRIBUTION DISCLOSURE AFFIRMATION**

I FURTHER AFFIRM THAT:

The Business affirms that it is aware of, and will comply with, the provisions of Sections 14-101 through 14-108 of the Election Law Article of the Annotated Code of Maryland, which require that every person who makes, during any 12-month period, one or more contracts, with one or more Maryland governmental entities involving cumulative consideration, or at least $200,000.00, shall file with the State Board of Elections certain specified information to include disclosure of attributable political contributions in excess of $500 during defined reporting periods.

10. **CERTIFICATION OF CORPORATION REGISTRATION AND TAX PAYMENT**

I FURTHER AFFIRM THAT:

(1) The Business is a _________ (State) circle one: (Corporation), (LLC), (Partnership), (Sole Proprietor/Individual), (Other:____________________), that it is registered in accordance with the Corporations and Associations Article of the Annotated Code of Maryland, that it is in good standing in the State of Maryland, and that it has filed all of its annual reports, together with filing fees, with the Maryland State Department of Assessments and Taxation, and that the name and address of its resident agent filed with the State Department of Assessments and Taxation is:
(2) Except as validly contested, the Business has paid, or has arranged for payment of, all taxes due the State of Maryland and Baltimore County, and has filed all required returns and reports with the Comptroller of the Treasury, the State Department of Assessments and Taxation, and the Employment Security Administration, as applicable, and will have paid all withholding taxes due the State of Maryland prior to final settlement.

11. CONTINGENT FEES

I FURTHER AFFIRM THAT:

The Business has not employed or retained any person, partnership, corporation, or other entity, other than a bona fide employee or agent working for the Business, to solicit or secure the Contract, and that the Business has not paid or agreed to pay any person, partnership, corporation, or other entity, other than a bona fide employee or agent, any fee or other consideration contingent on the making of the Contract.

12. NONDISCRIMINATION IN EMPLOYMENT STATEMENT

I FURTHER AFFIRM THAT:

During the performance of any contract awarded of which this affidavit is a part:

(1) The Business will not discriminate against any employee or applicant for employment because of race, color, religion, sex, age, national origin, marital status, sexual orientation, genetic information, or disability unrelated in nature and extent so as to reasonably preclude the performance of the employment, or because of the individual's refusal to submit to a genetic test or make available the results of a genetic test. The Business will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, age, national origin, marital status, sexual orientation, genetic information, or disability unrelated in nature and extent so as to reasonably preclude the performance of the employment, or because of the individual's refusal to submit to a genetic test or make available the results of a genetic test. Such action shall include, but not be limited to the following: employment, promotion, upgrading, demotion or transfer, rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Business agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the owner setting forth provisions of this nondiscrimination clause.

(2) The Business will, in all solicitations or advertisements for employees placed by or on behalf of the Business, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, age, national origin, marital status, sexual orientation, genetic information, or disability unrelated in nature and extent so as to reasonably preclude the performance of the employment, or because of the individual's refusal to submit to a genetic test or make available the results of a genetic test.

(3) The Business shall send to each labor union or representative of workers with which the Business has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the owner, advising the said labor union or workers' representative of these commitments, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.
The Business shall furnish, if requested by the County, a compliance report concerning our employment practices and policies in order for the County to ascertain compliance with the special provisions of this affidavit concerning nondiscrimination in employment.

In the event of the Business's noncompliance with the nondiscrimination clause of this affidavit, the contract may be canceled, terminated, or suspended in whole or in part, and the Business may be declared ineligible for further County work.

The Business shall include the special provisions outlined herein pertaining to nondiscrimination in employment in every subcontract, so that such nondiscrimination in employment provisions shall be binding on each subcontractor or vendor.

13. FOREIGN CONTRACTS

I FURTHER AFFIRM THAT:

The Business affirms that it is aware of, and will comply with, the provisions of Sections 10-2-110 Article 10. Finance, Title 2 - Purchasing, Baltimore County Code 2003, which requires that prior to the award of a contract for services under the provisions of this title, and during the entire term of a contract award, the bidder or vendor shall disclose to the County whether any services covered by the bid or contract, including any subcontracted services, will be performed outside the United States. The disclosure shall be made to the Office of Budget and Finance, Purchasing Bureau.

14. MINORITY BUSINESS ENTERPRISE AND FEMALE CONTRACTORS

THIS BUSINESS INTENDS to affirmatively seek out and consider minority business enterprises to participate in this contract as subcontractors and/or suppliers of materials and services.

THE UNDERSIGNED UNDERSTANDS AND AGREES: that any and all subcontracting of supplies and services in connection with this contract, whether undertaken before or after award of contract, will be in accordance with the Minority Business Enterprise and Female Contractor requirement included in the Bid Proposal package and incorporated herein as if fully set forth; and

THE UNDERSIGNED ALSO UNDERSTANDS AND AGREES that no subcontracting will be approved until Baltimore County has reviewed and approved the affirmative actions taken by this firm.

15. REQUIREMENTS FOR EXECUTING AFFIDAVIT & PROPOSAL

The Affidavit must be signed in ink in order for the bid to be accepted and that the Proposal must be typewritten or filled out in ink.

THE UNDERSIGNED ALSO UNDERSTANDS that:

Proposals submitted by an INDIVIDUAL must be signed by an individual.

Proposals submitted by a PARTNERSHIP must be signed by the partner who is legally authorized authority to bind the partnership. Attach a copy of the Partnership Agreement and a duly certified resolution evidencing the authority of the partner so signing on behalf of the partnership.

Proposals submitted by a CORPORATION must be signed by a legally authorized officer of the corporation and attested to by the Corporate Secretary. Attach a copy of the Articles of Incorporation, By-Laws and a duly certified Board Resolution evidencing the authority of the officer so signing on behalf of the corporation.
Proposals submitted by a LIMITED LIABILITY COMPANY must be signed by a legally authorized member of the company and attested to. Attach a copy of the Operating Agreement, Articles of Organization and a duly certified resolution evidencing the authority of the member so signing on behalf of the limited liability company.

NOTE: The contractor may file with the County a list of the names of those officers, partners or members, as applicable, having legal authority to execute documents on behalf of and legally bind the contractor, duly certified, as applicable and legally required, together with the aforesaid corporate documents, which shall remain in full force and effect until such time as the County Department of Public Works Construction Contract Administration is advised in writing to the contrary.

16. ACKNOWLEDGMENT

I ACKNOWLEDGE THAT this Affidavit is to be furnished to the County and may be distributed to units of (1) Baltimore County; (2) the State of Maryland; (3) other counties or political subdivisions of the State of Maryland; (4) other states; and (5) the federal government. I further acknowledge that this Affidavit is subject to applicable laws of the United States and the State of Maryland, both criminal and civil, and that nothing in this Affidavit or any contract resulting from the submission of this bid or proposal shall be construed to supersede, amend, modify or waive, on behalf of Baltimore County, or the State of Maryland or any unit of the State of Maryland having jurisdiction, the exercise of any statutory right or remedy conferred by the Constitution and the laws of Maryland with respect to any misrepresentation made or any violation of the obligations, terms and covenants undertaken by the Business with respect to (a) this Affidavit, (b) the contract, and (3) other Affidavits comprising part of the contract.

