# *PROPOSAL FORM*

# *BALTIMORE COUNTY*
# *DEPARTMENT OF PUBLIC WORKS & TRANSPORTATION*
# *TOWSON, MARYLAND*

## *Division of Construction Contracts Administration*

**Contract No. 20203 WX0**
**Water Design Project**
**Towson Water Pumping Station Renovations –**
**7781 Far Hills Drive, Towson, Maryland 21286**
**Towson – District 9c5**
**Job Order No. / Workday No.**
**231-203-0035-0445 / 030350445**
**CONTRACT BASED ON FEBRUARY 2000**
**STANDARD SPECIFICATIONS FOR CONSTRUCTION & MATERIALS**
**AND STANDARD DETAILS FOR CONSTRUCTION, 2007**

**Bidders Information**

Pre-bid Meeting: A site visit will be held on Wednesday, October 11, 2023 @ 10:00 A.M. EST. Located at 7781 Far Hills Drive,Towson, Maryland 21286. A pre-bid meeting will be held on Wednesday, October 4, 2023 at 11:00 A.M. EST. via WebEx. Phone-In (Audio Only) – 1-415-655-0001, Access Code 2323 399 2434#, for Video Conference go to signin.webex.com/join, Meeting Number 2323 399 2434##, Password **Fw2guT3JYS6.**

Wage Rate Affidavit & Requirements **see pages 1029-1037**
**(Contract Disclosure):** "***Wage rates that are in effect as of the contract solicitation date will be the wage rates through the duration of the project***"

MBE/WBE Requirements & Forms **see pages 1038-1058**

**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.**

TABLE OF CONTENTS

# S E C T I O N 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.

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.

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 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 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** $ 620.00 **.**

**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 (MSBDFA, 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. MSBDFA 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. MSBDFA 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 for information, applications and a checklist of required documents and reports that must accompany the application.

CONTRACT NO. 20203 WX0

# 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.

2. Addendum 3 to the February 2000 *Standard Specifications for Construction and Materials* and *Standard Details for Construction*.

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

4. ***Revised General Provisions Pages** (19 - 128) **and Terms and Conditions (TC) Pages** (129 - 141).

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.**

- REVISON to **GP 7.29 MINORITY BUSINESS ENTERPRISE AND AFFIRMATIVE ACTION** of the Standard Specification 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 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, 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. ***Quarries providing material to Baltimore County Projects must be approved by Maryland State Highway Administration and listed in the current MDSHA 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 MDSHA 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 675:
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

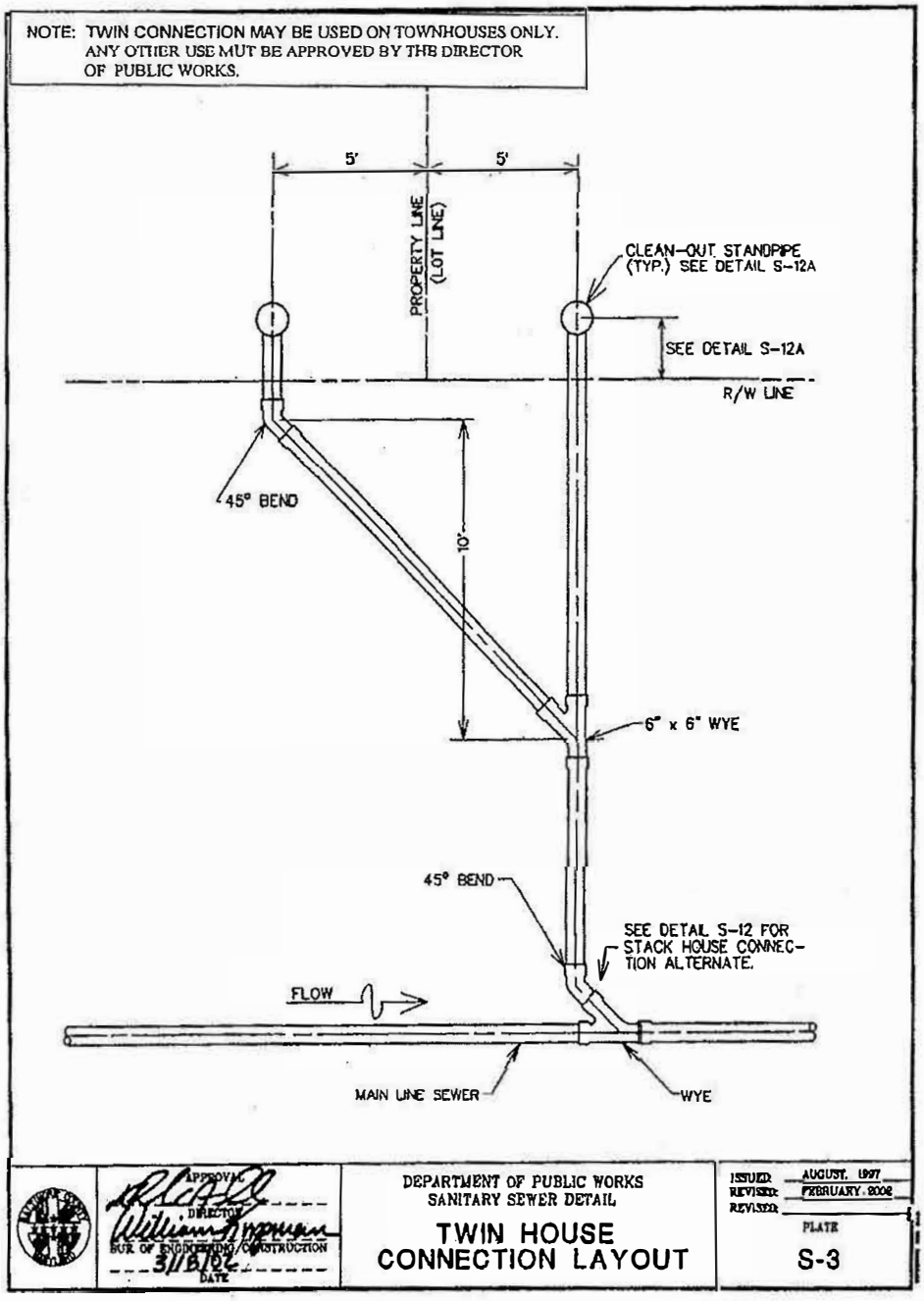
7 F Roads and Streets Details Index Sheet

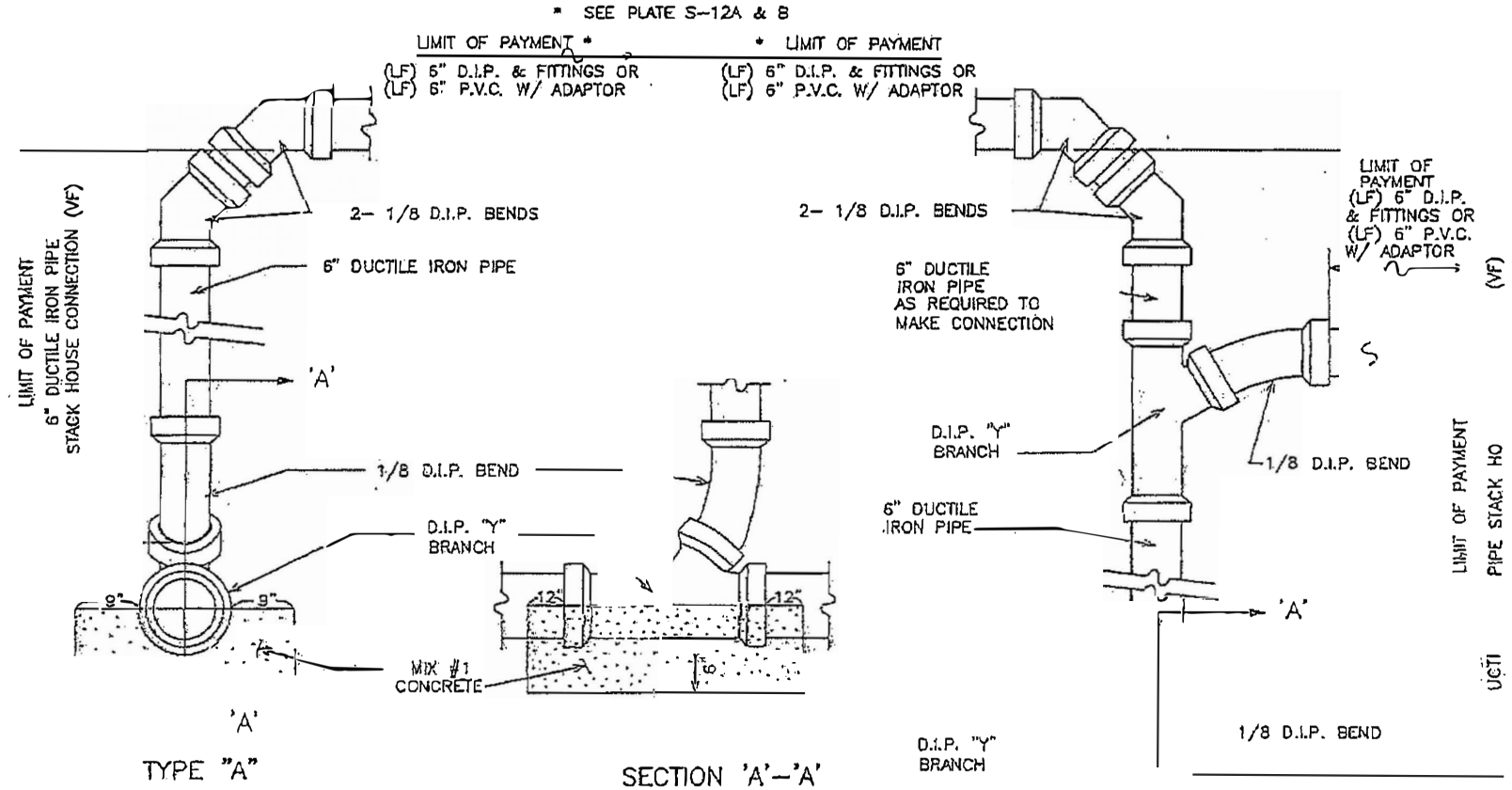
Rev. 11/09

## Sanitary Sewer Standard Details

| PLATE # | TITLE | SIGNATURE DATE | STD. SPECS. REFERENCE | COMMODITY CODE |
|---|---|---|---|---|
| S-1 | Manhole | 3/10/2005 | 1008 | 870000 |
| S-2 | Shallow Manhole | 3/10/2005 | 1008 | 872190 |
| S-3 | Twin House Conn. Layout | 3/18/2002 | 1007 | - |
| S-4 | Precast 48" San.MH | 1/2/2007 | 1008 | 875000 |
| S-5 | 60", 72" Precast San. MH | 1/2/2007 | 1008 | 875000 |
| S-6 | Drop MH - Type A & B | 3/18/2002 | 1008 | 880000, 881000 |
| S-6A | Precast San.Drop MH | 12/4/2001 | 1008 | 880000, 881000 |
| S-7 | Bedding/Gravity PVC Pipe | 1/31/2007 | 1001 | - |
| S-8 | Heavy Traffic MH Fr.&Cvr | 10/23/1997 | 1008 | 877000 |
| S-8B | Sanitary MH Platen Cover – 1 | 9/12/2000 | 1008 | 877000 |
| S-8C | Sanitary MH Platen Cover – 2 | 9/12/2000 | 1008 | 877000 |
| S-12 | Stack House Connections | 10/23/1997 | 1007 | - |
| S-12A | House Conn.@ Prop.Line | 1/10/2007 | 1007 | - |
| S-12B | Grinder Pump Conn@Hse.Conn. | 1/2/2007 | - | - |
| S-13 | Watertight MH Fr.&Cvr | 10/23/1997 | 1008 | 877000 |
| S-14 | Air Relief Valve Vault | 3/18/2002 | Special Provision | 886000 |
| S-15 | Precast Doghouse Riser | 5/15/2002 | 1008 | - |

**Rev. 9/09**


NOTE: TWIN CONNECTION MAY BE USED ON TOWNHOUSES ONLY. ANY OTHER USE MUT BE APPROVED BY THE DIRECTOR OF PUBLIC WORKS.
5'
5'
PROPERTY LINE (LOT LINE)
CLEAN-OUT STANDPIPE (TYP.) SEE DETAIL S-12A
SEE DETAIL S-12A
R/W LINE
45° BEND
10'
6" x 6" WYE
45° BEND
SEE DETAIL S-12 FOR STACK HOUSE CONNEC-TION ALTERNATE.
FLOW
MAIN LINE SEWER
WYE
APPROVAL
DIRECTOR
BUR. OF ENGINEERING/CONSTRUCTION
3/18/02
DATE
DEPARTMENT OF PUBLIC WORKS
SANITARY SEWER DETAIL
TWIN HOUSE CONNECTION LAYOUT
ISSUED: AUGUST, 1997
REVISED: FEBRUARY, 2002
REVISED:
PLATE
S-3




NOTES:

1. USE ALL DUCTILE IRON FITTINGS INCLUDING SEWER WYE.
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 BACKFILL.
5. NO STACK CONNECTIONS TO BE BUILT ON VCP OR PVC MAIN.

APPROVAL
DIRECTOR
BUR. OF ENGINEERING/CONSTRUCTION
10/31/13
DATE

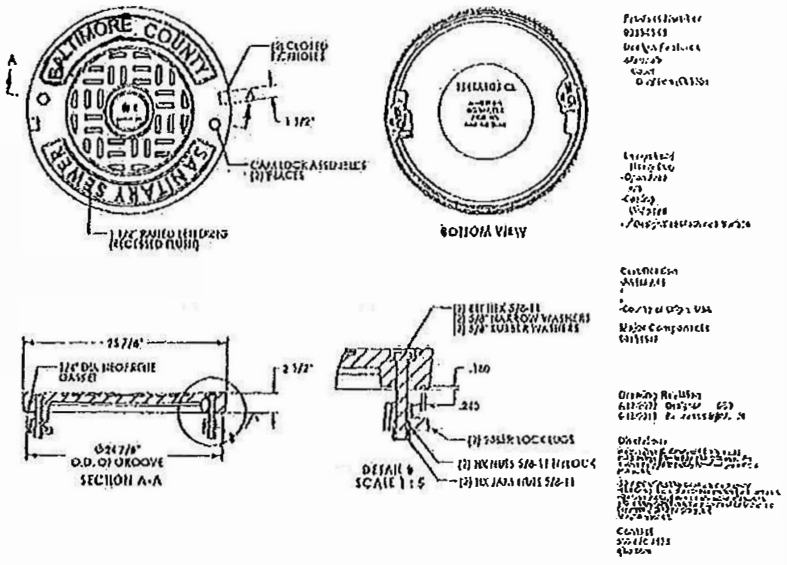
DEPARTMENT OF PUBLIC WORKS
SANITARY SEWER DETAILS

# STACK HOUSE CONNECTIONS

ISSUED: OCTOBER 1977
REVISED: AUGUST 1997
REVISED: JUNE 2013
REVISED: MAY 5, 2014
PLATE
S-12

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

## 1545A1GS Assembly

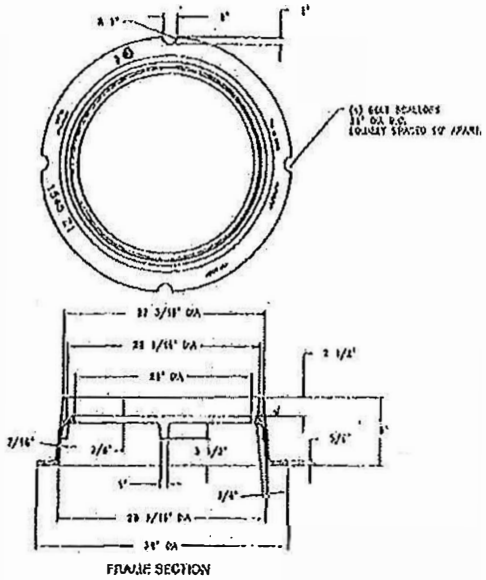



00154548
Quantity: 1

For In-Roadway Use
Or Approved Equal.

Supersedes Detail S-13

## 1545Z1 Frame




00154512
Quantity: 1

**Disclaimer**
Weight (tolerance), dimensions (inches/mm) and die steps provided for your guidance. We reserve the right to modify specifications without prior notice.

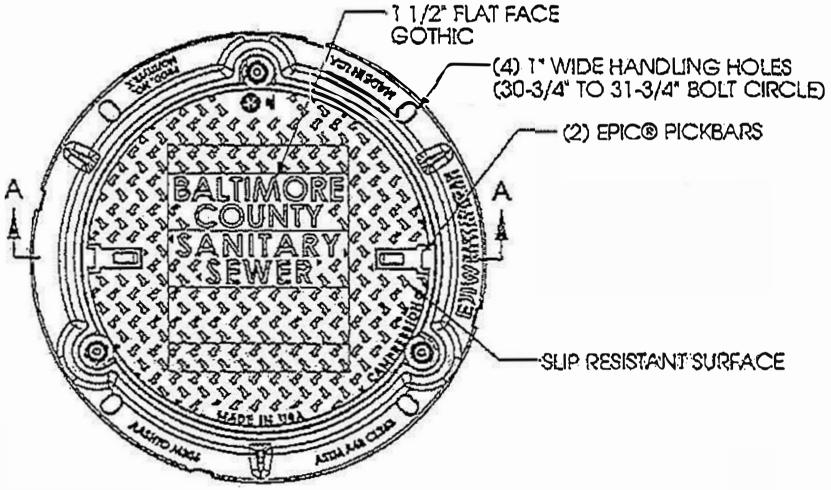


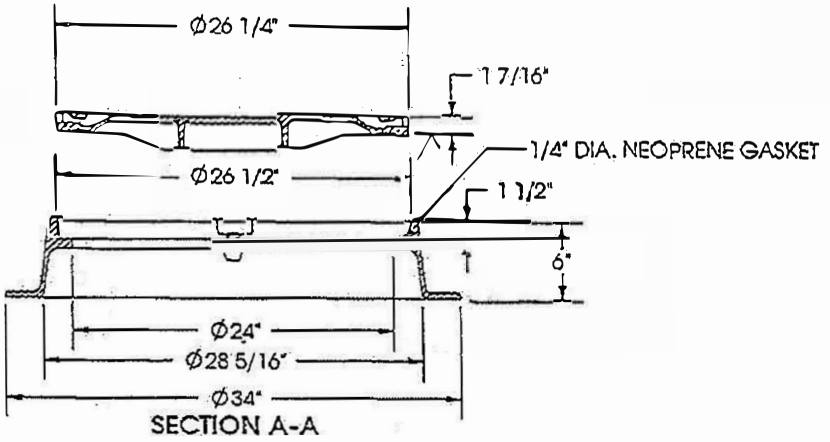
**Contact**
800 626 4653
ejco.com

# CAMPRESSION Assembly

For outside of roadway use.
Or Approved Equal.

Supersedes Detail S-13




SECTION A-A

**PRELIMINARY**

Submittal Number
NPR14-954A

Design Features
-Materials
Frame
Gray Iron (CL35B)
Cover
Ductile Iron (70-50-05)

-Design Load
Heavy Duty
-Open Area
n/a
-Coating
Undipped
-√ Designates Machined Surface

Certification
-ASTM A48
-ASTM A536
-Country of Origin: USA

Major Components
WT-12339011
WT-12339046

Drawing Revision
3/10/2014 Designer MAH
Revised By:

Disclaimer -
Weights (tare/gr. dimensions (technical and drawings provided for your guidance. We reserve the right to modify specifications without prior notice.

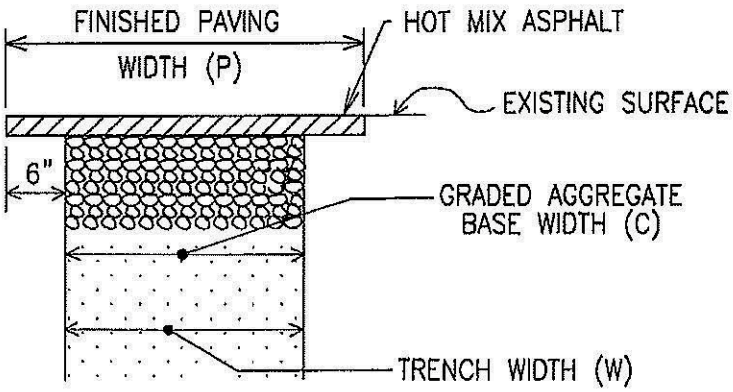


Contact
800 626 4653
ejco.com

## Roads and Streets Standard Details

| PLATE # | TITLE | SIGNATURE DATE | STD. SPECS. REFERENCE | COMMODITY CODE |
|---|---|---|---|---|
| R-1 | Pri.Rd.Paving Sections | 11/21/2000 | 501, 504 | - |
| R-2A | Subdiv.Paving Sect.(CBR≥5) | 3/10/2005 | 501, 504 | - |
| R-2B | Subdiv.Paving Sect.(CBR<5) | 3/10/2005 | 501, 504 | - |
| R-10 | 20'St.(40'R/W)-No Pkg. | 10/23/1997 | - | - |
| R-11 | 22'St.(40'R/W)-No Pkg. | 10/23/1997 | - | - |
| R-12 | 26'St.(50'R/W)-Pkg.1 Side | 11/24/1999 | - | - |
| R-13 | 30'St.(50'R/W)-Pkg.1 Side | 11/24/1999 | - | - |
| R-14 | Concrete Alleys | 2/22/2006 | 520 | 561100 |
| R-14A | Concrete Alleys | 11/24/1999 | 520 | 387404, 387120, 390500 |
| R-15 | Drive Entr.-No Curb | 10/23/1997 | 501, 504 | 520114, 530300 |
| R-15A | Drive Entr-Sdwk/Curb Var | 2/22/2006 | 520 | 561100 |
| R-15B | Drive Entr-SdwkAbutsCurb | 2/22/2006 | 520 | 561100 |
| R-17 | Concrete Alley Joints | 11/24/1999 | 520 | 561100 |
| R-18 | Alley Entrance | 2/22/2006 | 520 | 561100 |
| R-19 | Std.4'Sidewalk | 2/22/2006 | 610 | 655000 |
| R-20A | H.M.A. Mountable Curb | 11/24/1999 | 609.03.02 | 615581 |
| R-20B | Extr.Conc.Mount.Curb | 10/23/1997 | 609 | 615591, 2 |
| R-21 | 7"Comb.Curb & Gutter | 2/22/2006 | 609 | 630000, 616000 |
| R-22 | Underdrain-Paved Streets | 12/4/2001 | 306 | 387000, 390500 |
| R-23 | Conc.Ditch to Curb & Gtr | 2/22/2006 | 609, 307 | 631000, 630000 |
| R-24 | Concrete Curb | 12/20/2002 | | |
| R-27 | Barricades | 10/23/1997 | 612, 918 | 659000 |
| R-28 | Svce.Station Entr.Chnlz | 2/22/2006 | 520 | - |
| R-29 | Svce.Sta.Entr.@Intersect | 2/22/2006 | 520 | - |
| R-30 | Commercial Entr.Chnlztn | 2/22/2006 | 520 | - |
| R-31 | Comm.Entr.@Intersection | 2/22/2006 | 520 | - |
| R-32 | Single Commercial Entr | 1/2/2007 | 520 | - |
| R-32A | Rural Commercial Entr | 10/23/1997 | 501, 504, 303 | - |
| R-33 | Valley Gutter-90Deginter. | 1/2/2007 | 520 | 631010 |
| R-35 | Accel.Lane(Min.Widening) | 10/23/1997 | - | - |
| R-35A | Accel.Lane(Widened to PL) | 10/23/1997 | - | - |
| R-36A | Ped.Ramp/Median/Depressed | 12/20/2002 | - | - |
| R-36B | Truncated Pedestrian Ramp | 12/20/2002 | - | - |
| R-36C | Detectable Warnings | 12/20/2002 | - | - |
| R-36D | Median/Island Ped.Passage | 12/20/2002 | - | - |
| R-36E | Pedestrian Bump-Out | 12/20/2002 | - | - |
| R-37 | 7"Valley Gutter/Perp.Pkg | 2/22/2006 | 520 | 631010 |
| R-38 | Flexible Pvg.of Trenches | 3/18/2002 | 505 | 120550, 61, 63 |
| R-39 | Adjusting Utility Frame | 10/23/1997 | 305, 508 | 590110, 20 |
| R-41 | Pavement Failure Repairs | 11/24/1999 | 505 | 590600, 5 |
| R-42 | Hot-Mix Asphalt Paving | 10/23/1997 | 504 | 556360 |

Rev. 9/09




## REPAVING QUANTITIES
SHOWN IN TONS PER LINEAR FOOT

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

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

| PIPE DIAMETER ( INCHES ) | 12 INCH GRADED * AGGREGATE BASE (TONS / LINEAR FOOT) | 2 INCH HOT MIX * ASPHALT PAVING (TONS / LINEAR FOOT) | 3 INCH HOT MIX ** ASPHALT PAVING (TONS / LINEAR FOOT) |
|---|---|---|---|
| 6" | 0.225 | 0.04 | 0.08 |
| 8" | 0.225 | 0.04 | 0.08 |
| 10" | 0.225 | 0.04 | 0.08 |
| 12" | 0.225 | 0.04 | 0.08 |
| 15" & 16" | 0.225 | 0.04 | 0.08 |
| 18" | 0.263 | 0.047 | 0.09 |
| 20" & 21" | 0.263 | 0.047 | 0.09 |
| 24" | 0.30 | 0.053 | 0.10 |
| 27" | 0.375 | 0.067 | 0.12 |
| 30" | 0.375 | 0.067 | 0.12 |
| 33" | 0.413 | 0.073 | 0.13 |
| 36" | 0.413 | 0.073 | 0.13 |
| 42" | 0.488 | 0.087 | 0.15 |
| 48" | 0.525 | 0.093 | 0.16 |
| 54" | 0.60 | 0.107 | 0.18 |
| 60" | 0.638 | 0.113 | 0.19 |
| 66" | 0.675 | 0.12 | 0.20 |
| 72" | 0.75 | 0.133 | 0.22 |
| 78" | 0.825 | 0.147 | 0.24 |
| 84" | 0.863 | 0.153 | 0.25 |
| 90" | 0.90 | 0.16 | 0.26 |
| 102" | 0.975 | 0.173 | 0.28 |
| 108" | 1.05 | 0.187 | 0.30 |
| BRACING ADDITIVES | | | |
| SINGLE TIER | ADD 0.15 | ADD 0.027 | ADD 0.04 |
| DOUBLE TIER | ADD 0.30 | ADD 0.053 | ADD 0.08 |

* BASED ON TRENCH WIDTH (W)

** BASED ON FINISHED PAVING WIDTH (P)

BALTIMORE COUNTY MARYLAND

APPROVAL

DIRECTOR

BUR. OF ENGINEERING / CONSTRUCTION

10/13/17
DATE

DEPARTMENT OF PUBLIC WORKS
GENERAL DETAILS

# PAYMENT QUANTITIES FOR REPAVING TRENCHES

ISSUED: OCTOBER, 2017
PREVIOUS REVISION: AUGUST, 1997

PLATE

G-7

## 1001.05 STEEL PLATES

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 |
| **AISI** | 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 |

| | |
|---|---|
| **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 |
| **pccp** | prestressed concrete cylinder pipe |
| **PCI** | Precast Concrete Institute |
| **PVC** | Poly Vinyl Chloride |
| **QPL** | Qualified Products List |
| **rccp** | reinforced concrete culvert pipe |
| **rcsp** | 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 therefor 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:

**9 6 0 0 0 X X 0**

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 (X X 0 above) indicates the general nature of the Work and the division of the Contract for accounting purposes. The two letters (X X) 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**

| **First X** | **Second X** |
|---|---|
| B - Bridge | D - Development (Public) |
| C - Culvert | F - Fire Station |
| D - Storm Drain | L - Library |
| G - Grading or miscellaneous | |

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)**

**Contract 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.

**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.

**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.

**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. BG&E 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

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

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

## GP-2.07 PROPOSAL GUARANTY/BID SECURITY

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.

## GP-2.08 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.

## GP-2.09 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.

## GP-2.13 OPENING AND RECORDING OF BIDS

(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

(4) Directing acceleration in the performance of the Work.

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.

(c) 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 DISCREPANCIES IN THE CONTRACT DOCUMENTS

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

(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.

## 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.

## 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 <u>not</u> submit for approval Materials other than those specified, unless the Contractor concurrently submits a written statement explaining why such a <u>substitution</u> 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

(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 hereinunder.

## 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,

Code of Federal Regulations, Part 1926, formerly Part 1518, as revised from time to time) promulgated by the United States Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standard Act, (83 Stat. 96) and under any Construction safety and health standards and regulations promulgated by the Commissioner of Labor and Industry in accordance with the Maryland Occupational Safety and Health Act and/or the Maryland General Assembly (as the same may be amended from time to time).

The Contractor and each Subcontractor shall permit inspection without delay and at any reasonable time on any premises where the Work is being performed by a federal or State inspector authorized to investigate compliance with the above mentioned federal and State statutes and regulations.

The Contractor further agrees to correct any violations found to exist during such inspection within a reasonable time after the issuance of any citation, unless the Contractor contests the validity thereof through the appropriate administrative and judicial process.

**(b)** 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 Construction, 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

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.

## 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

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.

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 Contact 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:

(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 a 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

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

a diameter greater than three inches (3") from a Construction Strip, Contractor shall provide a copy of the written permission to the Engineer before Contractor enters said property and/or fells such tree(s).

**(d)** Unless otherwise provided in the Contract Documents, all trees may be felled with the permission of the Engineer in those Rights-of-Way identified as a Highway Right-of-Way or a slope, utility or drainage Easement.

**(e)** Unless otherwise provided in the Contract Documents, the Contractor is to preserve and protect, remove and replace, or restore fences, mail boxes, Sidewalks, driveways, shrubs, perennial plants, or other private improvements in Rights-of-Way identified as Construction Strips or Easements of any kind.

**(f)** The Contractor shall not enter upon public or private property (outside of the Right-of-Way or Contract Work area as shown on the Contractor Drawing) for any purpose without obtaining prior written permission from any applicable property owners and 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 and private utility structures. The Contractor shall carefully protect from disturbance all survey land monuments and property marks located on the Contract Drawings or found in on, or at the Work site. 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.

**(g)** Upon Final Acceptance for Maintenance of the Work by the County, the Contractor shall restore the Rights-of-Way provided to a condition equivalent to that originally encountered, unless improved by the Work completed or as specified by the Contract. Property used by the Contractor under letter of permission or property that has been damaged shall be restored pursuant to GP-7.11 and the applicable letter of permission or to the satisfaction of the property owner without any cost or expense to the County.

**(h)** No arrangements will be made by the County for rights-of-way or rights of access beyond those shown in the Contract Documents. Any and all expense or costs relative to additional rights-of-way, rights of ingress and egress, or any other supplemental property rights beyond those described in the Contract Documents are considered to have been accounted for in the Bid.

# GP-SECTION 8
# PROSECUTION AND PROGRESS

## GP-8.01 SUBCONTRACTING

**(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.

(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 re-submittal 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

**(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,

(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.

(g) 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.

(h) 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.

## GP-8.10 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

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.

(c) 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

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.

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.

(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, for Extra 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.

(3) Quantities of Materials, prices and extensions.

(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

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".