I DO SOLEMNLY DECLARE AND AFFIRM UNDER THE PENALTIES OF PERJURY THAT THE CONTENTS OF THIS AFFIDAVIT ARE TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE, INFORMATION, AND BELIEF.

WITNESS/ATTEST:

__________________________________________  By:__________________________________________
Name:__________________________________________
Date:__________________________________________
Title:__________________________________________
(Authorized Representative and Affiant)

Rev. 11/10

V-6

847
BID BOND

Principal

Business Address of Principal

Surety

Obligee: BALTIMORE COUNTY, MARYLAND

A body corporate and politic

A Corporation of the State of _____________________ and authorized to do business in Maryland

Five Percent of Bid Amount

Penal Sum of Bond [shall be determined pursuant to latest revised Specification / G.P. 2.07 (2000 Ed.)]

Sparks Water Pumping Station and Elevated Tank Rehabilitation

Contract Name

20094 WX0

Contract Number/Proposal Item Number

KNOW ALL MEN BY THESE PRESENTS, that we, the Principal, above named, and Surety, above named, and authorized to do business in the State of Maryland, are held and firmly bound unto the Obligee, above named, in the penal sum of the amount stated above, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that if the aforesaid Principal is the apparent low bidder and complies with all specified matters required before award or if the aforesaid Principal is awarded the contract, the said Principal will, within the time required, execute and deliver to the Obligee a formal contract and good and sufficient payment and performance bonds in the form provided by the Obligee, then, this obligation to be void; otherwise the Principal and Surety will, upon demand, pay unto the Obligee the entire Penal Sum of this Bid Bond as liquidated damages.

THE SURETY FURTHER GUARANTEES No Proposal will be considered unless accompanied by a guaranty of the amount specified in the Proposal in the form of either a certified check, bank cashier’s check or a Bid Bond on the form provided therein or an exact facsimile thereof. The Bid Bond must be executed by a Surety that is, as of the date of the Bid: (a) licensed in the State of Maryland, (b) rated "B" or better by the A.M. Best Company, (c) on federal funded projects, authorized by the underwriting limitation contained in the U.S. Department of the Treasury Circular 570, as amended, to guarantee the amount of the Bid, and (d) in good standing as determined by the County’s Engineer. The Bid Bond must guaranty payment to the County of liquidated damages as follows: (a) if only one Bid is received, the guaranteed payment shall be five (5%) percent of the Bidder's Bid amount, (b) if two or more Bids are received, the guaranteed payment shall be the difference between the Bidder's Bid amount and the next lowest Bid amount, subject to the limitation that the guaranteed payment not be greater than five (5%) percent of the Bidder's Bid amount. This Bid Bond is required in case the successful Bidder, after issuance of notice of Award, fails to comply, timely and completely, with each of the requirements set forth under Section GP-3.04.

Signed and sealed ________________

Date

IN WITNESS WHEREOF, the above-bounded parties have executed this instrument under their several seals on the date indicated above, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

In Presence of: Individual Principal

Witness: ____________________________ as to: ____________________________ (SEAL)

Print Name: ____________________________ Print Name: ____________________________

In Presence of: Corporate Principal

Witness: ____________________________ By: ____________________________

Print Name: ____________________________ Print Name: ____________________________ (SEAL)

Title: ____________________________

Surety

Business Address: ____________________________

Witness: ____________________________ By: ____________________________ Affix

Print Name: ____________________________ Print Name: ____________________________ Corporate

Title: ____________________________ Seal
BALTIMORE COUNTY, MARYLAND
USE OF MINORITY BUSINESS ENTERPRISES AND WOMEN’S BUSINESS ENTERPRISES
IN
COUNTY CONTRACTS
MBE/WBE Plan Package

Office of Budget and Finance
Historic Courthouse
400 Washington Ave
Towson, Maryland 21244
410-887-3407
www.baltimorecountymd.gov/go/mwbe
@BaCoBiz4All
PROSPECTIVE BIDDERS/OFFERORS

Baltimore County Executive Order 2017-003 Use of Minority Business Enterprises and Women’s Business Enterprises states:

SECTION 6. BID REQUIREMENTS.
(A)(1) All bidders shall submit a list of all subcontractors contacted in preparation of their bid package or proposal. The list shall include the service to be performed, bid amount, and the race/ethnicity/gender of the business owner(s).
(B)(1) All bidders shall submit a list of all subcontractors to be used on a county contract in the bid package. This list shall include all subcontractors (both MBE/WBE and non MBE/WBE) used, the service to be performed, the total amount to be paid, and the race/ethnicity/gender of the owner.

If the solicitation includes a MBE/WBE subcontracting goal, you MUST demonstrate “Good Faith” effort either by:

1. Complete and sign FORM A, FORM B (to include FORM B-Prime if MBE/WBE Prime wishes to count towards the goal) and FORM C listing all subcontractors with the initial bid submission.
   a. All Forms must be completed and signed. However, FORM C MUST be completed and signed by both the prime and the MBE/WBE subcontractor.
      OR
   2. If you are unable to meet any portion of the goal, you MUST do one of the following:

      a. If you are requesting a partial waiver, complete and sign FORM A with initial bid submission. FORM B (to include FORM B-Prime if MBE/WBE Prime wishes to count towards the goal) and FORM C (listing all subcontractors). In addition, complete, sign and submit FORM D and FORM E accompanied with all supporting documentation for the portion of the goal that will not be achieve as specified on FORM A.
      b. If you are requesting a full waiver, complete and sign FORM A indicating your intent to request a full waiver accompanied with a completed and signed FORM C listing all subcontractors, FORM D and FORM E accompanied with all supporting documentation. This MUST be submitted with the initial bid as specified on FORM A.
      c. All Forms must be completed and signed. FORM C and FORM D MUST be completed and properly signed by both the Prime AND the MBE/WBE subcontractor(s).

NOTE: The MBE/WBE subcontracting goal applies to ALL prime/general contractors including certified and non-certified minority and women owned firms. However, a Minority-owned or a Women-owned prime may self-perform up to 50% of MBE/WBE subcontracting goal set in the solicitation. The MBE/WBE primes that wish to count towards the goal must list themselves on all appropriate forms.
Executive Order: Minority business enterprises and women business enterprises (MBE/WBE) shall have the maximum opportunity to participate in the performance of contracts financed in whole, or in certain circumstances, in part with County funds. Accordingly, on July 27, 2017, the County Executive adopted the EXECUTIVE ORDER No. 2017-003 addressing MBE/WBE participation in County contracts. The July 27, 2017 Executive Order may be found on the Baltimore County website at www.baltimorecountymd.gov/go/mwbe.

Each Contract: The County shall establish a minimum MBE/WBE participation amount for each contract, as applicable.

Bidder/Offeror Responsibility: The bidder/offeror shall ensure that MBE/WBE participation occurs in accordance with the contract requirements and the County Executive’s Executive Order. All bidder/offerors shall ensure that MBE/WBE have the maximum opportunity to compete for and perform County contracts, as applicable. Baltimore County, Maryland, and/or its bidder/offerors and contractors shall not discriminate on the basis of race, color, national origin, disability or sex in the award and performance of any County contract.