(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:

| COST GROUP ESTIMATE | COST GROUP LETTER CLASS |
|---|---|
| Up to $ 100 000 | A |
| $ 100 001 to $ 500 000 | B |
| $ 500 001 to $ 1 000000 | C |
| $ 1 000 001 to $ 2 500 000 | D |
| $ 2 500 001 to $ 5 000 000 | E |
| $ 5 000 001 to $ 10 000 000 | F |
| $ 10 000 001 to $ 15 000 000 | G |
| $ 15 000 001 to $ 30 000 000 | H |
| $ 30 000 001 to $ 50 000 000 | I |
| $ 50 000 001 to $ 75 000 000 | J |
| $ 75 000 001 to $ 100 000 000 | K |
| Over $ 100 000 000 | L |

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:

Scaled Distance = Actual Distance to Damage Point in Feet (Charge Weight in Pounds per delay) $^{1/2}$

Charge Weight in = (Actual Distance to Damage Point in feet) squared pounds per Delay (Scaled Distance) 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

address.

**(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 REHANDLED 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.

351.03.10 Chlorination, Bacteriological, Hydrostatic and Leakage Tests.

(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:_____

# 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.

# BALTIMORE COUNTY
# DEPARTMENT OF PUBLIC WORKS
# TOWSON, MARYLAND

## BUREAU OF ENGINEERING AND CONSTRUCTION

JOB ORDER NO. 231-203-0035-0445

CONTRACT NO. 20203 WX0

# RENOVATIONS TO
# TOWSON WATER PUMPING STATIONS

9C13 - DISTRICT

# TECHNICAL SPECIFICATIONS

**JUNE 5, 2023**

WHITMAN, REQUARDT AND ASSOCIATES, LLP
801 SOUTH CAROLINE STREET
BALTIMORE, MARYLAND 21231

**********

**RENOVATIONS TO THE**
**TOWSON WATER PUMPING STATIONS**
TECHNICAL SPECIFICATIONS INDEX

DIVISION 1 - GENERAL REQUIREMENTS



DIVISION 2 - SITEWORK



DIVISION 3 - CONCRETE



DIVISION 4 - MASONRY



DIVISION 5 - METALS

**RENOVATIONS TO THE**
**TOWSON WATER PUMPING STATIONS**
TECHNICAL SPECIFICATIONS INDEX

APPENDICIES

LIMITED HAZARDOUS MATERIALS SURVEY REPORT

**SECTION 01010**

**SUMMARY OF WORK**

PARAGRAPH INDEX

## SECTION 01010

## SUMMARY OF WORK

### PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. These Technical Specifications are divided into 3 parts.

1. Part 1 - General: includes administrative and procedural requirements, related documents, system or item description, submittals, and quality assurance.

2. Part 2 - Products: includes materials, equipment, components and source quality control.

3. Part 3 - Execution: includes construction, installation, application, testing, and field quality control. Schedules, if used, are in Part 3.

B. These Technical Specifications include Section 01900 Special Conditions.

1. Special Conditions modify the General Provisions (GP) of the Baltimore County Department of Public Works "Standard Specifications for Construction and Materials", dated February 2000, and all associated Errata, Addenda, and Supplemental Specifications.

2. These Special Conditions contain general and specific information concerning the control of work, methods of construction, and temporary facilities.

C. These Technical Specifications supplement the Standard Specifications, specifically the General Provisions (GP) and Terms & Conditions (TC). In the event of conflict, these Divisions of the Special Provisions, including the Special Conditions, shall prevail.

1.02 DESCRIPTION OF WORK

A. The work to be completed under this contract shall include all labor, materials and equipment necessary to construct Renovations to Towson Water Pumping Station Nos. 2 and 3 as indicated on the Contract Drawings, Technical Specifications, Standard Specifications, and as directed by the Engineer. These two pumping stations are located on the site of the Towson Reservoir, 401 Hillen Rd. Towson, MD 21286.

B. The work shall be complete, in place and ready to operate. Work includes, but is not limited to: mobilization; all related excavation, shoring and backfill; construction of the Renovations at: Pumping Station No. 2, Pumping Station No. 3, Station No. 2 Venturi Vault, Station No. 3 Venturi Vault, Bypass Venturi Vault, Station No. 2 Surge Valve Vault and No. 3 Surge

Valve Vaults; replacement of finished water piping on the suction and discharge sides of Station No. 2; and all other work shown on the Contract Drawings and specified in the Contract Documents required to complete the Project in its entirety.

1.03 CONTRACT TIME

The work in this Contract shall be completed with the contract time as indicated in the Proposal Form.

1.04 INTERFACING CONTRACTS

A. The following contract(s) are in the Construction Phase on the Towson Reservoir Site, in parallel with this Contract, or where Conditional Acceptance may or may not have granted at the time of Bid.

1. Baltimore County Contract No. 13018WX0 – 42-Inch Towson Water Transmission Main from Towson Pumping Station, Hillen Road, Towsontown Blvd, Bosley Ave to Kenilworth Dr

2. Baltimore City Water Contract (WC) No. 1327 – Montebello Chlorine Handling Safety Improvements

3. Baltimore City SCADA Upgrades (WC) No. 1326 – SCADA Master Plan

B. Work performed under the above contracts is considered to be existing and in place, in these Contract Documents.

1.05 PUMPING STATION NAMING/NOMENCLATURE

A. Throughout these Documents, Pumping Station No. 2 may be referred to as any one of the following:

| | |
|---|---|
| Pump Station No. 2 | Pumping Station 2 |
| Station No. 2 | Pump Station 2 |
| Pumping Station #2 | Station 2 |
| Pump Station #2 | |
| Station #2 | |
| PS #2 | |

B. Throughout these Documents, Pumping Station No. 3 may also be referred to in a similar fashion.

1.06 CONSTRUCTION SEQUENCING PARAMETERS

The following parameters shall be accounted for by the Contractor in preparation of the Bid and of the initial Job Construction Schedule:

A. Pumping Station No. 3 PLC Replacement – For initial scheduling purposes,

Contractor shall arrange his schedule to perform the Replacement of the Pumping Station No. 3 PLC prior to any other major work for this Contract.

1. The Pumping Station No. 3 PLC PLC is a 'Master PLC' which communicates pumping and chlorination equipment status and alarms to Baltimore City's Telemetry Control Center (TCC), and transmits remote pump start and stop commands from the to TCC for all pumps on site, (Pumping Station No 2 and Pumping Station No 3).

2. To shorten the transition time from the existing Pumping Station No. 3 PLC to the new PLC, existing chart recorder panels in Pumping Station No. 3 shall be demolished, to create the space necessary to install and test a new Station No.3 PLC panel enclosure.

B. Pumping Station No. 2 shall be removed from service in its entirety for a single extended time period.

1. Prior to the removal of Station No.2 from service:

   a. All suction piping shown on Contract drawings within the LOD shall be located and identified per Drawing requirements. All piping identified to be constructed with thrust blocks for anchors shall be located and identified.

2. Pumping Station No. 2 may be removed from service in its entirety starting on September 15 through May 1 of the following year. This duration is 229 calendar days, (230 calendar days in leap years).

3. Pumping Station No. 2 rehabilitation work includes the following major work activities, which are to be performed with the station out of service:

   a. Construction of the new Station No. 2 Entrance, including all excavation, concrete, backfill, masonry wall and slate roof work.

   b. Modifications to Station Foundation Drain Piping

   c. Installation of a new Station No. 2 Ventilation and dehumidification systems.

   d. Demolition of instrumentation piping between Station No. 2 and the Station No. 2 Venturi Vault.

   e. Replacement of Pumping Units C and D

   f. Replacement of Pumps C and D Isolating Gate Valves

   g. Replacement of Pumps C and D Cone Valves' hydraulic control panels (cone valves to be stored during construction and remain)

   h. Replacement of Pump C and D interior piping, fittings and wall castings.

i. Replacement of 20 and 24-inch underground piping on the South (Suction) and North (Discharge) sides of the Station.

j. Removal of the 24-inch Wall Casting in the Station No. 2 Meter Vault (South Side),

k. Installation of a new 20-inch Magnetic Flowmeter in the Station No. 2 Meter Vault.

l. Installation of a new Access Hatch at the Station No. 2 Meter Vault.

m. Replacement of Pump and Station Pressure instrumentation

n. Installation of New Ventilation, Heating and dehumidification equipment

o. Replacement of Pump C and D Pump Motor Disconnect Switches

p. Installation of Pump Motor C and D Power Factor Correction Capacitors

q. Replacement of the Station No. 2 PLC, in accordance with the parallel City WC 1326 – SCADA Master Plan.

r. Replacement of 120V Panelboard

s. Any remaining required modifications to Station No. 3 Electrical and Instrumentation equipment, including wire connections, and terminations, as needed to support Station No. 2 automated and remote operation.

4. For Pumping Station No. 2, County record drawings from original station construction indicate that steel sheet piling was installed nominally 18 inches outbound of the Station's foundation slab, with a top elevation of 479.65 (NAVD 88). For Bidding purposes, Contractor shall assume that this piling was left in place. Piling exposed as a result of the work shall be demolished.

C. Pumping Station No. 2 Surge Valve Vault - The Work in this Surge Valve Vault (Surge Vault) shall occur in parallel with the Pumping Station No. 2 Outage described herein.

D. Unless otherwise noted herein, at all other times at Pumping Station No. 2, no more than one (1) pump may be removed at a time in order to perform the Work.

E. Pumping Station No. 3 shall only be removed from service in it is entirety once, to perform the new isolation valve installation on the Station’s external discharge header, between the Pump E and F discharge line connections.

1. The allowable duration to perform this valve installation is three (3)

calendar days, (i.e. 72 consecutive hours). Work on this valve installation shall be done on a continuous 24-hour per day basis until the new valve and piping is installed and the header is ready for operation.

2. This valve installation station outage shall be performed between September 15 through May 1 the following year, provided the ground at the discharge header is not frozen.

3. This valve installation station outage cannot occur until the successful completion and testing of the new pumping units installed during Pumping Station No. 2 extended outage described herein.

F. Pumping Station No. 3 – Existing Surge Relief Vault and New Surge Valve Vault

1. The Pumping Station No. 3 New Surge Valve Vault shall be constructed and placed into service prior to the demolition of the Pumping Station No. 3 Existing Surge Relief Vault.

G. Pumping Station No. 3 – Exterior Piping Work Sequence

1. Begin construction of Pumping Station No. 3 New Surge Valve Vault with inline valve and associated 16-inch piping.

2. Connect 16-inch piping from the New Surge Valve Vault to 16-inch side line from the 42-inch Hillen Road Transmission Main. Leave 16-inch valve closed.

3. Complete the new 10-inch drain line for the New Surge Valve Vault

4. Remove Pumping Station No. 3 completely from service as indicated herein.

5. Remove existing 48" x 30" PCCP Reducer on the Discharge Header and add new isolation butterfly valve and fittings. This step shall be performed on a continuous 24-hour per day basis until completed.

6. Close new 30-inch discharge header isolation butterfly valve and place Pump F and Pump G back in service, utilizing the New Surge Valve Vault. Open the 16-inch valve on east side of New Surge Valve Vault, placing this new vault in service.

7. Demolish Existing Station No. 3 Surge Relief Vault and 30"x12" reducer.

8. Construct the new 30-inch discharge main to the 30-inch stub off of the 42-inch Hillen Road Transmission Main. Cut the ductile iron stub as needed to make the connection. Construction of this main incudes the new Magmeter Vault and its isolation valves.

9. Place Pump E back in service. Open the new 30-inch discharge

header isolation butterfly valve. Open 16-inch valve west of the new Surge Relief Valve Vault.

10. For Hillen Road Traffic Control work related to the above Pump Station No. 3 Discharge Piping Modifications, see the Drawings.

H. Unless otherwise noted herein for the Pumping Station No. 3 Discharge header modification work: No more than one (1) of the three (3) station finished water pumps, (Pump E, F and G), can be removed from service to perform the Work at any time.

1. None of the Station No. 3 pumps shall be removed from service to perform work during the entire duration that Pumping Station No. 2 is out of service.

2. Otherwise, any one of the three station finished water pumps may be removed from service multiple times, as needed to perform the work.

I. The following Station No. 3 work shall be performed with Pump E out of service:

1. Pump E rehabilitation

2. Pump E discharge piping modifications

3. Pump E Power factor correction capacitor installation

J. The following Station No. 3 work shall be performed with Pump F out of service:

1. Pump F rehabilitation

2. Pump F Pump discharge piping modifications

3. Pump F Power factor correction capacitor installation

K. The following Station No. 3 work shall be performed with Pump G out of service

1. Pump G rehabilitation

2. Pump G cone valve rehabilitation

3. Pump G Replacement of the power factor correction capacitor

L. Pumping Station No. 3 - 2.4 kV MCC

1. Any work or modifications required to any equipment mounted on or inside this MCC can only be performed by the MCC manufacturer, EATON, or their authorized representatives. The MCC was constructed under Baltimore City Contract WC 1164, previously noted herein.

1.07 USE OF CRANES AND HOISTS

A. (Ref: 29 CFR 1910.179) The Contractor may use the existing 5-ton capacity in Pumping Station No. 3 and the two 1-ton hoists and monorails in Pumping Station No. 2 during construction of the Project, at his own risk.

B. Contractor shall operate and shall perform daily inspections of the crane and/or monorail, per OSHA requirements, when the crane and/or monorail is being used by his forces. Any damage to the existing crane or monorail, through their use by the Contractor, shall be corrected by the Contractor at no additional cost to the County. If damage to the crane is judged to be extensive by the Engineer, the damaged part and components shall be replaced in their entirety by the Contractor at no additional cost to the County.

C. The Contractor shall provide a written request to the County and City Pumping Section Personnel at least seven (7) calendar days prior to the Contractor's initial and any subsequent intended uses of the crane or monorail.

D. Prior to Contractor's initial use of the crane or monorail, the Contractor shall provide, at a minimum, an OSHA monthly inspection, and functional testing of the unloaded crane or monorail and its associated hoist and/or trolley, to determine crane's initial condition. After the Contractor's anticipated last use, the same inspection and testing shall be performed to determine the crane's or monorail's condition, prior to turnover of the crane operation to the County and City Pumping Section Personnel.

1.08 BALTIMORE CITY PUMPING SECTION PERSONNEL

A. Baltimore City Department of Public Works Pumping Section (City Pumping Section) is responsible for the day-to-day operation and maintenance of Towson Water Pumping Stations No.2 and No. 3. This includes remote operation of Station Pumps from the Telemetry Control Center (TCC) located at the Ashburton Water Filtration Plant in Baltimore City.

B. Baltimore City Pumping Section is responsible for the safe conveyance of finished water through the Towson Pumping Stations.

1. For any pumping equipment outage or pumping station outage, Contractor shall coordinate with City Pumping Section personnel, and notify them and County personnel at least seven (7) days in advice of any planned removal of pumping equipment or facilities as needed to perform the Work.

2. Baltimore City Pumping Section may as required, control the conduct of Contractor forces by request to the County and in accordance with the County Standard Specifications, in order to maintain safe pumping operations.

C. Baltimore City Pumping Section is the Owner of the Telephone lines utilized for voice and for station data telemetry between the Towson Site and the Telemetry Control Center (TCC). Under this Contract, the existing site copper telephone lines shall be replaced with fiber optic lines (TLS). The Contractor shall provide new conduit and any other work in order for the telephone service provider, Verizon, to install the new TLS service as indicated on the Drawings. Any other work which affects site telephone service shall be fully coordinated with Baltimore City Pumping Section, and Verizon, as necessary.

**PART 2 - PRODUCTS**

Not Used

**PART 3 - EXECUTION**

Not Used

END OF SECTION

**SECTION 01020**

**ALLOWANCES**

PARAGRAPH INDEX

**SECTION 01020**

**ALLOWANCES**

## PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract including general and supplementary conditions and Division 1 specifications sections apply to the work of this section.

B. Coordinate all contingent allowance work with related work to ensure that each part is completely integrated and interfaced with related work.

1.02 DESCRIPTION OF REQUIREMENTS

A. Definitions and Explanations: Contingent allowance work consists of providing all material, labor, equipment, tools and incidentals necessary for construction of a predefined additional work effort, beyond the scope of work otherwise defined by the contract documents, as ordered by the Engineer. Work for which a Bid Allowance has been defined is identified in Section 01025.

B. Types of allowances scheduled herein for the work include the following:

1. Lump Sum allowance

C. Submit proposals and recommendations for purchase of materials, products and/or systems associated with work under the allowance in the format specified for change orders.

D. Change Order Data: the Contractor shall, where applicable, include in each change order proposal the quantities of materials, products and/or systems being purchased; the unit costs of materials, products and/or systems being purchased; and the 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. The County reserves the right to establish the actual quantity of work in place by an independent quantity survey, measure or count.

F. No work is to be performed using the allowance without written approval of the Engineer.

## PART 2 - MATERIALS

Not used.

## PART 3 - EXECUTION

3.01 GENERAL

A. Furnish all the materials, products and/or systems required and the associated labor to install, as approved in writing by the Engineer.

B. Include in the Total Costs for Contract the lump sum contingent allowance(s) as defined by Section 01025.

END OF SECTION

**SECTION 01025**

**MEASUREMENT AND PAYMENT**

PARAGRAPH INDEX

## SECTION 01025

## MEASUREMENT AND PAYMENT

### PART 1 - GENERAL

1.01 RELATED DOCUMENTS

Measurement and payment shall be according to the provisions of the Standard Specifications, except as modified herein.

1.02 DESCRIPTION

Payment for all work under this Contract will be made by lump sum bid broken down as described in Paragraph 1.03 herein, plus contingent items, if utilized. These prices shall include the furnishing of all labor, tools, equipment, and materials, and the performing of all work necessary to complete the project as shown and specified, in strict accordance with all the requirements of the Contract Documents and to the satisfaction of the Engineer.

1.03 CONTRACTOR TO SUBMIT BREAKDOWN

In order to determine the amount of the monthly estimate, the successful Contractor shall furnish a schedule of values, showing a complete breakdown of his total bid. He shall furnish this information within ten (10) days after being requested. The breakdown shall follow the outline of the specification sections. Upon approval by the Engineer, the breakdown shall be the basis for calculating the amount of monthly estimates, as specified in General Provisions Section 9.03 (a) (1) and (2) of the Standard Specifications.

1.04 CONTINGENT ITEMS

A. Items in the Proposal designated as "Contingent" are for work not included in any of the other items of the proposal and is work that may 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 indicated in the Proposal. Such work shall be performed only as and when directed 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. No payment will be made for loss of profit and overhead due to the fact that these items were not used in the work or used in smaller or larger quantities than that indicated in the Proposal. Quantities ordered by the Engineer to be used in the Work will be paid for at the County fixed price or contract unit price bid in the Proposal.

B. Contingent items in the Proposal have been assigned an approximate quantity

to establish an accurate cost basis for each item.

C. Contingent work items and work descriptions are defined herein.

1.05 PAYMENT ITEMS

A. Bid Item #1: CONSTRUCTION OF RENOVATIONS TO TOWSON WATER PUMPING STATIONS

1. This item of work consists of providing all material, labor, equipment, and tools necessary to complete the Renovations of the Towson Water Pumping Stations as shown on the Contract Drawings, and as specified. Work includes, but is not limited to: mobilization;; installation of Engineer's Office No. 3; erosion and sediment control measures; all related excavation, shoring and backfill; Construction of the Renovations at: Pumping Station No. 2, Pumping Station No. 3, Station No. 2 Venturi Vault, Station No. 3 Venturi Vault, Bypass Venturi Vault, Station No. 2 Surge Valve Vault and No. 3 Surge Valve Vaults; replacement of finished water piping on the suction and discharge sides of Station No. 2; and all work shown on the Contract Drawings and specified in the Contract Documents required to complete the project in its entirety.

2. Measurement and payment under this item will be made on the basis of percentage of work completed on the Contractor's submitted "Schedule of Values", in accordance with Paragraph 1.03 herein, as approved by the Engineer.

B. Bid Item #2: CONTINGENT CLASS 3 EXCAVATION WITH SELECT BACKFILL

1. The work under this item shall include the excavation and off-site disposal of all material below subgrade performed by written order of the Engineer. Subgrade is defined as the lowest limit of excavation shown on the Contract Drawings or specified in the Special Provisions. This work will be authorized when, in the judgment of the Engineer, unsuitable conditions not caused by the Contractor exist at subgrade for the construction of the structure or utility. This is a fixed price County item.

2. Measurement under this item will be made on the basis of the actual volume of material excavated and replaced, in cubic yards measured in place and compacted, as directed by the Engineer.

3. Payment will be made at the unit fixed price per cubic yard as shown on the bid schedule. Payment includes loading, hauling and disposal

off-site of unsuitable material.

C. Bid Item #3: CONTINGENT BORROW MATERIAL, A-1, A-2-4, OR A-2-6

1. This item of work shall consist of furnishing and placing complete, borrow material, A-1, A-2-4, or A-2-6, as described in Section 02200 of this Specification, in addition to that shown on the Drawings, specified, or as included in other Bid Items, or in the event that sufficient suitable material is not available from the required excavations on site, and in accordance with the written direction of the Engineer.

2. Measurement under this item will be made on the basis of the actual in-place cubic yard volume of material satisfactorily furnished and placed, as directed by the Engineer.

3. Payment will be made at the unit price bid per cubic yard furnished and placed.

D. Bid Item #4: CONTINGENT DG AGGREGATE MATERIAL, CR-6

1. This item of work shall consist of furnishing and placing complete, Dense Graded Aggregate Material, CR-6, as described in Section 02200 of this Specification, in addition to that shown on the Drawings, specified, or included in other Bid Items, and in accordance with the written direction of the Engineer.

2. Measurement under this item will be made on the basis of the actual in-place tons of material satisfactorily furnished and placed, as directed by the Engineer.

3. Payment will be made at the unit price bid per cubic yard furnished and placed.

E. Bid Item #5: CONTINGENT OGC AGGREGATE MATERIAL, MDSHA NO. 57 AGGREGATE

1. This item of work shall consist of furnishing and placing complete, Open Graded Coarse Aggregate Material, MDSHA No. 57 Aggregate, as described in Section 02200 of this Specification, in addition to that shown on the Drawings, specified, or included in other Bid Items, in accordance with the written direction of the Engineer.

2. Measurement under this item will be made on the basis of the actual in-place tons of material satisfactorily furnished and placed, as directed by the ENGINEER.

3. Payment will be made at the unit price bid per cubic yard furnished and placed.

F. Bid Item #6: CONTINGENT ALLOWANCE - PUMP CASING MACHINING

1. This item of work shall consist of all labor, materials, equipment, tools and incidentals necessary for machining the existing pump casing to reestablish machine fits, including the mating flanges and line bore on existing finished water pumps E, F and/or G, beyond that otherwise defined by the Contract Documents, as ordered by the Engineer. This Payment Item shall be in accordance with Section 01020, entitled ALLOWANCES.

2. Measurement under this item will be made on the basis of percentage of work completed.

3. 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 PUMP CASING MACHINING shall be in accordance with the Contractor's proposal as approved by the Engineer. For all work performed as part of the CONTINGENT PUMP CASING MACHINING, the Contractor shall include an amount of $25,000.00 per finished water pump E, F, and/or G, which shall cover this contingent item work for all three finished water pumps, and said amount shall be included in the Contractor's Total Cost for Contract as indicated on the Proposal Form.

G. Bid Item #7: CONTINGENT ALLOWANCE - IMPELLER RECONSTRUCTION

1. This item of work consists of furnishing labor, materials, and equipment necessary to reconstruct the existing pump impeller on existing finished water pumps E, F and/or G, beyond that otherwise defined by the Contract Documents, as ordered by the Engineer. This would include work in order to reestablish impeller vane profiles, repairing holes, repairing cavitation damage, trimming impeller diameter and restoring impeller vane surface conformity. This Payment Item shall be in accordance with Section 01020, entitled ALLOWANCES.

2. Measurement under this item will be made on the basis of percentage of work completed.

3. 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 IMPELLER RECONSTRUCTION shall be in accordance with the Contractor's proposal as approved by the

Engineer. For all work performed as part of the CONTINGENT IMPELLER RECONSTRUCTION, the Contractor shall include an amount of $20,000.00 per finished water pump E, F, and/or G, which shall cover this contingent item work for all three finished water pumps, and said amount shall be included in the Contractor's Total Cost for Contract as indicated on the Proposal Form.

H. Bid Item #8: CONTINGENT ALLOWANCE - REPLACEMENT OF PUMP SHAFT

1. This item of work consists of furnishing labor, materials, and equipment necessary to replace the existing pump shaft on existing finished water pumps E, F and/or G beyond that otherwise defined by the Contract Documents, as ordered by the Engineer. This Payment Item shall be in accordance with Section 01020, entitled ALLOWANCES.

2. Measurement under this item will be made on the basis of percentage of work completed.

3. 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 REPLACEMENT OF PUMP SHAFT shall be in accordance with the Contractor's proposal as approved by the Engineer. For all work performed as part of the CONTINGENT REPLACEMENT OF PUMP SHAFT, the Contractor shall include an amount of $30,000.00 per finished water pump E, F, and/or G, which shall cover this contingent item work for all three finished water pumps, and said amount shall be included in the Contractor's Total Cost for Contract as indicated on the Proposal Form.

I. Bid Item #9: CONTINGENT ALLOWANCE - REPLACEMENT OF PUMP IMPELLER

1. This item of work consists of furnishing labor, materials, and equipment necessary to replace the existing pump impeller on existing finished water pumps E, F and/or G beyond that otherwise defined by the Contract Documents, as ordered by the Engineer. This Payment Item shall be in accordance with Section 01020, entitled ALLOWANCES.

2. Measurement under this item will be made on the basis of percentage of work completed.

3. 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 REPLACEMENT OF PUMP IMPELLER shall be in accordance with the Contractor's proposal as approved by the

Engineer. For all work performed as part of the CONTINGENT REPLACEMENT OF PUMP IMPELLER, the Contractor shall include an amount of $50,000.00 per finished water pump E, F, and/or G, which shall cover this contingent item work for all three finished water pumps, and said amount shall be included in the Contractor's Total Cost for Contract as indicated on the Proposal Form.

J. Bid Item #10: CONTINGENT REPLACEMENT OF WEARING PARTS IN CONE VALVE OPERATOR MECHANISM

1. This item of work consists of furnishing labor, materials, and equipment necessary to replace wearing parts in the cone valve 'G' operator mechanism. Parts include but are not limited to items identified in Section 15102 – 2.01.C.4. This Payment Item shall be in accordance with Section 01020, entitled ALLOWANCES.

2. Measurement under this item will be made on the basis of percentage of work completed.

3. 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 REPLACEMENT OF WEARING PARTS IN CONE VALVE OPERATOR MECHANISM shall be in accordance with the Contractor's proposal as approved by the Engineer. For all work performed as part of the CONTINGENT REPLACEMENT OF WEARING PARTS IN CONE VALVE OPERATOR MECHANISM, the Contractor shall include a lump sum amount of $50,000.00, which shall cover this contingent item work and said amount shall be included in the Contractor's Total Cost for Contract as indicated on the Proposal Form.

K. Bid Item #11: CONTINGENT REPLACEMENT OF MEDIUM VOLTAGE UNDERGROUND POWER CABLES FOR STATION NO.2 PUMPS

1. This item of work consists of furnishing labor, materials, and equipment necessary to replace medium voltage power cable from the Pumping Station No. 3 Motor Control Center to the new Pumping Station No. 2 Pump 'C' and/or Pump 'D' Disconnect Switch. This work includes but is not limited to: Removal of the Existing Power Cables, Installation and Termination of New Power Cables, in accordance with the written direction of the Engineer.

2. Measurement under this item will be made on the basis of percentage of work completed.

3. Payment under this item will be made on the basis of percentage of work completed.

L. Bid Item #12: CONTINGENT CONCRETE REPAIR AND PATCHING WITH POLYMER – MODIFIED MORTAR

1. This item of work shall consist of: performing area preparation, furnishing polymer – modified mortar, including all mortar mixing, application, curing and finishing, as specified in Section 03700, for all those concrete repair areas, which are in addition to those areas and/or repair quantities shown on the Drawings, specified, or included in other Bid Items, and in accordance with the written direction of the Engineer.

2. Measurement under this item will be made on the basis of the actual square foot of repair area satisfactorily repaired to the depth of one (1) lift, as directed by the Engineer. For measuring purposes depth of contingent repair area shall be no greater that one (1) lift of polymer – modified mortar with aggregate that can be applied per mortar manufacturer recommendations.

3. Payment under this item will be made at the unit price per square foot.

**PART 2 - PRODUCTS**

Not Used

**PART 3 - EXECUTION**

Not Used

END OF SECTION

**SECTION 01400**

**QUALITY CONTROL**

PARAGRAPH INDEX

**SECTION SP-01400**

**QUALITY CONTROL**

## PART 1 - GENERAL

1.01 RELATED DOCUMENTS

All quality control shall be according to the Terms and Conditions of the Standard Specifications, except as modified by this Special Provision.

1.02 CODES, RULES, PERMITS, AND FEES

A. General

The Contractor shall give all necessary notices, pay all government taxes, fees, and other costs in connection with the work, file all necessary plans, prepare all documents, and obtain all necessary approvals of all government departments or agencies having jurisdiction.

B. Included Items

1. The Contractor shall include in the Work, without additional cost to the County, all labor, materials, services, apparatus, and drawings required to comply with all applicable laws, ordinances, rules, and regulations, whether or not shown on the Contract Drawings and/or specified.

2. It shall be the Contractor's responsibility to obtain the appropriate permits for the off-site disposal of excess and unsuitable material.

1.03 STANDARDS

A. Where the following or any other standards, codes, or specifications are referred to in these Special Provisions, the reference is to the particular standard, code, or specifications, together with all amendments and errata applicable at the time the Bids are taken and shall apply except to the extent that said standards, and/or requirements may be in conflict with applicable laws and ordinances.

| Abbreviations | Organization |
|---|---|
| AEIC | Association of Edison Illuminating Companies |
| AGA | American Gas Association |
| AGMA | American Gear Manufacturer's Association |
| AMCA | Air Moving and Conditioning Association, Inc. |
| ASTM | American Society of Testing and Materials |
| AWS | American Welding Society |

| Abbreviations | Organization |
|---|---|
| AWWA | American Water Works Association |
| CBM | The Certified Ballast Manufacturers Association |
| ETL | Electrical Testing Laboratories, Inc. |
| Federal | Federal Government Specifications |
| HI | Hydraulics Institute |
| IBR | Institute of Boiler and Radiator Manufacturers |
| IEEE | Institute of Electrical and Electronics Engineers |
| IPCEA | Insulating Power Cable Engineers Association |
| JIC | Joint Industry Conference |
| MOSHA | Maryland Occupational Safety and Health Administration |
| MSS | Manufacturers Standardization Society of Valve and Fitting Industry |
| OSHA | Occupational Safety and Health Administration |
| RLM | Reflector and Lamp Manufacturers Institute |
| SMACNA | Sheet Metal and Air-Conditioning Contractors National Association |
| TEMA | Tabular Exchange Manufacturers Association |
| UL | Underwriters Laboratories |

B. ANSI/NSF Certification:

In accordance with Code of Maryland regulations (COMAR) 26.04.01.33, Direct and Indirect Additives, suppliers of water shall only use products (any materials that come in contact with water intended for use in public water supply) that meet the applicable American National Standards Institute / NSF International (ANSI / NSF) standards for direct or indirect drinking water additives. The products can also be certified by an organization accredited by the 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).

## PART 2 - MATERIALS

Not Used

## PART 3 - EXECUTION

Not Used

END OF SECTION

**SECTION 01453**

**SPECIAL INSPECTION SERVICES**

## SECTION 01453

## SPECIAL INSPECTION SERVICES

## PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Perform Special Inspections in accordance with the Statement of Special Inspections, Schedule of Special Inspections and Chapter 17 of ICC IBC. The Statement of Special Inspections and Schedule of Special Inspections are included as an attachment to this specification. Special Inspections are intended to ensure that the work of the contractor is in accordance with the Contract Documents and applicable building codes.