APPROVED MBE/WBE LISTINGS

Published compilations of approved and certified MBE/WBE, contractors, subcontractors, material suppliers, etc. include:

1. DIRECTORY OF MINORITY BUSINESS ENTERPRISE (MDOT): http://mbe.mdot.state.md.us/directory/search_select.asp
2. MINORITY BUSINESS DIRECTORY OF THE CITY OF BALTIMORE: http://cityservices.baltimorecity.gov/mwboo/

BIDDER/OFFEROR’S ACTIONS

Seeking Firms: The bidder/offeror will seek commitments by subcontract or otherwise from MBE/WBE firms for supplies and/or services, any combined value of which equals or exceeds the required percentage of MBE/WBE participation goal for the County contract. However a MBE/WBE Prime that affirms its MBE/WBE status on the Minority and/or Women Prime Participation Affidavit may count up to 50% of the goal.

Expenditures for Materials and Supplies: A bidder/offeror may count toward its MBE/WBE contract requirements, all expenditures for materials and supplies obtained from MBE/WBE suppliers and manufacturers, provided that the MBE/WBE assumes the actual and contractual responsibility for the provision of the materials and supplies.

Information to be supplied: All bidder/offerors shall submit the following information to the County at the time of bid submission:

1. The name of an employee designated as the bidder/offeror’s liaison to the County’s Minority Business Enterprise Unit.

2. The following forms shall be completed and submitted
   • Certified MBE/WBE Utilization and Fair Solicitation Affidavit (Form A); from among those names appearing in the Approved MBE/WBE Listings (excluding Federal Highway Administration projects, which exclusively require DBE approved and certified by the Maryland Department of Transportation Certification Committee);

   • A MBE/WBE Participation (Form B) completed and signed by the prime contractor and MBE/WBE for each MBE/WBE listed on the Form.
BALTIMORE COUNTY, MARYLAND
MBE/WBE PARTICIPATION SUMMARY

- A MBE/WBE Disclosure and Participation Statement (Form C) completed and signed by the prime contractor and MBE/WBE firms for each MBE/WBE listed on the Form. Form C must match what is stated on Form B.

- If applicable, MBE/WBE Subcontractor Unavailable Certificate (Form D) completed and signed by the prime contractor and MBE/WBE for each MBE/WBE listed on the Form.

3. If applicable, MBE/WBE Outreach Efforts - Compliance Statement (Form E) completed and signed by the Bidder/Offeror. The prime shall submit a list of all subcontractors.

4. For DPW contracts, if the bidder/offeror intends to fulfill the MBE/WBE requirements by use of a joint venture, he/she must submit a Joint Venture Disclosure Affidavit (Form D-EEO-006-A and B) showing the extent of MBE/WBE participation. If a bidder/offeror intends to use a MBE/WBE joint venture as a subcontractor to meet its MBE/WBE requirements, the affidavit must be submitted through the bidder/offeror by the proposed subcontractors and signed by all parties.

5. If the bidder/offeror’s proposed MBE/WBE participation does not meet the MBE/WBE contract requirements, information sufficient to demonstrate that the bidder/offeror has made every effort to meet the requirements must be submitted. (See DETERMINATION OF BID RESPONSIVENESS hereafter)

RECORDS AND REPORTS

Returning Records: The bidder/offeror must keep such records as are necessary to determine compliance with its MBE/WBE utilization requirements:

1. The MBE/WBE and non-minority contractors, type of work being performed, actual values of work and services.

2. Documentation of all correspondence, contacts, telephone calls, etc., to obtain MBE/WBE services for the contract.

3. All prime contractors and MBE/WBE sub-contractors are required to report monthly to the County through an online system called PRISM. If the contractor cannot submit his/her report on time, he/she will notify the County MBE/WBE office and request additional time to submit the report. Failure of the contractor to report in a timely manner may result in a finding of noncompliance. The County in its sole discretion and/or upon written request may require additional reports regarding MBE/WBE.

Retaining Records: All MBE/WBE records must be retained for 3 years following the expiration or any earlier termination of the contract and shall be available for inspection and photocopying by the County.

Investigation and Notification: Whenever the County believes the bidder/offeror, contractor, or any subcontractor may not be operating in compliance with the MBE/WBE requirements, the County may, in its sole discretion, conduct an investigation. If the County finds the bidder/offeror, contractor, or any subcontractor is not in compliance with the MBE/WBE requirements, the County may exercise any and all rights and remedies available to the County, under the contract, at law or equity, as deemed applicable and appropriate by the County in its sole discretion.

DETERMINATION OF BID RESPONSIVENESS

Request for Deviation: If the bidder/offeror is unable to procure from MBE/WBE firms (by subcontract or otherwise), supplies and services, any combined value of which equals the required percentage of the total value of the contract, the bidder/offeror may request, in writing, a deviation or waiver of the contract requirements. To obtain such a waiver, the bidder/offeror must submit the following information at the time bids are due:
The request for waiver request shall include (1) a signed unavailability statement (Form D) executed by all MBEs and WBEs that the bidder/offeror solicited for participation and (2) Outreach Efforts/Compliance Statement (Form E) that demonstrates the bidder/offeror’s good faith efforts to comply with the contract requirements, including copies of solicitation documentation to all potential subcontractors:

- Emails, letters, facsimile transmittals and confirmations containing plans, specifications, and anticipated time schedule for portions of the work to be performed and meeting notes and agendas clearly identifying the certified MBE or WBE classification and dates that the bidder/offeror contacted each MBE/WBE; and
- Telephone logs containing names, addresses, dates, telephone numbers, work to be performed, anticipated time schedule and classification of certified MBEs and WBEs contacted.

Bid Rejection: The failure of any bidder/offeror (including the apparent low bidder/offeror) to provide a responsive MBE/WBE Plan as required by the solicitation may result in the bidder/offeror being deemed non-responsive and the County’s rejection of the bid.

Liquidated Damages: If the County issues a notice of intent to award contract to the apparent low bidder/offeror who provided a responsive MBE/WBE Plan, but, if after said notice and before execution of Contract Documents, it is determined by the County that the apparent low bidder/offeror has failed to comply with the MBE/WBE Plan, such failure may result in the recommendation by the appropriate Procurement Official to annul the award and forfeit the bidder/offeror’s Proposal Guaranty to the County, not as a penalty, but as liquidated damages, it being acknowledged that actual damages will be difficult if not impossible to accurately measure. In addition, the County may proceed as it determines to be in its best interest, including but not limited to, the Notice of Award may be made to the next lowest responsive and responsible bidder/offeror or the work may be re-advertised.

Contract Breach: If, after execution of a County contract, the contractor becomes aware it may or will fail to fulfill the applicable MBE/WBE requirements and/or may or will deviate from the contractor’s bid response/contract terms, the contractor shall promptly advise the County of this in writing. Thereafter, the County will determine what action or remedy is appropriate on a case-by-case basis, in the County’s sole discretion.

Approval Required for Changes: Any and all changes to the MBE/WBE subcontractors or the type or amount of work to be performed by such subcontractors during the contract term must be mutually agreeable to the County and the contractor and shall be documented via a contract amendment, executed by legally authorized representatives of the County and the contractor.

Cooperation in Reviews: The bidder/offeror will cooperate with the County in any reviews of the contractor’s procedures and practices with respect to MBE or WBE firms, which the County may from time to time conduct in its sole discretion.

Other: If the documents used to determine the contractor’s efforts, achievement of, and/or the status of an MBE/WBE requirement or fulfillment thereof contain false, misleading or misrepresented information, the contractor may be declared in breach of the contract and the County may take any and all actions and/or remedies available to the County under the contract, at law, or in equity. If an MBE/WBE is disqualified by any public entity, including but not limited to, Baltimore City, the State or MDOT, at any time after award or during the term of the contract, the County may, in its sole discretion, require the prime contractor to promptly submit for County approval, the contractor’s plans for fulfilling the required MBE/WBE participation under the contract, and/or request such detail and additional information as the County, in its discretion deems appropriate.
PRIME CONTRACTOR MINORITY AND WOMEN PARTICIPATION AFFIDAVIT

A. AUTHORIZED REPRESENTATIVE

I HEREBY AFFIRM THAT:

I am the [title]________________________________________ and the duly authorized representative of [business]_______________________________________ (the “Business”) and that I possess the legal authority to make this Affidavit on behalf of myself and the Business for which I am acting.

B. AFFIRMATION REGARDING MINORITY AND WOMEN PARTICIPATION

I FURTHER AFFIRM THAT:

I am aware that, pursuant to the July 27, 2017 Executive Order of Baltimore County, Maryland, the following words have the meanings indicated.

(A) “Minority Business Enterprise” or “MBE” means a business enterprise that is owned, operated and controlled by one or more minority group members (African American, Hispanic American, Asian American, or Native American) who have at least 51% ownership and in which the minority group members have operational and managerial control, interest in capital and earnings commensurate with their percentage of ownership.

(B) “Women’s Business Enterprise” or “WBE” means a business enterprise that is owned, operated and controlled by one or more women who have at least 51% ownership and in which the women have operational and managerial control, interest in capital and earnings commensurate with their percentage of ownership.

☐ The Prime is a MBE or WBE

☐ Maryland State Department of Transportation (MDOT) #_____________________

☐ City of Baltimore #_____________________

☐ Name Other Jurisdiction: __________________________________ #_____________________

☐ The ownership of the Noncertified MBE/WBE business consists of _____% minorities and _____% women (for a total of _____ %), each of which has operational and managerial control, interest in capital and earnings commensurate with their percent ownership.

☐ % African American ☐ % Hispanic American ☐ % Native American ☐ % Disadvantaged (DBE)

☐ The MBE/WBE prime anticipates meeting up to 50% of the stated participation goal with its own workforce. MBE/WBE primes percentage must be stated on the MBE/WBE PRIME PARTICIPATION SCHEDULE (FORM B) to count towards the goal.

☐ The prime ☐ anticipates ☐ does not anticipate utilizing subcontractors for _____% of the work of the contract requirements, of which it anticipates ____% will be MBEs and ____% will be WBEs.

I DO SOLEMNLY DECLARE AND AFFIRM UNDER THE PENALTIES OF PERJURY THAT THE CONTENTS OF THIS AFFIDAVIT ARE TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE, INFORMATION, AND BELIEF.

Date: ________________________ By:_____________________ __________________________
(Authorized Representative and Affiant’s Name and Title)
I acknowledge the goal for solicitation #20094 WX0 is a minimum of 20%. This goal must be met by any combination of the MBE/WBE subcontractors. However, for instances where the Prime is counting up to 50% of the goal, the remaining goal balance must be met by any combination of the MBE/WBE subcontractors.

- The goal breakdown is as follow:
  - ___% Minority/Women Prime
  - ___% for certified MBE-owned businesses and/or
  - ___% for certified WBE-owned businesses.

I have made a good-faith effort to achieve this MBE/WBE solicitation requirement. If awarded the contract, I will comply with this MBE/WBE contract requirement and will continue to use my best efforts to increase MBE/WBE participation during the contract term.

PLEASE CHECK ONE BOX (EITHER 1, 2, OR 3)

1    [ ] Prime has met the MBE/WBE contract requirements for this solicitation and contract. I submit the MBE/WBE Participation Form B and Form C, along with this Affidavit, which details how the Prime will achieve the contract requirements. Submit a complete list of all additional subcontractors

Or

2    [ ] After having made a good-faith effort to achieve the MBE/WBE requirements, the Prime can only achieve partial success. I submit the MBE/WBE Participation Form B, Form C, Form D and Form E along with this Affidavit, which details how the Prime will partially achieve the contract requirements. Submit a complete list of all additional subcontractors

I request a partial waiver and will meet the following MBE/WBE participation goals:

- Partial waiver of MBE/WBE subcontract participation:
  - ___% Minority/Women Prime
  - ___% for certified MBE-owned businesses and/or
  - ___% for certified WBE-owned businesses.

Or

3    [ ] After having made a good faith effort to achieve the MBE/WBE requirements for this contract, the Prime is unable to achieve the requirements and/or sub requirements for this contract. I submit the MBE/WBE Participation Form D and Form E, along with this Affidavit, which details the steps the Prime has taken in an attempt to achieve the contract requirements. Therefore, I request a full waiver.

IF YOU HAVE CHECKED BOX 2 OR 3, THE FOLLOWING IS APPLICABLE:

1) If a bidder is unable to comply with the goals established in a bid for a project, the bidder may submit a request for a waiver at the time of bid submission. However, occasions for granting waivers will be limited.
2) The request for waiver shall include documentation that demonstrates the bidder’s good faith efforts to comply with the goals, including:
   (I) Signed unavailability statements from all MBEs and WBEs that the bidder solicited for participation; and
   (II) Copies of solicitation documentation to include the scope of services to be performed by the subcontractors accompanied with the following:
      (a) Emails, letters, facsimile transmittals and confirmations containing plans, specifications, and anticipated time schedule for portions of the work to be performed and meeting notes and agendas clearly identifying the certified MBE or WBE classification and dates that the bidder contacted each; and
      (b) Telephone logs containing names, addresses, dates, telephone numbers, work to be performed, anticipated time schedule and classification of certified MBEs and WBEs contacted.
      (c) Responses from MBE/WBE firms contacted to fulfill the goal.

As I have checked Box 2 or 3 of this Affidavit, I understand I must submit the following supporting documentation with the bid:

- MBE/WBE Participation Schedule (Form B)
- MBE/WBE Disclosure and Participation Statement (Form C)
- MBE/WBE Subcontractors Unavailable Certificate (Form D) (if applicable)
- MBE/WBE Outreach Efforts – Compliance Statement (Form E) (if applicable)

I acknowledge that the MBE/WBE subcontractors/suppliers listed on the MBE/WBE Participation Schedule (Form B) will be used to accomplish the percentage of MBE/WBE participation that the Prime shall achieve. A fully executed Form C must match Form B.

In the solicitation of subcontract quotations or offers, MBE/WBE subcontractors were provided the same information and amount of time to respond, as were non-MBE/WBE subcontractors.