B. The Owner will procure and bear all costs of the Special Inspections and Special Inspector's Testing Laboratory, except as otherwise noted. The Special Inspector will be the manager of the Special Inspection process. The Special Inspector checks the certification of all other inspecting agents required by Special Inspections and coordinates their activities. The Special Inspector carries the exclusive responsibility for assuring that the inspections indicated are performed. The Statement of Special Inspections will be required by the Building Official as a condition for building permit issuance.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. Related Sections include the following:

1. Division 2 "Site Construction"

2. Division 3 "Concrete"

3. Division 4 "Masonry"

4. Division 5 "Metal"

1.03 REFERENCES

A. American Society of Civil Engineers (ASCE):

1. 2010 Minimum Design Loads for Buildings and Other Structures (ASCE 7-10)

2. 2013 Building Code Requirements for Masonry Structures (TMS 402-13/ACI 530-11/ASCE 5-13)

3. 2013 Specification for Masonry Structures (TMS 602-13/ACI 530.1-13/ASCE 6-13)

B. American Institute of Steel Construction (AISC):

1. 2010 Specification for Structural Steel Buildings (AISC 360).

C. American Welding Society (AWS)

1. B5.1: Specification for the Qualification of Welding Inspectors (AWS B5.1).

2. D1.1/D1.1M: Structural Welding Code – Steel (AWS D1.1/D1.1M).

D. International Code Council:

1. 2015 International Building Code (IBC).

1.04 DEFINITIONS

A. Continuous Special Inspection: Continuous Special Inspections is the constant monitoring of specific tasks by a special inspector. These inspections must be carried out continuously over the duration of the particular tasks.

B. Periodic Special Inspection: Special inspection by the special inspector who is intermittently present where the work to be inspected has been or is being performed.

C. Perform: Perform these Special Inspections tasks for each welded joint or member.

D. Observe: Observe these Special Inspections items on a random daily basis. Operations need not be delayed pending these inspections.

E. Special Inspector (SI): A qualified person retained by the Owner–having the competence necessary to inspect a particular type of construction requiring Special Inspections.

F. Associate Special Inspector (ASI): A qualified person who assists the SI in performing Special Inspections but must perform inspection under the direct supervision of the SI and cannot perform inspections without the SI on site.

G. Third Party: A third party inspector must not be company employee of the Contractor or any Sub-Contractor performing the work to be inspected.

H. Designer of Record (DOR): A registered design professional employed by Owner responsible for the overall design and review of submittal documents prepared by others. The DOR is registered or licensed to practice their respective design profession as defined by the statutory requirements of the professional registration laws in state in which the design professional works. The DOR is also referred to as the Engineer of Record (EOR) in design code documents.

I. Statement of Special Inspections (SSI): A document developed by the DOR identifying the material, systems, components and work required to have Special Inspections.

J. Schedule of Special Inspections: A schedule which lists each of the required Special Inspections, the extent to which each Special Inspections is to be performed, and the required frequency for each in accordance with ICC IBC Chapter 17.

K. Certification: A statement of professional opinion by a registered design professional that indicates that the item(s) under consideration meet the requirement of the approved construction document. Certifications shall bear the original seal and signature of the design professional making the statement.

L. Completion Letter: A certification letter signed and sealed by the design professional(s) of record who performed special inspections stating that the construction elements specified for special inspections have been inspected and conform to the approved Construction Documents and specifications.

M. Construction Documents: Plans and specifications and other documents prepared for the purposes of obtaining a building permit.

N. Fabrication and Erection Documents: Written, graphic and pictorial documents prepared or assembled after issuance of a building permit describing the design, location and physical characteristics of building components or materials necessary for fabrication, assembly or erection of project elements.

O. Final Report of Special Inspections: A certification by the Special Inspector (SI) indicating that specified special inspections are completed and meet the requirements of the approved construction documents and project specifications.

P. Inspection and Testing Agency: Approved agency or agencies, not affiliated or hired by the Contractor, to perform special inspections and materials testing including but not limited to concrete cylinder breaks, soils testing, and masonry materials testing.

Q. Non-Structural Elements: Elements of a building that are not primary or secondary structural elements such as exterior curtain walls and cladding, non-load-bearing partitions, stair railings, etc.

R. Quality Control Inspector (QCI): Individual designated by the erector or fabricator to perform controls and inspections implemented by the erector or fabricator, as applicable, to ensure that the material provided and work performed meet the requirements of the approved construction documents and referenced standards.

1.05 SPECIAL INSPECTOR QUALIFICATIONS

A. Submit qualifications for each special inspector

1. Certifying Associations

a. AABC: Associated Air Balance Council

b. ACI: American Concrete Institute

c. AWCI: Association of the Wall and Ceiling Industry

d. AWS: American Welding Society

e. FM: Factory Mutual

f. ICC: International Code Council

g. NDT: Nondestructive Testing

h. NICET: National Institute for Certification in Engineering Technologies

i. PCI: Precast/Prestressed Concrete Institute

j. PTI: Post-Tensioning Institute

k. UL: Underwriters Laboratories

B. Steel Construction and High Strength Bolting

1. Special Inspector

a. ICC Structural Steel and Bolting Special Inspector certificate with one year of related experience, or

b. Registered Professional Engineer with related experience

2. Associate Special Inspector

a. Engineer-In-Training with one year of related experience.

C. Welding structural steel

1. Special Inspector

    a. ICC Structural Welding Special Inspector certificate with one year of related experience, or

    b. AWS Certified Welding Inspector

2. Associate Special Inspector

    a. AWS Certified Associate Welding Inspector

D. Nondestructive Testing of Welds

1. Special Inspector

    a. NDT Level III Certificate

2. Associate Special Inspector

    a. NDT Level II Certificate plus one year of related experience

E. Concrete construction: Refer to Section 03300

F. Masonry Construction

1. Special Inspector

    a. ICC Structural Masonry Special Inspector Certificate with one year of related experience, or

    b. Registered Professional Engineer with related experience

2. Associate Special Inspector

    a. Engineer-In-Training with one year of related experience

G. Verification of Site Soil Condition, Fill Placement and Load-Bearing Requirements

1. Special Inspector

    a. ICC Soils Special Inspector Certificate with one year of related experience, or

    b. NICET Soils Technician Level II Certificate in Construction Material Testing, or

    c. NICET Geotechnical Engineering Technician Level II Construction or Generalist Certificate, or

d. Geologist-In-Training with one year of related experience, or

e. Registered Professional Engineer with related experience

2. Associate Special Inspector

a. NICET Soils Technician Level I Certificate in Construction Material Testing with one year of related experience, or

b. NICET Geotechnical Engineering Technician Level I Construction or Generalist Certificate with one year of related experience, or

c. Engineer-In-Training with one year of related experience

1.06 Testing Service Agencies qualifications

A. Contractor to engage inspection and testing service agencies, including independent testing, laboratories that are prequalified as complying with the American Council of Independent Laboratories' "Recommended Requirements for Independent Laboratory Qualification" and that specialize in the types of inspections and tests to be performed.

1. Each independent inspection and testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the state where the Project is located.

2. Each independent Inspection and Testing Agency engaged on the Project shall demonstrate that it has the experience and capability to conduct the required field and laboratory testing without delaying the progress of the work. The minimum qualification requirements shall be as follows:

a. American Society of Testing Materials (ASTM) E329-05, Specifications for Agencies Engaged in the Testing and/or Inspection of materials used in Construction.

b. American Society of Non-Destructive Testing:

1) Recommended Practice SNT-TC-1A- Non-Destructive Testing-2001

2) Standard for Qualification and Certification of Non-Destructive Testing Personnel.

1.07 SUBMITTALS

A. Qualifications: submit the qualifications for special inspectors, and testing service agencies.

B. The Special Inspector and the Independent Testing Agency shall submit a certified written report, in duplicate, of each inspection, test, or similar service to the Engineer, unless the Contractor is responsible for this service. If the Contractor is responsible for the service, submit a certified written report, in duplicate, of each inspection, test, or similar service to the Engineer.

1. Submit additional copies of each written report directly to the governing authority, when the authority so directs.

2. Report Data: Written reports of each inspection, test, or similar service include, but are not limited to the following:

   a. Date of issue.

   b. Project title and number.

   c. Name, address and telephone number of testing agency.

   d. Dates and locations of samples and tests or inspections.

   e. Names of individuals making the inspection or test.

   f. Designation of the Work and test method.

   g. Identification of product and Specification Section.

   h. Complete inspection and test data.

   i. Test results and an interpretation of test results.

   j. Ambient conditions at the time of sample taking and testing.

   k. Comments or professional opinion on whether inspected or tested Work complies with Contract Document requirements.

   l. Name and signature of laboratory inspector.

   m. Recommendations on retesting.

3. Final Report: At the completion of the project submit a comprehensive final report of Special Inspections that documents the Special Inspections completed for the project and corrections of all discrepancies noted in the reports. The comprehensive final report of Special Inspections must be signed, dated and indicate the certification of the special inspector qualifying them to conduct the inspection.

## PART 2 - PRODUCTS

Not used

## PART 3 - EXECUTION

3.01 CONTRACTOR'S RESPONSIBILITIES

A. Cooperate with testing agency personnel, special inspector, and agents of the Owner and provide access to the work.

1. Providing access to the work shall include all labor and facilities to perform inspections and tests as listed in the specifications for the duration of the inspections or tests involved.

2. Provide means to obtain and handle samples taken on site.

B. Attend a pre-construction meeting to coordinate and clarify inspection and testing procedures, requirements.

C. Notify special inspector and/or testing agency of work to be inspected/tested minimum of 72 hours prior.

D. Work for which special inspections are required shall remain accessible and exposed for the purposes of special inspections until completion of required special inspections.

E. Any portion of work that is not in conformance shall be corrected and re-inspected. Such portions of the work shall not be covered or concealed until authorized by Construction Manager.

F. Work to be inspected should be complete at time of inspector's arrival on-site.

G. Payment for Special Inspection services will be in accordance with the following:

1. Payment described below is for the Testing Agency and Special Inspector costs and does not include the Contractor's costs listed in Paragraph 3.01A.

2. After Contractor notification, inspector arrives at site and performs inspection within the timeframe defined in Item 4 below.
   a. Inspection reveals work is satisfactory.
   b. Owner pays all costs associated with this inspection.

3. After Contractor notification, inspector arrives at site and performs inspection within the timeframe defined in Item 4 below.
   a. Inspection reveals work is deficient.

b. Contractor corrects deficiencies within timeframe defined in Item 4 below.
c. Work is re-inspected and work is satisfactory.
d. Owner pays all costs associated with this inspection.

4. After Contractor notification, inspector arrives at site and work is not ready for inspection when inspector arrives.
   a. Inspector will remain on-site for a maximum of 2 hours awaiting the completion of the work.
   b. If work is not ready for inspection at the end of this period, inspector will be dismissed until Contractor requests re-inspection.
   c. All costs associated with this inspection trip will be charged to the Contractor.

5. After Contractor notification, inspector arrives at site and performs inspection within the timeframe defined above.
   a. Inspection reveals work is deficient.
   b. Contractor attempts to correct deficiencies within 2-hour timeframe and calls for re-inspection.
   c. Work is re-inspected and found to still be deficient.
   d. Inspector will be dismissed.
   e. All costs associated with this inspection trip will be charged to the Contractor.

6. Owner will pay for "passing" soils on the Project. Costs of corrective actions and cost of failed test areas requiring retesting are the sole responsibility of the Contractor. For additional specific payment requirements for soils see the respective Division 2 Section.

H. Special Inspection is intended to be an independent quality assurance. Special Inspections shall not relieve the Contractor of any quality assurance, quality control, workmanship, or warranty responsibilities. Contractor's own personnel shall review all work to be inspected for conformance with Contract Documents prior to calling for inspection.

## 3.01 REPORTING DUTIES AND AUTHORITY

A. A pre-construction meeting to coordinate and clarify inspection, testing, and procedural requirements.

1. The meeting is to be attended by:
   a. Owner.
   b. Engineer.
   c. Testing Agency and Special Inspectors.
   d. General Contractor.
   e. Appropriate Sub-contractor(s).

B. Special Inspector shall report all deficient work to the Contractor as soon as possible.

1. Deficient work that has been covered up or concealed prior to re-inspection shall be reported to the Engineer.

C. Special Inspector does not have authority to stop work or modify the requirements of the Contract Documents.

END OF SECTION

# SCHEDULE OF SPECIAL INSPECTIONS

Reference 01453 for all requirements not noted as part of this schedule.

**INSPECTION DEFINITIONS:**

**PERFORM**: Perform these tasks for each weld, fastener or bolted connection, and noted verification.

**OBSERVE:** Observe these items randomly during the course of each work day to insure that applicable requirements are being met. Operations need not be delayed pending these inspections at contractor's risk.

**DOCUMENT**: Document, with a report, that the work has been performed in accordance with the contract documents. This is in addition to any other reports required in the Special Inspections guide specification.

**CONTINUOUS:** Constant monitoring of identified tasks by a special inspector over the duration of performance of said tasks.

---

The Seismic Design Category for this project is: ☐ A, ☒ B, ☐ C, ☐ D, ☐ E, ☐ F (check appropriate box)

## STRUCTURAL - STEEL – WELDING SECTION

**ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED: ☒**

| STEEL INSPECTION PRIOR TO WELDING – VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>2018 IBC 1705.2.1, AISC 360-16: Table C-N5.4-1 | | |
|---|---|---|
| TASK | INSPECTION TYPE[1] | DESCRIPTION |
| 1. Verify that the welding procedures specification (WPS) is available | **PERFORM** | |
| 2. Verify manufacturer certifications for welding consumables are available | **PERFORM** | |
| 3. Verify material identification | **PERFORM** | Type and grade. |
| 4. Welder Identification System | **PERFORM** | The fabricator or erector, as applicable, shall maintain a system by which a welder who has welded a joint or member can be identified. Stamps, if used, shall be the low-stress type. |
| 5. Fit-up of groove welds (including joint geometry) | OBSERVE | ✓ Joint preparation<br>✓ Dimensions (alignment, root opening, root face, bevel)<br>✓ Cleanliness (condition of steel surfaces)<br>✓ Tacking (tack weld quality and location)<br>✓ Backing type and fit (if applicable) |
| 6. Configuration and finish of access holes | OBSERVE | |
| 7. Fit-up of fillet welds | OBSERVE | ✓ Dimensions (alignment, gaps at root)<br>✓ Cleanliness (condition of steel surfaces)<br>✓ Tacking (tack weld quality and location) |
| STEEL INSPECTION DURING WELDING – VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>2018 IBC 1705.2.1, AISC 360-16: Table C-N5.4-2 | | |
| TASK | INSPECTION TYPE | DESCRIPTION |
| 8. Use of qualified welders | **PERFORM** | Welding by welders, welding operators, and tack welders who are qualified in conformance with requirements. |
| 9. Control and handling of welding consumables | OBSERVE | ✓ Packaging<br>✓ Electrode atmospheric exposure control |
| 10. No welding over cracked tack welds | OBSERVE | |
| 11. Environmental conditions | OBSERVE | ✓ Wind speed within limits<br>✓ Precipitation and temperature |
| 12. Welding Procedures Specification followed | OBSERVE | ✓ Settings on welding equipment<br>✓ Travel speed<br>✓ Selected welding materials<br>✓ Shielding gas type/flow rate<br>✓ Preheat applied<br>✓ Interpass temperature maintained (min./max.)<br>✓ Proper position (F, V, H, OH)<br>✓ Intermix of filler metals avoided |
| 13. Welding techniques | OBSERVE | ✓ Interpass and final cleaning<br>✓ Each pass within profile limitations<br>✓ Each pass meets quality requirements |

[1] **PERFORM**: Perform these tasks for each weld, fastener or bolted connection, and required verification.
**OBSERVE**: Observe these items on a random sampling basis daily to insure that applicable requirements are met. Operations need not be delayed pending these inspections at contractor's risk.