The solicitation process was conducted in such a manner so as to not place MBE/WBE subcontractors at a competitive disadvantage to non-MBE/WBE subcontractors.

I solemnly affirm under the penalties of perjury that this Affidavit is true to the best of my knowledge, information, and belief.

Bidder/Offeror Name

Phone Number

Address

Affiant Signature

Address (continued)

Printed Name & Title

E-mail address

Date

December 14, 2018
<table>
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<tr>
<th>Prime Name</th>
<th>Prime Address, Telephone Number and Email</th>
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<td>Project Location</td>
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<td>1. Subcontractor Name and Tax ID</td>
<td>Subcontractor Address</td>
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<td>Telephone Number</td>
<td>Minority Status (If applicable):</td>
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<td>☐ Alaska Native ☐ Disadvantaged</td>
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<td>Provide if Applicable: ☐ MDOT ☐ Baltimore City #</td>
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<td>Percent of Total Contract</td>
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<td>2. Subcontractor Name and Tax ID</td>
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<td>Form Prepared by:</td>
<td>Reviewed and Accepted by Baltimore County Minority Business Enterprise Office</td>
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<td>Total SB/SBE Participation</td>
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October 29, 2019
PLEASE COMPLETE AND SUBMIT THIS FORM TO ATTEST EACH SPECIFIC ITEM OF WORK THAT YOUR MBE/WBE PRIME FIRM WILL PERFORM USING ITS OWN WORKFORCE PERTAINING TO THE PERCENTAGE STATED MBE/WBE PARTICIPATION SCHEDULE (FORM B) FOR PURPOSES OF MEETING THE MBE/WBE PARTICIPATION GOALS.

*This document must be completed and submitted with Bid/Proposal to Baltimore County.

NOTE: If you do not complete and submit this form with your bid or offer to the County, the County may, in its sole discretion, deem your bid or offer NON-RESPONSIVE and accordingly the COUNTY WILL NOT CONSIDER YOU FOR CONTRACT AWARD.

Provided that ____________________________ (Prime Contractor’s Name) with Certification Number ____________________ is awarded the County contract in conjunction with Solicitation No. ________________________, such MBE Prime Contractor intends to perform with its own forces at least $___________ which equals to___% of the Total Contract Amount for performing the following products/services for the Contract:

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<tr>
<th>NAICS CODE</th>
<th>WORK ITEM, SPECIFICATION NUMBER, LINE ITEMS OR WORK CATEGORIES (IF APPLICABLE). FOR CONSTRUCTION PROJECTS, GENERAL CONDITIONS MUST BE LISTED SEPARATELY.</th>
<th>DESCRIPTION OF SPECIFIC PRODUCTS AND/OR SERVICES</th>
<th>VALUE OF THE WORK</th>
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MBE PRIME CONTRACTOR

Signature of Representative: _________________________________

Printed Name and Title: _________________________________

Firm’s Name: _________________________________

Federal Identification Number: ______________

Address: _________________________________

Telephone: _________________________________

Date: _________________________________

Certified ☐ Yes ☐ No

Certifying Jurisdiction _________________________________

MBE PRIME CONTRACTOR

Minority Status:

☐ African American

☐ Hispanic American

☐ Women

☐ Asian American

☐ Native American

☐ Disadvantaged

5/10/2019
BALTIMORE COUNTY, MARYLAND
SUBCONTRACTOR DISCLOSURE AND PARTICIPATION STATEMENT
(FORM C)

*This document must be completed and submitted with Bid/Proposal to Baltimore County.

NOTE: If you do not complete and submit this form with your bid or offer to the County, the County may, in its sole discretion, deem your bid or offer NON-RESPONSIVE and accordingly the COUNTY WILL NOT CONSIDER YOU FOR CONTRACT AWARD.

NOTE: ANY INCONSISTENCY BETWEEN THIS FORM AND FORM B MBE/WBE PARTICIPATION MAY RENDER A BID/PROPOSAL NON-RESPONSIVE AND THE COUNTY WILL NOT CONSIDER YOU FOR CONTRACT AWARD.

Contract Name, Bid/Proposal Number: _____________________________________
________________________________________________________________________________

Name of Prime: ____________________________

Name of MBE/WBE Subcontractor: _________________________________________
________________________________________________________________________________

Print Representative Name, Title: ____________________________
Best Contact Information: ____________________________

☐ MDOT ☐ Baltimore City Certification Number: ____________________________
☐ MBE ☐ WBE ☐ SBE ☐ N/A

1. NAICS Code(s), Work/Services to be performed by MBE/WBE Subcontractor: ____________________________

2. Subcontract Amount: $ ____________________________ or _________% of the County contract cost.

3. Bonds - Amount and type required of Subcontractor if any: ____________________________

4. MBE/WBE Anticipated Commencement Date: ___________ Completion Date: ___________

5. This is a MBE-Owned Business Firm: Yes ☐ No ☐

6. This is a WBE-Owned Business Firm: Yes ☐ No ☐

********************************************************************************************
NOTE: If the Prime is notified that it will be awarded the above referenced contract, the undersigned MBE/WBE subcontractor and Prime must enter into a subcontract for the work/service indicated above upon the Prime’s execution of a contract for the above referenced project with the Baltimore County, and provide a copy of the fully executed MBE/WBE SUBCONTRACTOR PARTICIPATION NOTICE OF INTENT TO AWARD (FORM C-Subcontractor) accompanied with the anticipated Work Breakdown Schedule (providing the subcontractor’s mobilization timeframe) to mwbe@baltimorecountymd.gov within 10 calendar days of receipt by the Prime of FORM C-
Subcontractor from the County. The undersigned subcontractor is a MDOT or Baltimore City certified MBE/WBE firm. The terms and conditions stated above are consistent with our agreements.

Signature of MBE/WBE Subcontractor: ____________________________ Date: ___________

MBE/WBE Subcontractor’s Printed Name and Title: ____________________________

The terms and conditions stated above are consistent with our agreements.

Signature of Prime: ____________________________ Date: ___________

Prime’s Printed Name and Title: ____________________________

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Revised 10/25/2019
*If applicable, this document must be completed and submitted with Bid/Proposal to Baltimore County.

NOTE: If you do not complete and submit this form with your bid or offer to the County, the County may, in its sole discretion, deem your bid or offer NON-RESPONSIVE and accordingly the COUNTY WILL NOT CONSIDER YOU FOR CONTRACT AWARD.

1. It is hereby certified that the firm of ____________________________
   (Name of Minority firm)

   located at _____________________________________________
   (Number)    (Street)
   (City)    (State)   (Zip)

   was offered an opportunity to bid on the______________________________ contract.

2. The ____________________________ (MBE/WBE Firm), is either unavailable for the work/service or unable to prepare a bid for this project for the following reason(s):

   _____________________________________________
   _____________________________________________
   _____________________________________________

   Signature of Minority Firms MBE/WBE   Representative Title   Date

   MDOT/Baltimore City Certification #   Telephone #

3. PRIME’S SIGNATURE AND CERTIFICATION

   I certify under oath that I contacted the Certified MBE/WBE and they advised me that they are unavailable, unable to perform the work/services for the above-contract or failed to respond to repeated requests for a price proposal for the above-contract.