**STRUCTURAL - STEEL – WELDING SECTION (CONTINUED)**

| STEEL INSPECTION AFTER WELDING – VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>2018 IBC 1705.2.1, AISC 360-16: Table C-N5.4-3 | | |
|---|---|---|
| TASK | INSPECTION TYPE [1] | DESCRIPTION |
| 14. Welds cleaned | OBSERVE | |
| 15. Size, length, and location of all welds | **PERFORM** | Size, length, and location of all welds conform to the requirements of the detail drawings. |
| 16. Welds meet visual acceptance criteria | **PERFORM AND DOCUMENT** | ✓ Crack prohibition<br>✓ Weld/base-metal fusion<br>✓ Crater cross section<br>✓ Weld profiles<br>✓ Weld size<br>✓ Undercut<br>✓ Porosity |
| 17. Arc strikes | **PERFORM** | |
| 18. k-area | **PERFORM** | When welding of doubler plates, continuity plates or stiffeners has been performed in the k-area, visually inspect the web k-area for cracks. |
| 19. Backing removed, weld tabs removed and finished, and fillet welds added where required | **PERFORM** | |
| 20. Repair activities | **PERFORM AND DOCUMENT** | |
| 21. Document acceptance or rejection of welded joint or member | **PERFORM** | |

**END SECTION**

[1] **PERFORM**: Perform these tasks for each weld, fastener or bolted connection, and required verification.
**DOCUMENT**: Document in a report that the work has been performed as required. This is in addition to all other required reports.

**STRUCTURAL - STEEL – BOLTING SECTION**

**ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED: ☒**

| STEEL INSPECTION TASKS PRIOR TO BOLTING – VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>2018 IBC 1705.2.1, AISC 360-16: Table C-N5.6-1 | | |
|---|---|---|
| TASK | INSPECTION TYPE [1] | DESCRIPTION |
| 1. Manufacture's certifications available for fastener materials | **PERFORM** | |
| 2. Fasteners marked in accordance with ASTM requirements | OBSERVE | |
| 3. Proper fasteners selected for joint detail (grade, type, bolt length if threads are to be excluded from shear plane) | OBSERVE | |
| 4. Proper bolting procedure selected for joint detail | OBSERVE | |
| 5. Connecting elements, including appropriate faying surface condition and hole preparation, if specified, meet applicable requirements | OBSERVE | |
| 6. Proper storage provided for bolts, nuts, washers, and other fastener components | OBSERVE | |
| STEEL INSPECTION TASKS DURING BOLTING – VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>2018 IBC 1705.2.1, AISC 360-16: Table C-N5.6-2 | | |
| TASK | INSPECTION TYPE [1] | DESCRIPTION |
| 7. Fastener assemblies of suitable condition, placed in all holes and washers (if required) are positioned as required | OBSERVE | |
| 8. Joint brought to the snug-tight condition prior to pretensioning operation | OBSERVE | |
| 9. Fastener component not turned by the wrench prevented from rotating | OBSERVE | |
| 10. Bolts are pretensioned in accordance with RCSC Specification, progressing systematically from the most rigid point toward the free edges | OBSERVE | |
| STEEL INSPECTION TASKS AFTER BOLTING – VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>IBC 1705.2.1, AISC 360-10: Table C-N5.6-3 | | |
| TASK | INSPECTION TYPE [1] | DESCRIPTION |
| 11. Document acceptance or rejection of all bolted connections | **DOCUMENT** | |

**END SECTION**

[1] **PERFORM**: Perform these tasks for each weld, fastener or bolted connection, and required verification.
**OBSERVE**: Observe these items on a random sampling basis daily to insure that applicable requirements are met. Operations need not be delayed pending these inspections at contractor's risk.
**DOCUMENT**: Document in a report that the work has been performed as required. This is in addition to all other required reports.

**STRUCTURAL - STEEL - NON DESTRUCTIVE TESTING SECTION**

**ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED: ☒**

| NONDESTRUCTIVE TESTING OF WELDED JOINTS – VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>2018 IBC 1705.2.1, AISC 360-16: Section N5.5 | | |
|---|---|---|
| TASK | INSPECTION TYPE [1] | DESCRIPTION |
| 1. Use of qualified nondestructive testing personnel | **PERFORM** | Visual weld inspection and nondestructive testing (NDT) shall be conducted by personnel qualified in accordance with AWS D1.8 clause 7.2 |
| 2. Welded joints subject to fatigue | OBSERVE | Dye penetrant testing (DT) and Ultrasonic testing (UT) shall be performed on 100% of welded joints identified on contract drawings as being subject to fatigue. |
| 3. Weld tab removal sites | OBSERVE | At the end of welds where weld tabs have been removed, magnetic particle testing shall be performed on the same beam-to-column joints receiving UT |

**END SECTION**

[1] **PERFORM**: Perform these tasks for each weld, fastener or bolted connection, and required verification.
**OBSERVE**: Observe these items on a random sampling basis daily to insure that applicable requirements are met. Operations need not be delayed pending these inspections at contractor's risk.

## STRUCTURAL - STEEL - OTHER INSPECTIONS

**ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED: ☒**

| OTHER STEEL INSPECTIONS – VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>2018 IBC 1705.2.1, AISC 341-16: Tables J8.1 & J10.1 | | |
|---|---|---|
| TASK | INSPECTION TYPE [3] | DESCRIPTION |
| 1. Anchor rods and other embedments supporting structural steel | **PERFORM** | Verify the diameter, grade, type, and length of the anchor rod or embedded item, and the extent or depth of embedment prior to placement of concrete. |
| 2. Fabricated steel or erected steel frame | OBSERVE | Verify compliance with the details shown on the construction documents, such as braces, stiffeners, member locations and proper application of joint details at each connection. |

**END SECTION**

## STRUCTURAL - OPEN-WEB STEEL JOISTS SECTION

**ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED: ☒**

| OPEN-WEB STEEL JOISTS AND JOIST GIRDERS – VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>IBC TABLE 1705.2.3 | | |
|---|---|---|
| TASK | INSPECTION TYPE [1] | DESCRIPTION |
| 1. Installation of open-web steel joists and joist girders | OBSERVE | ✓ End connections – welded or bolted<br>✓ Bridging – horizontal and diagonal |

**END SECTION**

[3] **PERFORM**: Perform these tasks for each weld, fastener or bolted connection, and required verification.
**OBSERVE**: Observe these items on a random sampling basis daily to insure that applicable requirements are met. Operations need not be delayed pending these inspections at contractor's risk.
**DOCUMENT**: Document in a report that the work has been performed as required. This is in addition to all other required reports.

**STRUCTURAL - CONCRETE CONSTRUCTION SECTION**

**ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED: ☒**

| CONCRETE CONSTRUCTION, INCLUDING COMPOSITE DECK – VERIFY THE FOLLOWING ARE IN COMPLIANCE IBC TABLE 1705.3 (ACI 318 REFERENCES NOTED IN IBC TABLE) | | |
|---|---|---|
| TASK | INSPECTION TYPE [8] | DESCRIPTION |
| 1. Inspect reinforcement, including prestressing tendons, and verify placement. | OBSERVE | Verify prior to placing concrete that reinforcing is of specified type, grade and size; that it is free of oil, dirt and unacceptable rust; that it is located and spaced properly; that hooks, bends, ties, stirrups and supplemental reinforcement are placed correctly; that lap lengths, stagger and offsets are provided; and that all mechanical connections are installed per the manufacturer's instructions and/or evaluation report. |
| 2. Reinforcing bar welding | OBSERVE | ✓ Verify weldability of reinforcing bars other than ASTM A 706<br>✓ Inspect single-pass fillet welds, maximum 5/16" in accordance with AWS D1.4 |
| 3. All other welding | **CONTINUOUS** | Visually inspect all welds in accordance with AWS D1.4 |
| 4. Cast in place anchors and post installed drilled anchors (downward inclined) | OBSERVE | Verify prior to placing concrete that cast in place anchors and post installed drilled anchors have proper embedment, spacing and edge distance. |
| 5. Post-installed adhesive anchors in horizontal or upward inclined orientations | **CONTINUOUS AND DOCUMENT** | ✓ Inspect as required per approved ICC-ES report<br>✓ Verify that installer is certified for installation of horizontal and overhead installation applications<br>✓ Inspect proof loading as required by the contract documents |
| 6. Verify use of required mix design | OBSERVE | Verify that all mixes used comply with the approved construction documents |
| 7. Prior to concrete placement, fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete | **CONTINUOUS** | At the time fresh concrete is sampled to fabricate specimens for strength test verify these tests are performed by qualified technicians. |
| 8. Inspect concrete and/or shotcrete placement for proper application techniques | **CONTINUOUS** | Verify proper application techniques are used during concrete conveyance and depositing avoids segregation or contamination. Verify that concrete is properly consolidated. |
| 9. Verify maintenance of specified curing temperature and technique | OBSERVE | Inspect curing, cold weather protection, and hot weather protection procedures. |
| 10. Pre-stressed concrete | **CONTINUOUS** | Verify application of prestressing forces and grouting of bonded prestressing tendons. |

**CONTINUED ON FOLLOWING PAGE**

[8] **OBSERVE**: Observe these items on a random sampling basis daily to insure that applicable requirements are met. Operations need not be delayed pending these inspections at contractor's risk.
**DOCUMENT**: Document in a report that the work has been performed as required. This is in addition to all other required reports.
**CONTINUOUS**: Constant monitoring of identified tasks by a special inspector over the duration of performance of said tasks.

**STRUCTURAL - CONCRETE CONSTRUCTION (CONTINUED)**

| CONCRETE CONSTRUCTION, INCLUDING COMPOSITE DECK – VERIFY THE FOLLOWING ARE IN COMPLIANCE IBC TABLE 1705.3 (ACI 318 REFERENCES NOTED IN IBC TABLE) | | |
|---|---|---|
| TASK | INSPECTION TYPE [9] | DESCRIPTION |
| 11. Inspect erection of precast concrete members | OBSERVE | |
| 12. Verify in-situ concrete strength, prior to stressing of tendons in post-tensioned concrete and prior to removal of shores and forms from beams and structural slabs. | OBSERVE | |
| 13. Inspect formwork for shape, location and dimensions of the concrete member being formed. | OBSERVE | |

**END SECTION**

[9] **OBSERVE**: Observe these items on a random sampling basis daily to insure that applicable requirements are met. Operations need not be delayed pending these inspections at contractor's risk.
**DOCUMENT**: Document in a report that the work has been performed as required. This is in addition to all other required reports.
**CONTINUOUS:** Constant monitoring of identified tasks by a special inspector over the duration of performance of said tasks.

## STRUCTURAL - MASONRY CONSTRUCTION SECTION (ALL RISK CATEGORIES)

**ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED: ☒**

| MASONRY CONSTRUCTION – VERIFY THE FOLLOWING ARE IN COMPLIANCE AT START OF CONSTRUCTION<br>IBC 1705.4 (ACI 530-13 TABLE 3.1.2 & 3.1.3) | | |
|---|---|---|
| TASK | INSPECTION TYPE [10] | DESCRIPTION |
| 1. Compliance with approved submittals prior to start | OBSERVE | |
| 2. Proportions of site-mixed mortar. | OBSERVE | |
| 3. Grade and type of reinforcement, anchor bolts, and prestressing tendons and anchorages | OBSERVE | |
| 4. Prestressing technique | OBSERVE | |
| 5. Properties of thin bed mortar for AAC masonry | OBSERVE | |
| MASONRY CONSTRUCTION – VERIFY THE FOLLOWING ARE IN COMPLIANCE PRIOR TO GROUTING<br>IBC 1705.4 (ACI 530-13 TABLE 3.1.2 & 3.1.3) | | |
| TASK | INSPECTION TYPE [1] | DESCRIPTION |
| 6. Grout space | OBSERVE | |
| 7. Proportions of site-prepared grout and prestressing grout for bonded tendons | OBSERVE | |
| 8. Proportions of site-mixed grout and prestressing grout for bonded tendons | OBSERVE | |
| 9. Placement of masonry units and mortar joints | OBSERVE | |
| 10. Welding of reinforcement | **CONTINUOUS** | |
| MASONRY CONSTRUCTION – VERIFY THE FOLLOWING ARE IN COMPLIANCE DURING CONSTRUCTION<br>IBC 1705.4 (ACI 530-13 TABLE 3.1.2 & 3.1.3) | | |
| TASK | INSPECTION TYPE [1] | DESCRIPTION |
| 11. Size and location of structural elements is in compliance | OBSERVE | |
| 12. Preparation, construction, and protection of masonry during cold weather (temperature below 40°F (4.4°c) or hot weather (temp above 90°F (32.2°C)) | OBSERVE | |
| 13. Application and measurement of prestressing force | **CONTINUOUS** | |
| 14. Placement of grout and prestressing grout for bonded tendons | **CONTINUOUS** | |
| 15. Placement of AAC masonry units and construction of thin bed mortar joints | **CONTINUOUS** | Continuous for first 5000 square feet only (465 square meters). |
| 16. Observe preparation of grout specimens, mortar specimens, and/or prisms | OBSERVE | |
| 17. Type, size and placement of reinforcement, connectors, anchor bolts and prestressing tendons and anchorages, including details of anchorage of masonry to structural members, frames, or other construction | OBSERVE | |

**END SECTION**

[10] **OBSERVE**: Observe these items on a random sampling basis daily to insure that applicable requirements are met. Operations need not be delayed pending these inspections at contractor's risk.
**CONTINUOUS:** Constant monitoring of identified tasks by a special inspector over the duration of performance of said tasks.

## GEOTECHNICAL - SOILS INSPECTION SECTION

**ALL OR PORTIONS OF THIS SECTION ARE APPLICABLE IF BOX IS CHECKED: ☒**

| SOILS INSPECTION – VERIFY THE FOLLOWING ARE IN COMPLIANCE<br>IBC 1705.6 | | |
|---|---|---|
| TASK | INSPECTION TYPE [12] | DESCRIPTION |
| 1. Materials below shallow foundations are adequate to achieve the design bearing capacity. | OBSERVE | |
| 2. Excavations are extended to proper depth and have reached proper material | OBSERVE | |
| 3. Perform classification and testing of compacted fill materials | **OBSERVE** | |
| 4. Verify use of proper materials, densities and lift thicknesses during placement and compaction of compacted fill | **CONTINUOUS** | |
| 5. Prior to placement of compacted fill, inspect subgrade and verify that site has been prepared properly. | OBSERVE | During fill placement, the special inspector shall verify that proper materials and procedures are used in accordance with the provisions of the approved geotechnical report |

**END SECTION**

[12] **OBSERVE**: Observe these items on a random sampling basis daily to insure that applicable requirements are met. Operations need not be delayed pending these inspections at contractor's risk.
**CONTINUOUS:** Constant monitoring of identified tasks by a special inspector over the duration of performance of said tasks.

**SECTION 01529**

**HEALTH AND SAFETY REQUIREMENTS**

PARAGRAPH INDEX

## SECTION 01529

## HEALTH AND SAFETY REQUIREMENTS

### PART 1 - GENERAL

1.01 SUMMARY

This section describes the requirements for a Health & Safety Plan (HASP). 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 United States Department of Labor OSHA standards. 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.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this Section.

B. Limited Hazardous Materials Survey, Towson Water Pumping Stations No. 2 & No. 3, 401 Hillen Road, Towson, MD 21286, August 13, 2012, EBA Engineering, Inc.

1.03 SUBMITTALS AND NOTICES

A. Before Start of Work: Submit the following to the Engineer for review. Work shall not start until these submittals are returned with Engineer's action stamp indicating that the submittal is returned for unrestricted use.

1. Qualifications of the Health Safety Officer (HSO) and the Site Health and Safety Coordinator (SHSC). Within 10 days after award of contract submit a resume and applicable certifications for the HSO and the SHSC.

2. Health and Safety Plan (HASP) – Submit at least 30 days before commencement of field activities, for review and comment. Comments on the Contractor’s HASP and any modifications thereto will be provided, but the HASP will not be approved. The Contractor shall not mobilize to the site until the Contractor has received and addressed comments on the HASP unless otherwise indicated by the Engineer.