   ____________________________   _______________________   ________________
   Signature of Prime   Title   Date
*This document must be completed and submitted with Bid/Proposal to Baltimore County.

NOTE: If you do not complete and submit this form with your bid or offer to the County, the County may, in its sole discretion, deem your bid or offer NON-RESPONSIVE and accordingly the COUNTY WILL NOT CONSIDER YOU FOR CONTRACT AWARD.

In conjunction with the bid or offer submitted in response to Solicitation Number ______________, I state the following:

1. Bidder/Offeror identified opportunities to subcontract in these specific work categories:

2. Attached to this form are copies of the solicitation documentation in accordance with Section 6 (E) Bid Requirements of the Executive Order, used to solicit certified MBE/WBEs for the subcontract opportunities accompanied with the signed MBE/WBE Subcontractor Unavailability Certificate (Form D).

3. Bidder/Offeror made the following attempts to solicit MBE/WBEs:

_________________________________
Signature – Bidder Offeror

____________________
Print or Type Name of Firm

____________________
Street Address

____________________
City  State  Zip Code

_________________________________
Date
To: Contractors/Consultants

From: Minority and Women Business Enterprise Office

Date: July 19, 2018

Subject: Compliance Reporting - Penalties

Baltimore County, Maryland (the “County”) requires all Prime Contractors and all Subcontractors to submit monthly reports through an online MBE/WBE Compliance Portal (PRISM). The Portal can be found under Compliance Reporting for Primes and Subcontractors at www.baltimorecountymd.gov/go/mwbe.

The County has found that a number of companies are failing to file reports in a timely manner, which makes it difficult for the County to verify compliance. As a result, the County has determined to assess penalties for non-compliance, effective September 1, 2018, as follows:

(a) For failure to file timely monthly reports:
   (i) Assessment of a late fee of $10 per day per task, up to a maximum of $1,500 per task; and/or
   (ii) For multiple violations, termination of the contract for convenience or for default, with the contractor suspended from participating in County contracts for five (5) years.

(b) For failure to meet MBE/WBE requirements:
   (i) Assessment of a penalty of up to 10% of the contract value; and/or
   (ii) Termination of the contract for convenience, with the contractor suspended from participating in County contracts for five (5) years together with assessment of a penalty of up to 10% of the contract value; and/or
   (iii) Termination of the contract for default together with assessment of a penalty of 10% of the contract value.

Each action and/or remedy described above is at the sole discretion of the County, and is in addition to any damages which the County may be entitled to under the contract.
This short video can be used as guidance on submitting the Prime to Subcontractor Payment Reporting:
http://stage.prismcompliance.com/etc/movies/vendor_contractpayment_tutorial.htm

If after contract expiration it has been determined the MBE/WBE firms named were not used, or were under used, by the contractor and supporting documentation was not provided and approved by the County, the contractor may be assessed a penalty of up to 10% of the contract value and/or suspended from participating in County contracts for 5 years.

Questions regarding this correspondence and/or the use of this system can be directed to the MBE Office at mwbe@baltimorecountymd.gov or call (410) 887-3407.

Cc: File
SECTION VI

POST AWARD DOCUMENTS

This Section to be Completed by Successful Bidder after Award
CONTRACT AGREEMENT

THIS CONTRACT AGREEMENT ("Contract"), IS MADE THIS _____ day of _______ 20___, by and between Baltimore County, Maryland, a body corporate and politic ("County"), and ______________________________________, ("Contractor").

WITNESSETH, that the Contractor, for and in consideration of the payment or payments herein specified and agreed to by the County, hereby covenants and agrees to furnish and deliver all the materials and to do and perform all the work, services, and labor in fulfillment of the requirements of Contract No. 20094 WX0 “Project”) in strict conformity with the solicitation, plans, specifications, special provisions, any and all addenda, and the proposal, at the prices named therein, and all of which are collectively the Proposal, and said Proposal is attached hereto and made a part thereof.

The Project shall be done in strict compliance with (i) the Proposal, (ii) the Baltimore County Department of Public Works and Transportation February 2000 “Standard Specifications for Construction and Materials” and “Standard Details for Construction” (iii) and any and all revisions thereto as of the date of advertisement, including but not limited to the supplemental specification known as Addendum 3 and General Conditions Building Projects, as applicable, and all of which (i-iii) are made a part hereof and incorporated herein (collectively, the “Specifications”). Contractor understands and agrees it is Contractor’s responsibility and obligation to obtain a copy of the “Specifications” and agrees the Specifications are incorporated herein. Copies of the revisions are on file and available at the Division of Construction Contracts Administration, County Office Building, Towson, Maryland, and are on the County’s website at http://www.baltimorecountymd.gov/Agencies/publicworks/standardsandspecs/specsanddetails.html. In the event of a conflict between (a) the February 2000 “Standard Specifications for Construction and Materials” and “Standard Details for Construction” and (b) the supplemental specification known as Addendum 3 and General Conditions Building Projects, as applicable, then (b) the supplemental specification shall control.

The Project shall be subject to the inspection and approval of the Director of Public Works and Transportation for Baltimore County, or his authorized representative, and in the event any portion thereof shall be rejected by said Director or his representative as defective or unsuitable, then the said portion shall be removed and replaced and be performed anew to the satisfaction and approval of the said Director or his representative at the cost and expense of the Contractor.

THE CONTRACTOR AFFIRMS that it is aware of, and will comply with, the provisions of Sections 14-101 through 14-108 of the Election Law Article of the Annotated Code of Maryland, as the same may be amended from time to time, which require that every person who makes, during any 12-month period, one or more contracts, with one or more Maryland governmental entities involving cumulative consideration, of at least $200,000.00, to file with the State Board of Elections certain specified information to include disclosure of attributable political contributions in excess of $500 during defined reporting periods.

THE CONTRACTOR FURTHER COVENANTS AND AGREES that all the Project shall be furnished, performed and delivered, in every respect, to the satisfaction and approval of the Director of Public Works and Transportation, aforesaid, on or before the expiration of TWO HUNDRED SIXTY (260) WORKING DAYS (the “Contract Period”) after written notice has been given by the Director or his authorized representative to begin the work.

IT IS AGREED THAT TIME IS OF THE ESSENCE. In the event the Contractor fails to achieve Final Completion and Final Acceptance of the Contract work within the Contract Period specified herein, plus any extensions thereto agreed to in writing by a legally authorized representative of the County pursuant to the terms of this Contract, then Contractor shall pay the County the sum of FIVE HUNDRED DOLLARS ($500.00) as Liquidated Damages for each WORKING DAY after the expiration of the Contract Period, as may be extended by the County, until the Contractor achieves Final Completion and Final Acceptance of the Project.

Contractor’s Initials

Date

VI-1 Rev. 1/09
IT IS FURTHER AGREED that:

(a) These Liquidated Damages are a reasonable estimate of the County’s damages solely due to the public’s loss of use of the Project during the delay period and is not a penalty.

(b) It is very difficult, if not impossible, to accurately measure the damages to the County due to the public’s loss of use of the Project during the delay period.

(c) Notwithstanding GP 8.09 of the Baltimore County Standard Specification for Construction, in addition to the damages due to the public’s loss of use of the Project during the delay period, the County is likely to incur additional direct costs during the delay period, including but not limited to, costs for construction management, consultants, architectural services, office trailer and supplies, utilities, County employees’ time, County vehicles, and such other costs that the County will incur to continue administration of the construction and the Contract during the delay period, all of which will be monitored by the County, and if so required by the County, the Contractor shall pay such actual damages incurred during the delay period. THE PARTIES HERETO UNDERSTAND AND AGREE THAT CONTRACTOR’S OBLIGATION TO PAY THE COUNTY FOR ACTUAL DAMAGES DURING THE DELAY PERIOD SHALL BE IN ADDITION TO THE CONTRACTOR’S OBLIGATION TO PAY THE LIQUIDATED DAMAGES DUE TO THE PUBLIC’S LOSS OF USE OF THE PROJECT.

(d) The County shall have the right, but not the obligation, to deduct the Liquidated Damages due to the public’s loss of use of the Project, and the County’s actual costs and costs to continue administration of the construction and the Contract, from any monies due or any monies that may become due to the Contractor.

IT IS DISTINCTLY UNDERSTOOD AND AGREED that no claim for extra work, material or overhead not specifically provided for in the Contract will be allowed by the County, nor shall the Contractor do any work or furnish any materials not covered by this Contract and the Specifications, unless the same is ordered in writing by a legally authorized representative of the Department of Public Works and Transportation in accordance with the terms of the Contract. Any such work or materials which may be done or furnished by the Contractor without any such written order first being given shall be at said Contractor’s sole risk, cost and expense and Contractor hereby covenants and agrees that without such written order, Contractor shall make no claim for compensation for work, materials, or overhead so done or furnished.

NOTWITHSTANDING GP 4.06 OF THE BALTIMORE COUNTY STANDARD SPECIFICATIONS FOR CONSTRUCTION, IT IS SPECIFICALLY AGREED that the Contractor shall have no entitlement to damages arising out of delay, disruption, interference or hindrance from any cause whatsoever. However, this provision shall not preclude recovery or damages by the Contractor for hindrances or delays due solely to fraud or gross negligence on the part of the County or its agents.

IT IS FURTHER DISTINCTLY AGREED that the said Contractor shall not assign this Contract, nor any part thereof, nor any right to any of the monies to be paid hereunder, nor shall any part of the work to be done or material furnished under said Contract be sublet without the prior written consent of a legally authorized representative of the Department of Public Works and Transportation in accordance with the terms of this Contract. Further, the acceptance of the final payment by the Contractor shall effectuate a release in full of all claims against County and its officials, employees, representatives, and agents arising out of, or by reason of the Project and this Contract.

The Contractor shall review government issued identification and badge all employees of the Contractor and its subcontractors. The Contractor shall also review all federal forms, including but not limited to I-9’s, for compliance as well as copies of all employment eligibility and identity documentation maintained to the extent required by law.

The Bonds, given by the Contractor in a sum equal to the total contract price of the Project in compliance with the terms and provisions of this Contract, are hereby attached and incorporated herein.

IT IS AGREED that in the event that the County is delayed or prevented from timely execution of this Contract, the Contractor releases County and agrees Contractor shall have no action, claim or demand against County therefore.

**Contractor’s Initials**

**Date**
THE CONTRACTOR HEREBY FURTHER AGREES to receive the prices set forth in the Proposal incorporated herein as full compensation for the completion of the Project and, in all respects, to complete said Contract to the satisfaction of the County.

THE CONTRACTOR REPRESENTS AND WARRANTS:

(i) it is duly formed and validly existing under the laws of the State of ____________;
(ii) it is in good standing in the State of Maryland;
(iii) it has the power and authority to consummate the obligations and responsibilities contemplated hereby, and has taken all necessary action to authorize the execution, delivery and performance required under this Contract;
(iv) the Contractor and the person executing this Contract for the Contractor each warrant that he/she is duly authorized by the Contractor to execute and seal this Contract on the Contractor’s behalf;
(v) the warranties of merchantability and fitness for a particular purpose and use and warranties of title and against infringement, and all express warranties contained in this Contract, including but not limited to the Proposal (and any sample or model presented by Contractor and expressly accepted by the County) shall apply to the portion of this Contract pertaining to or for goods;
(vi) all representations and warranties made in the Proposal and herein remain true and correct in all respects when made, as of the date of this Contract, and throughout the term of this Contract; and
(vii) there exists no actual or potential conflict of interest between its performance under this Contract and its engagement or involvement in any other personal or professional activities and in the event such conflict or potential conflict arises during the term of this Contract, the Contractor shall immediately advise the County in writing thereof.

THE CONTRACTOR shall not disclose any documentation and information of any kind or nature disclosed to the Contractor in the course of its performance of duties hereunder without the express prior written consent of the County.

Those sections in this Contract which by their nature are intended to survive, including but not limited to, Contractor’s representations and warranties, confidential information, and indemnification shall survive the termination of this Contract.

IN WITNESS WHEREOF, the Contractor has hereunto set its hand and seal the day and year first above written.

CONTRACTOR NAME: ________________________________

FEDERAL TAX ID or SS #: ________________________________

By: ________________________________ (Seal)

Name: ________________________________

Title: ________________ Date: ______

BALTIMORE COUNTY, MARYLAND

By: ________________________________ Date: ______

Stacy L. Rodgers, County Administrative Officer

Executive Secretary

Type (Print) Name

APPROVED FOR FORM AND LEGAL AND SUFFICIENCY* (Subject to execution by the duly authorized Administrative official and Chairperson of the County Council, as indicated).

APPROVED:

______________________________________________ Date: ______

D’Andrea L. Walker, Acting Director,
Department of Public Works & Transportation

Type (Print) Name

Office of the County Attorney

*Approval of Form and Legal Sufficiency does not convey approval or disapproval of the substantive nature of this transaction. Approval is based upon typeset documents. All modifications require re-approval.
KNOW ALL MEN BY THESE PRESENTS, that we, the PRINCIPAL, above-named, and SURETY, above-named, and authorized to do business in the State of Maryland, are held and firmly bound unto the OBLIGEE, above-named, in the penal sum of the amount stated above, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, THE PRINCIPAL entered into a certain contract with the OBLIGEE described and dated as shown above and is required to provide this bond pursuant to Maryland State law and/or County law and the contract.

NOW, THEREFORE, if the aforesaid PRINCIPAL shall well and truly perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of said contract during the original term of said contract and any extensions thereof that may be granted by the OBLIGEE with or without notice to the SURETY, and during the life of any guaranty required under the contract, and shall also well and truly perform and fulfill all the undertakings covenants, terms, conditions and agreements of any and all duly authorized modifications of said contract that may hereafter be made, notice of which modifications to the SURETY being hereby waived, then, this obligation to be void; otherwise to remain in full force and effect.