B. During Work: Submit the following as required by the work.

1. Site specific safety training for each worker must be provided before the first day that the worker will be on site. A copy of training documentation shall be submitted whenever workers are trained.

2. A safety log including observations of the Site Safety and Health Coordinator, record of any samples collected, and any laboratory results received shall be available on-site at all times and submitted weekly.

3. An incident report shall be submitted immediately upon completion (or partial completion) but at the latest within 24 hours after the incident for each incident resulting in injury requiring medical attention to workers or the public, or property damage greater than $500.

1.04 APPLICABLE REGULATIONS

A. Federal, State, and Local health and safety regulations apply. This section identifies some key regulations that are triggered by the presence of hazardous materials on the site. Failure to cite a regulation does not relieve the Contractor of the responsibility to comply with that regulation.

B. OSHA Regulations

1. 29 CFR 1926 Construction

C. Maryland Laws and Regulations

1. Code of Maryland Regulations

a. 09.12.20 Occupational Safety and Health Regulations

b. 09.12 31 Maryland Occupational Safety and Health Regulations

c. 09.12.33 Access to Information About Hazardous and Toxic Substances

d. 09.12.35 Standard for Confined Spaces

2. Annotated Code of Maryland – Labor and Employment

a. Article 5.401 et seq - Access To Information About Hazardous and Toxic Substances

**PART 2 - PRODUCTS OR EQUIPMENT**

(NOT USED)

**PART 3 - EXECUTION**

3.01 HEALTH AND SAFETY PERSONNEL RESPONSIBILITIES

A. Site Health and Safety Coordinator (SHSC): The Contractor shall designate a SHSC. The SHSC shall be present during all activities, make safety

observations daily, and shall perform and document a weekly safety inspection. The SHSC has the primary responsibility for.

1. Supervising environmental monitoring, evaluating on-site conditions and implementing modifications to the HASP with concurrence from the Contractor's Health and Safety Officer.
2. Assessing compliance with the HASP.
3. Ensuring that all personnel entering the site are aware of the potential hazards and the provisions of the Contractor's HASP and are familiar with all site-specific emergency procedures.
4. Ensure that personal protective equipment (PPE) is available and properly used by all personnel.
5. Determining that all Contractor personnel entering the site have received proper health and safety training for this project and are familiar with all personal protection equipment required by this Plan.
6. Halting work, if necessary, in consultation with the Contractor's Health and Safety Officer.

B. Health and Safety Officer (HSO): The HSO has ultimate responsibility for the development of the health and safety program and evaluation of its implementation and effectiveness. The SHSC will immediately report to the HSO any changes in site conditions or required modifications to the H&S plan. The HSO will provide guidance and instruction to the SHSC and must approve any modifications to the health and safety plan. The HSO shall approve submittals, and be available to assist in resolving health and safety issues, investigate incidents, and attend project management meetings.

C. Site Superintendent: The superintendent is responsible for implementing all aspects of the safety program.

D. Site Workers: Site workers shall know and understand the requirements of the HASP. They shall comply with all requirements of the plan.

## 3.02 REGULATOR SITE VISIT

If a regulator for health, safety, or environment requests permission to inspect the site, the inspection shall be delayed until the Engineer or consultant to the Engineer can be present.

## 3.03 PERSONNEL QUALIFICATIONS

A. Site Health and Safety Coordinator(s) (SHSCs): The SHSCs shall have specialized training and experience in construction safety supervision and have a thorough knowledge of OSHA regulations. The SHSCs shall have performed these duties for a minimum of 3 similar projects. Minimum training shall include:

1. Hazard Communication
2. First Aid and CPR – current certification
3. Blood Borne Pathogens
4. 30 hour OSHA construction safety course
5. Confined Space
6. Lockout / Tagout

When the project involves active work associated with the following hazards, the SHSC with training in these hazards shall be onsite.

7. Scaffolding
8. Fall Protection
9. Asbestos Supervisor
10. Lead Competent Person
11. Other specialized training required based on planned construction methods

B. Health and Safety Officer: The HSO will be a Certified Industrial Hygienist (CIH) with experience in construction and in good standing with the American Board of Industrial Hygiene (ABIH) or a Certified Safety Professional (CSP) with experience in construction and in good standing with the Board of Certified Safety Professionals (BCSP).

C. Field Personnel: Contractor personnel who enter the work area must meet the requirements for personnel in the Site Specific HASP.

## 3.04 HEALTH AND SAFETY PLAN

A HASP shall be prepared that covers chemical, physical, and biological hazards for all work to be done on site. The plan shall be reviewed and sealed by the HSO. An example HASP Outline recommended by OSHA is included in Attachment 1.

## 3.05 TRAINING

All training required by the HASP must be completed prior to starting work on the site with documentation that all workers have received required training being available on site for review. This training may include general construction safety, specialized training to work with a specific hazard, and site specific training.

## 3.06 MEDICAL SURVEILLANCE

Site workers who are anticipated to be exposed (without respect to the respirator assigned protection factor) to airborne concentrations of hazardous materials above the lesser of the Threshold Limit Value as published by the American Conference of Governmental Industrial Hygienists (ACGIH) or the Permissible Exposure Limit as required by OSHA regulation shall have a physical examination that includes

applicable biological monitoring prior to being exposed. A physical examination is also required for workers whose skin may be exposed to hazardous materials that can be absorbed through the skin.

3.07 FIT TESTING

Site workers who will wear negative pressure respirators shall have been fit tested for said respirators within the previous 12 months.

3.08 RISK CONTROL HIERARCHY

A. For each hazard, an explanation shall be included in the HASP why a control strategy was selected and why a higher level control strategy was not employed.

1. Eliminate Hazard
2. Engineering Controls
3. Work Practice Controls
4. Administrative Controls
5. Personal Protective Equipment

3.09 EXPOSURE MONITORING

The HASP shall identify a strategy to determine the exposure to anticipated hazardous materials. This shall not only include hazardous materials on-site, but also hazardous materials brought onto the site by the Contractor such as spray glue and solvents.

3.10 RECORD KEEPING

A. Medical surveillance and exposure monitoring records shall be maintained in a manner compliant with 29 CFR 1910.1020.

B. Asbestos exposure monitoring records shall be maintained in a manner compliant with 29 CFR 1926.1101.

C. Lead exposure monitoring records shall be maintained in a manner compliant with 29 CFR 1926.62.

3.11 SAFETY VIOLATIONS IDENTIFIED BY OTHERS

A. If the Engineer or a consultant to the Engineer observes a situation that represents an immediate danger to life and health of any worker or a violation of health, safety, and environmental regulations, they shall have the authority to stop work and contact the SHSC who will be responsible for further response. Such action on their part does not constitute an acceptance of responsibility for the GC's program and is valid for that instance only.

B. If the Engineer or a consultant to the Engineer observes a situation that represents a dangerous situation they shall immediately contact the SHSC and report the condition for prompt action by the GC safety staff. Such action does not constitute an acceptance of responsibility for the GC's program and is valid for that instance only.

END OF SECTION

**ATTACHMENT 1**

**TO TECHNICAL SPECIFICATION SECTION 01529**

**EXAMPLE HEALTH & SAFETY PLAN OUTLINE**

**(1 PAGE)**

**Example Health & Safety Plan Outline**

1.0 Title Page with Signature Block

2.0 Important Contacts including employer, contact name, title, cell phone, and e-mail

3.0 Organizational Structure (Identify title and responsibilities. Describe subcontractor requirements and how subcontractor safety will be assured.)

4.0 Job Hazard Analysis (Include a description of engineering controls, work practice controls, and PPE designed to reduce the risk for each hazard)

a. Chemical Hazards
b. Physical Hazards
c. Biological Hazards

5.0 Training Program

6.0 Medical Surveillance Program

7.0 Exposure Monitoring

8.0 Emergency and Accident Response (Must include a minimum of all information required by 29 CFR 1926.35)

Attachments - OSHA Required Written Programs

Attach a copy of each of the following required written programs, if the hazard analysis identifies the hazard as being present on the job site.

a. Hazard Communication
b. Emergency Action Plan
c. Bloodborne Pathogens
d. Hazardous Waste Operations
e. Respiratory Protection
f. Confined Space Entry
g. Lockout / Tagout
h. Fall Protection
i. Excavations
j. Lead

9.0 Any other OSHA standard requiring a written plan.

**SECTION 01900**

**SPECIAL CONDITIONS**

PARAGRAPH INDEX

## SECTION 01900

## SPECIAL CONDITIONS

### PART 1 - GENERAL

1.01 RELATED DOCUMENTS

Refer to Section 01010 of these Technical Specifications and the Standard Specifications for the order of precedence and relationship of the documents.

1.02 CONTRACT DOCUMENTS

The Contract Documents for this project shall consist of, but not be limited to, the following items, including any addenda, errata, modifications, or supplemental drawings subsequently furnished by the Owner:

A. Item 1 – CONTRACT DRAWINGS

The Plans referred to in the Contract Documents are entitled: RENOVATIONS TO TOWSON WATER PUMPING STATIONS. These plans contain drawings numbered G-01 through I-24 inclusive, totaling 118 sheets.

B. Item 2 – CONTRACT BOOK

This Contract Book contains the Special Provisions, Technical Specifications, and PROPOSAL FORM, JOB ORDER No. 231-203-0035-0445, RENOVATIONS TO TOWSON WATER PUMPING STATIONS, CONTRACT No. 20203 WX0.

C. Item 3 – STANDARD SPECIFICATIONS

The following documents, along with the latest revisions thereto, are hereby made part of the Contract Documents. These documents will be collectively referred to as the Standard Specifications.

1. Baltimore County Department of Public Works, "Standard Specifications for Construction and Materials", dated February 2000, and all associated Errata, Addenda, and Supplemental Specifications.

2. Baltimore County Department of Public Works, "Standard Details for Construction", dated April 2007, and all associated Errata, Addenda, and Supplemental Details.

3. "1994 Maryland Standards and Specifications for Soil Erosion and Sediment Control".

4. Maryland Department of Transportation, State Highway Administration, Book of Standard Specifications for Construction and

Materials, dated January 2001.

1.03 STAKEOUT AND BENCHMARKS

A. Baltimore County will set benchmarks for the Contractor at the start of construction. The Contractor shall protect the benchmarks during the course of the contract period. In the event that the controls are disturbed, the County will resurvey and restake the disturbed point(s) at the Contractor's expense.

B. The Contractor shall provide competent engineering services as necessary to establish 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 dimensions and elevations shown on the Drawings. The Contractor shall employ properly qualified personnel to perform the work described herein. The Contractor shall furnish and set all templates, batter boards and other control points for the work.

1.04 SAFETY

A. Safety Provisions:

1. Compliance with all applicable safety requirements shall be considered incidental to the contract and included in the amounts shown for the Bid Items.

B. Occupational Safety and Health Laws and Regulations:

1. Precaution shall be exercised at all times for the protection of persons (including employees) and property. The safety provisions of applicable laws, building and construction codes shall be observed. Machinery and equipment shall be guarded, and all hazards shall be eliminated in accordance with the safety provisions of the Manual of Accident Prevention in Construction published by the Associated General Contractors of America, to the extent that such provisions are not in conflict with applicable law.

2. 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).

3. Nothing in the Occupational Safety and Health Act of 1970 shall be construed to supersede or in any manner affect, the common law or statutory rights, duties, or liabilities of employers and employees under any law with respect to injuries, disease, or death of employees arising out of, or in the course of, employment.

4. The Contractor shall comply with all regulations and requirements of

the Maryland Occupational Safety and Health Administration (MOSHA).

C. OSHA Inspections

1. The Contractor shall immediately notify the Engineer when an OSHA Compliance Official (Federal or State Representative) presents his credentials and informs the Contractor that the workplace will be inspected for OSHA Compliance. The Contractor shall also notify the Engineer upon determining that an exit interview will take place upon completion of the OSHA Inspection.

1.05 SCAFFOLDING, RIGGING, AND HOISTING.

Unless otherwise specified, the Contractor shall furnish all scaffolding, rigging, hoisting and services necessary for delivery of materials to the work site and erection of all materials and equipment furnished. The Contractor shall remove same from the site when no longer required.

1.06 TEST BORINGS AND TEST PITS

A. Test borings have been made at the locations shown on the Contract Drawings. A geotechnical report is included in the Appendix of these Technical Specifications. The boring logs have been included in the Contract Drawings. If the bidder desires, he may inspect samples of the material recovered from the test borings, at the offices of Whitman, Requardt and Associates, LLP, Baltimore, MD, with the approval of the County. The test boring logs presenting subsurface conditions are for information purposes only. Neither Baltimore County nor the Engineer warrants or guarantees that the conditions and/or materials actually encountered in the prosecution of the work and/or any part thereof will be the same as shown by the test borings. If the Contractor relies for any purposes upon said information, he does so at his own risk.

B. Bidders are urged to make their own subsurface exploration upon approval of their written application. The entire cost of this exploration shall be the responsibility of the Contractor.

C. All known subsurface utilities, pipes, conduits, and structures are shown on the Contract Drawings. These utilities are shown based upon the best available plans and maps. Baltimore County assumes no responsibility for the accuracy of the utility locations. In any area where the Contractor must make connection to or cross existing utilities, it shall be his responsibility to test pit the utilities and verify the location to his satisfaction. In the event that utilities are not found located as shown on the Contract Drawings, the Contractor shall notify the Engineer so that an evaluation can be made as to the magnitude and method of any adjustments in the Plans.

D. The Contractor shall be solely responsible for any damage to underground or aboveground utilities encountered in any manner during construction. When crossing and working in the vicinity of existing utilities, it will be the Contractor's responsibility to properly support and maintain the operation of the utilities. Extreme care must be exercised in excavation and backfill operations. The Contractor will correct at his own expense any damage to existing utilities.

1.07 NIGHT WORK

A. Unless otherwise noted in Specification Section 01010, no night work requiring the presence of the Engineer or inspector will be permitted, except in case of an emergency and/or prior written permission of the Engineer.

B. In such cases, the Contractor shall notify the Engineer in writing at least two (2) days in advance of nights that he desires to work, stating the place where said work will be conducted and the type of work to be performed.

1.08 DISPOSAL OF EXCESS SOIL AND MATERIAL

All material not utilized on the job site or considered unsuitable by the Engineer, including excavated soil and rock, shall be removed from the site and disposed of by the Contractor at his expense at a permitted site.

1.09 LIMITS OF WORK

A. The construction site is within the site fence of the Towson Reservoir, with the exception of Pumping Station No. 3 Discharge Piping Modifications tie – in work. The Contractor shall confine his operations to the specific areas of the site necessary to construct the facilities as shown on the Contract Drawings.

B. Contractor shall not utilize adjacent property outside the specific work areas, other than the southern half of the Hillen Road Right-Way for Pumping Station No. 3 Discharge Piping Modifications tie –in work, as indicated in the Drawings.

C. Contractor shall not block existing traffic patterns without sufficient notice to the County and the Engineer, and only after securing their written approval.

D. All areas disturbed as a result of the Contractor's operations shall be restored to a condition equal to, or better than, the condition that existed prior to beginning the work.

E. The Contractor shall not prohibit vehicle parking in the adjacent public and private rights-of-way unless given written permission by the Engineer.

F. When vehicles enter or leave the site, care shall be taken to observe for pedestrians and cars using public roads and driveways of existing residences.

G. The Contractor shall maintain site vehicular access for County personnel and City Water Pumping Section Personnel.

1.10 PROTECTION AND RESTORATION OF STRUCTURES AND EQUIPMENT

A. Pumping

1. The Contractor, with his own equipment, shall perform all pumping necessary to prevent accumulation of water in excavations, installed piping and structures and flotation of any part of the installed piping or structures during construction operations.

2. Before discontinuing pumping or permitting any rise in water level, the Contractor shall submit computations to show the structure is safe against uplift. A factor of safety of 1.5 shall be used in such computations.