THE SURETY FURTHER GUARANTEES That it is (a) licensed in the State of Maryland, (b) rated "B" or better by the A.M. Best Company, (c) on federal funded projects, authorized by the underwriting limitation contained in the U.S. Department of the Treasury Circular 570, as amended, to guaranty the amount of the Bid, and (d) in good standing as determined by the County's Engineer. A Performance Bond is required for each and every Contract in excess of twenty-five thousand ($25,000). A Performance Bond shall be in the amount equal to at least one hundred (100%) percent of the Contract price. The fully executed Performance Bond shall be delivered by the Bidder to the Department's Division of Construction Contracts Administration no later than the time the Contract is to be executed by the Contractor.

IN WITNESS WHEREOF, the above-bounded parties have executed this instrument under their several seals on the date indicated above, the name and seal of each party being hereeto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

In Presence of: Individual Principal
Witness: ____________________________  as to: ____________________________ (SEAL)
Print Name: ____________________________  Print Name: ____________________________

Attest: Corporate Principal
(Name of Corporation)
Witness: ____________________________  By: ____________________________  Affix
Print Name: ____________________________  Print Name: ____________________________
Title: ____________________________  Corporate  Seal

Attest: Surety
(Name of Surety)
Witness: ____________________________  By: ____________________________  Affix
Print Name: ____________________________  Print Name: ____________________________
Title: ____________________________  Corporate  Seal

Reviewed for Baltimore County Requirements
Office of the County Attorney
PAYMENT BOND

Principal

Business Address of Principal

Surety

A Corporation of the State of __________________________ and authorized to do business in Maryland

Obligee: BALTIMORE COUNTY, MARYLAND

A body corporate and politic

Penal Sum of Bond (express in words and figures)

DOLLARS $__________________________

Sparks Water Pumping Station and Elevated Tank Rehabilitation

Contract Name  Date of Contract

20094 WX0 ________________________  20 _________

Contract Number       Date Bond Executed

KNOW ALL MEN BY THESE PRESENTS, that we, the PRINCIPAL, above-named, and SURETY, above-named, and authorized to do business in the State of Maryland, are held and firmly bound unto the OBLIGEE, above-named, in the penal sum of the amount stated above, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, THE PRINCIPAL entered into a certain contract with the OBLIGEE described and dated as shown above and is required to provide this bond pursuant to Maryland State law and/or County Law and the contract.

NOW, THEREFORE, the condition of this obligation is such that if the aforesaid PRINCIPAL shall promptly make payments to all persons supplying labor and/or material to the PRINCIPAL and to any subcontractor of the PRINCIPAL in the prosecution of the work provided for in said contract and any and all duly authorized modifications of said contract that may hereafter be made, notice of which modifications to the SURETY being hereby waived, then, this obligation to be void; otherwise to remain in full force and effect.

THE SURETY FURTHER GUARANTEES That it is (a) licensed in the State of Maryland, (b) rated "B" or better by the A.M. Best Company, (c) on federal funded projects, authorized by the underwriting limitation contained in the U.S. Department of the Treasury Circular 570, as amended, to guaranty the amount of the Bid, and (d) in good standing as determined by the County’s Engineer. A Payment Bond is required for each and every Contract in excess of twenty-five thousand ($25,000). A Payment Bond shall be in the amount equal to at least one hundred (100%) percent of the Contract price. The fully executed Payment Bond shall be delivered by the Bidder to the Department’s Division of Construction Contracts Administration no later than the time the Contract is to be executed by the Contractor.

IN WITNESS WHEREOF, the above-bounded parties have executed this instrument under their several seals on the date indicated above, the name and seal of each party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

In Presence of: Individual Principal

Witness: ___________________________ as to: ___________________________ (SEAL)

Print Name: ___________________________ Print Name: ___________________________

Attest: Corporate Principal

(Name of Corporation)

Witness: ___________________________ By: ___________________________ Affix

Print Name: ___________________________ Print Name: ___________________________ Corporate

Title: ___________________________ Seal

Attest: Surety

(Name of Surety)

Business Address: ___________________________

Witness: ___________________________ By: ___________________________ Affix

Print Name: ___________________________ Print Name: ___________________________ Corporate

Title: ___________________________ Seal

Reviewed for Baltimore County Requirements

Office of the County Attorney
1. GENERAL REQUIREMENTS

1.1 Coverages Required:
Unless otherwise required by the specifications or the contract, the Contractor/Vendor shall purchase and maintain the insurance coverages listed herein.

1.2 Certificate of Insurance:
Before starting work on the contract, or prior to the execution of the contract on those bids, the Contractor/Vendor shall provide Baltimore County, Maryland with verification of insurance coverage evidencing the required coverages.

1.3 Baltimore County as Insured:
The coverage required, excluding Workers' Compensation and Employers' Liability and Medical Malpractice Liability/Professional Liability/Errors and Omissions Liability, must include Baltimore County, Maryland and its agents, employees, officers, directors, and appointed and elected officials as an additional insured.

1.4 Contractor's/Vendor's Responsibility:
The providing of any insurance herein does not relieve the Contractor/Vendor of any of the responsibilities or obligations the Contractor/Vendor has assumed in the contract or for which the Contractor/Vendor may be liable by law or otherwise.

1.5 Failure to Provide Insurance:
Failure to provide and continue in force the required insurance shall be deemed a material breach of the contract. The Contractor/Vendor must maintain the insurance coverages required under the terms and conditions of this Contract while this Contract is in effect including renewal and extension terms.

2. INSURANCE COVERAGES

2.1 General Liability Insurance

2.1.1 Minimum Limits of Coverage:
Personal Injury Liability and Property Damage Liability Combined Single Limit - $500,000 each occurrence.

2.1.2 Such insurance shall protect the Contractor/Vendor from claims which may arise out of, or result from, the Contractor's/Vendor's operations under the contract, whether such operations be by the Contractor/Vendor, any subcontractor, anyone directly or indirectly employed by the Contractor/Vendor or Subcontractor, or anyone for whose acts any of the above may be liable.

2.1.3 Minimum Coverages to be Included:
(a) Independent Contractor's coverage;
(b) Completed Operations and Products Liability coverage; (c) Contractual Liability coverage.

2.1.4 Damages not to be Excluded:
Such insurance shall contain no exclusions applying to operations by the Contractor/Vendor or any Subcontractor in the performance of the Contract including but not limited to: (a) Collapse of, or structural injury to, any building or structure;
(b) Damage to underground property; or (c) Damage arising out of blasting or explosion.

2.2 Automobile Liability Insurance

2.2.1 Minimum Limits of Coverage:
Bodily Injury Liability and Property Damage Liability Combined Single Limit - $500,000 any one accident.

2.2.2 Minimum Coverages to be Included:
Such insurance shall provide coverage for all owned, non-owned and hired automobiles.

2.3 Workers' Compensation and Employers' Liability Insurance

Such insurance must contain statutory coverage, including Employers' Liability insurance with limits of at least:
Bodily Injury by Accident - $250,000 each accident
Bodily Injury by Disease - $500,000 policy limit
Bodily Injury by Disease - $250,000 each employee

2.4 Valuable Papers and Records Coverage and Electronic Data Processing Coverage

Minimum Limits of Coverage:
$100,000 Per Claim and Each Occurrence
$100,000 in the Aggregate

2.5 Other

Such other insurance in form and amount as may be customary for the type of business being undertaken by the Contractor/Vendor.