3. No separate payment will be made for pumping. The cost thereof shall be included in the lump sum and unit prices bid for this Contract.

B. The Contractor shall use whatever construction practices as may be necessary to prevent vibration or settlement of ground under structures and utilities adjacent to areas of construction due to excavation, dewatering, or other phases of construction necessary to fulfill the requirements of the contract.

C. The Contractor shall be responsible for damage to adjacent properties or structures caused by ground and/or structural settlement as a result of his dewatering, vibration, soil or rock excavation, or any other operations.

D. On paved surfaces, the Contractor shall not use or operate tractors, bulldozers, or other power-operated equipment if the treads or wheels will cut or otherwise damage such surfaces.

E. The restoration of existing property or structures, if needed, shall be done as promptly as practicable after such damage has been determined, and shall not be left until the end of the construction period.

1.11 DISCHARGE OF CHLORINATED WATER

A. No detectable chlorine can be released into the waters of the State.

B. If nearby sanitary sewer is available and in service, this is the preferred method of discharge. The discharge rate must be controlled and not exceed fifty (50) gpm to avoid overloading the sanitary sewer. All discharges shall be restricted to dry weather and not less than 24 hours after any rain event. All discharges into a sanitary sewer shall be coordinated with the County DPW Sewer Design Section as indicated in the Drawings.

C. After chlorination, pump out the water mains and haul the chlorinated water

to a safe discharge location. If sanitary sewer discharge is not available, discharge shall be in accordance with COMAR 26.08.03.06.

D. Payment for this work shall be included in the lump sum bid.

1.12 SHOP DRAWINGS AND PRODUCT DATA

A. Shop drawings and product data (including, but not limited to catalog sheets, warrantees, guarantees, O & M Manuals, and certifications) are required and shall be submitted for every element of the work, including but not limited to the tank and its appurtenances, pipe and fittings, piping arrangements, valves, mechanical equipment, electrical equipment, reinforcing steel, miscellaneous metals, and other items as required by the specifications. If the Contractor proposes to deviate from any detail indicated on the Contract Drawings, he shall submit detailed drawings and descriptions of this work for approval.

B. The Contractor shall submit for approval of the Engineer eight (8) complete sets of the working drawings at least 20 days prior to the date of manufacture of any item of material or equipment for which drawings are specified elsewhere in these specifications to be furnished by the Contractor, and for any other item or items of materials and equipment which are not built from detailed designs furnished by the County. These drawings shall be made in accordance with the Contract Drawings. These drawings shall be to scale, shall be accurate and distinct, and shall give all dimensions required for the manufacturing and erection of the work, and also outline sectional views and detail drawings, showing all working dimensions, materials to be used, and type of machine work and finish to be applied. See the Standard Specifications for additional working drawing requirements.

C. Each submittal shall be assigned a sequential number by the Contractor for purposes of easy identification, and shall retain its assigned number with appropriate subscript on required resubmittals. The assigned number shall consist of the project number, followed by the specification section number where the item is specified, followed by a sequential number indicating the number of submittals in that section. Resubmittals shall be identified with the same number as the original submittal followed by the subscript R1, R2, etc. All products and materials shall be identified with the appropriate equipment name and number as it appears in the Contract Drawings.

D. Shop Drawings and product data shall be submitted in proper sequence and time with due regard to the time required for the review of the submittal prior to release for fabrication or delivery.

E. Product data, including materials reproduced from manufacturer's catalogs, shall be no larger than 8-1/2 inches by 11 inches. Catalog data shall be explicit with regard to details of the product being furnished and complete enough to enable the Engineer to determine that the products submitted

conform to the requirements of the Specifications. If a submittal indicates more than one style, size, capacity, etc. of a product on a sheet, the Contractor shall clearly indicate by "highlighting" or otherwise specifically marking exactly which product type is being submitted for approval. Catalog data shall bear the name of the manufacturer of the product.

F. Submissions of shop drawings and product data shall be made to the County by the Contractor only. Any data prepared by subcontractors and suppliers and all correspondence originating with subcontractors and suppliers shall be submitted through the Contractor.

G. All shop drawings and product data covering related items of equipment or material or integrated systems of equipment or material shall be submitted at the same time in order that their complete installation can be adequately reviewed. No partial submissions will be considered.

H. No material or equipment for which shop drawings and product data have been submitted for approval shall be delivered to the job site or incorporated into the work until the Contractor has received copies of such approved drawings and data or until the Engineer has authorized him in writing to do so. Work shall not be done upon any part of the Contract which is dependent upon the approval of another part of the Contract until such approval has been received from the Engineer.

I. After a submittal has been reviewed by the Engineer, it will be returned to the Contractor with the Engineer's comments, if any. The Engineer's approval of the Contractor's submittal is for general conformance to the design only, subject to the detailed requirements of the Contract Drawings. Although the Engineer may review submittals in more or less detail, such reviewing is an effort to discover errors and omissions in the Contractor's submittals and to assist the Contractor in coordinating and expediting his work. The Engineer's review shall in no way relieve the Contractor of his obligations and responsibility to coordinate the work and plan the details of the work, or to relieve him of his responsibility in fulfilling the purpose and intent of the contract. Review by the Engineer shall not be construed as placing him or the County responsible for the accuracy, proper fit, functioning, or performance of any phase of work included in the Contract. The Engineer reserves the right to require written confirmation from the contractor that the comments placed on submittals stamped "APPROVED AS NOTED" shall be followed during the prosecution of the work.

J. All submittals must bear the stamp of approval of the Contractor as evidence that they have been checked by him. Submittals without this stamp will not be considered and will be returned to the Contractor for resubmission. If the drawings or other data show variations from the requirements of the Contract Documents because of standard practice or other reason, the Contractor shall make specific mention of such variation in his letter of transmittal in order

that, if acceptable, suitable action may be taken for proper adjustment; otherwise, the Contractor will not be relieved of the responsibility for executing the work in full conformance with the Contract Documents even though such submittals have been approved.

K. A maximum of two submissions of each shop drawing 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, will be reviewed and checked as deemed necessary by the Engineer. The cost of such review and checking beyond the second submission, as determined by the Owner and based upon a maximum rate of $138.00 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.

L. Two sets of drawings will be returned to the Contractor after approval, and three sets are to be retained by the County. If desired by the Engineer, the drawings shall be revised to meet his approval, and eight sets of the revised drawings furnished, two sets of which will be approved by the Engineer and returned to the Contractor.

M. The Contractor shall furnish samples of items and materials as specified in the Contract Documents. Samples shall be submitted to the County in duplicate and each sample shall be properly labeled and identified giving the date, the job for which it is offered, specification section number, the Contractor, supplier, and the trade name, and shall be accompanied by specifications and other such pertinent data.

N. Mix designs shall be submitted for concrete, grout, and bituminous paving. Mix designs shall indicate all materials used in the product and their respective relative quantities. In any one mix design, all quantities shall be expressed either by weight or volume insofar as it is practical to do so.

O. Mill test reports shall be submitted for structural steel and concrete reinforcement steel. Reports shall be on the mill's standard report form.

1.13 EQUAL OR APPROVED EQUAL

A. Where any article is specified by a proprietary name, trade name, and/or name of a manufacturer or vendor, with or without the addition of the expression "or equal," the article named is intended, subject to the approval of the Engineer, to establish the type, function, dimension, appearance and quality of the specified article. It is distinctly understood that: (1) the Engineer is to use his judgment in determining whether or not any article proposed to be substituted is the equal of any specified article; (2) the decision of the Engineer on all such questions of equality shall be final; and (3) in the event that the Engineer determines a proposed substitution is not equal to the specified item, no claim of any sort shall be made or allowed against the Engineer or the County.

B. An offer of a substitution by the Contractor for any article or material specified, will raise the presumption that it is for the purpose of cost reduction. If, in such a case, the substitute article or material is approved, the County shall be given credit equal to the difference in the net cost to the Contractor of the article or material submitted and the price at which he could have obtained the lowest priced article or material as 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 for substitution 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, trade or proprietary names is not intended to unduly restrict competition or to be exclusionary or discriminatory other than based upon performance or other salient requirements of procurement, and when so used, the specific features of the named brand which must be met is clearly specified.

E. See the Standard Specifications for submission of Value Engineering Change Proposals.

F. The Contractor shall submit a point by point comparison list comparing the named product with the proposed substitution product to determine whether or no the proposed product is “equal”.

1.14 SPARE PARTS

A. Where individual equipment specification section indicate the need for the Contractor to provide spare parts, the Contractor shall:

1. Provide notice minimum three (3) days in advance for any intended delivery. Facility contact information will be provided by the Owner.

2. Clearly Label all Spare Parts with the Project Name, Applicable

Specification Section, Number, Supplier, Manufacturer, Model and Serial Numbers as appropriate.

3. Crate all large parts against damage per manufacturer requirements.

4. Deliver all spare parts to the Owner at the following location:

   Baltimore City DPW
   Pumping Section Maintenance Facility
   3501 Hillen Road
   Baltimore MD, 21218.

5. Contractor shall have a City Pumping Section representative provide a signature for documentation of receipt/proof of delivery purposes.

1.15 EQUIPMENT DELIVERY, STORAGE AND HANDLING

A. All equipment to be delivered to the job site shall be shipped, unpackaged, handled and stored in accordance with all applicable manufacturer requirements.

B. Where manufacturer storage requirements require an environmentally controlled space, such as but not limited to: temperature limitations, humidity limitations (i.e. non-condensing atmosphere), ventilation limitations or interior storage only, then the Contractor shall comply completely with those requirements. Outdoor storage in a temporary shelter or structure shall not be allowed without prior written permission from the County.

C. For all electric motors supplied with internal heaters, Contractor shall provide temporary power for motors until such time that permanent power can be connected.

D. A copy of all manufacturer recommended storage and handling requirements for any piece of equipment to the site, shall be available at the job site for Owner inspection. Provide copies to the Owner on demand.

1.16 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 quantity 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.

1.17 PERMITS

The Contractor shall be aware of and abide by the conditions contained in the permits for erosion and sediment control and water quality management.

1.18 DRAINAGE

The Contractor shall keep all existing surface and subsurface drainage and water courses unobstructed, except for required sediment control devices.

1.19 ENGINEER'S FIELD OFFICE

A. An Engineer's Field Office shall be furnished in accordance with the Standard Specifications. The Contractor shall furnish on-site an Engineer's Office Type No. 3.

B. The cost for Engineer's Office No. 3 shall be included in the lump sum bid.

C. The Contractor shall provide for the sole use by the resident Inspectors, an equipped, air conditioned, ventilated, lighted and heated field office.

D. The equipped field office shall also include high speed internet access through a cable, DSL, satellite or wireless internet provider. The contractor shall coordinate the type and supplier of the high speed internet service with the County prior to ordering the service.

E. The field office shall have indoor plumbing with fully functioning restroom that is connected to public water and sewer. A temporary portable chemical toilet is not acceptable. If the field office cannot be connected to public water and sewer, connection to a well and septic system is acceptable. Otherwise, the Contractor shall provide a pressurized (minimum 20psi) water tank and a holding tank for sewage, in order to make the indoor restroom fully functional.

F. The Inspector's field office shall be a separate entity from any field office the Contractor intends to supply for their own use. The Inspector's 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 Inspector's field office shall be removed from the site by the Contractor and the site cleaned up and left in a neat and acceptable condition.

G. If there is insufficient space to locate the Inspector's field office on County property at the project site, the Contractor shall be responsible for securing offsite office space equal to or greater than that offered by a Type 3 trailer that is suitable for the County.

1.20 EXCAVATION AND BACKFILL

Excavation and backfill shall be in accordance with Section 02200 of these Special Provisions.

1.21 WARRANTY AND GUARANTEE

A. The Contractor shall provide the Engineer warrantees and guaranties for the specified systems as well as the overall work constructed under this Contract as required by the General Provisions of the Standard Specifications, unless indicated otherwise as follows:

1. The Contractor hereby guarantees all of the work for a period of two (2) years after the date of Final Acceptance thereof by the County.

2. 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.

3. 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.

4. 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 the guarantee obligations assumed by the Contractor under these Contract Documents.

1.22 CONSTRUCTION SITE SIGN

The Contractor shall provide and erect a Baltimore County Construction Site Sign at a location selected by the Engineer. The sign shall conform to the sketch attached at the end of this section.

1.23 OPERATING AND MAINTENANCE INSTRUCTIONAL PERIODS

A. Particular sections of the Contract Book may require that the Contractor furnish qualified personnel, approved by the Engineer, to instruct the Owner's (i.e. City Pumping Section) personnel in the proper operation and maintenance of equipment and systems provided in this Contract. Such instructional periods shall be in accordance with the requirements of the individual sections of the Contract Book and with the following paragraphs.

B. When specified in individual sections of these specifications, upon completion of all work and testing for a particular section of the Contract Book, the Contractor shall furnish the necessary factory representatives, including manufacturer's engineers, technicians, skilled labor, and helpers, and shall operate all systems and equipment for the specified instruction period. The factory representatives shall fully instruct the Engineer and County personnel in the operation, maintenance, lubrication, and adjustment of all systems and equipment. Sales representatives are not acceptable for performing these instructions.

C. The Contractor shall schedule the instruction period for a time mutually agreeable with the Engineer and the Owner.

D. Periods of installation 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.

E. At least two additional copies of all instructional literature and handouts given to instructional class attendees shall be provided to the City Pumping Section. Contractor shall maintain a transmittal file to document turnover of such information.

1.24 OPERATING AND MAINTENANCE MANUALS FOR EQUIPMENT AND PRODUCTS

A. General

1. The Contractor shall furnish Operation and Maintenance (O&M) Manuals for all products and equipment provided under this Contract.

2. Prior to completion of the work, and at least 30 days prior to the 50 percent payment, the Contractor shall furnish for the Engineer's review three (3) O&M Manual draft copies.

3. Prior to completion of the work, and at least 60 days prior to the 85 percent payment, the Contractor shall furnish for the Engineer's review five (5) copies of the final O&M Manuals. The final manual must be approved by the Engineer before a final inspection of the work will be conducted and prior to the issuance of the Certificate of Acceptance.

4. Operation and Maintenance Manuals must be received prior to training and instruction specified above.

B. Manual Preparation

1. Manuals shall include operation and maintenance information on all systems and items of equipment. Equipment that will function as part of a system shall have the data assembled in such a manner that describes the operation and maintenance of the entire system. The data shall consist of catalogs, brochures, charts, and schedules describing operation, maintenance, and lubrication for each rotating or reciprocating unit, and other information necessary for the Owner to establish an effective operating and maintenance program. All literature must be legible. Information from facsimile transmissions will not be accepted. The following data shall also be included:

   a. Equipment name, location, and number of units.

   b. Name, address, and phone number of the nearest certified manufacturer's representative.

   c. Nameplate data for the basic unit as well as components such as drives and motors.

   d. Approved Shop Drawings corrected to as-built conditions, when applicable, for each piece of equipment.

   e. Manufacturer's cuts and dimension drawings of each piece of equipment and details of all replacement parts.

   f. Complete wiring diagrams of all individual pieces of equipment and systems including one line diagrams, schematic or elementary diagrams, and interconnection and terminal board identification diagrams.

g. Complete piping and interconnection drawings.

h. Complete parts list with parts assembly drawing (preferably by exploded view), recommended list of spare parts, recommended list including names and addresses of spare parts suppliers, estimated lead time required for ordering spare parts, and sample order forms for ordering spare parts.

i. Instructions with easily understood schematics or diagrams for disassembling and assembling the equipment for overhaul or repair.

j. 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.

k. Guides to testing and troubleshooting. These shall include a chart giving symptoms, probable cause, and remedies.

l. A lubricating schedule showing lubrication point, frequency, operating weight, and manufacturer's recommended lubricant including one or more brand alternates. Lubrication schedules shall include recommendation for periods when equipment is in standby or storage.

m. Recommended preventative maintenance measures and frequency of performance. Each recommended maintenance measure shall be described in terms of procedures, tools, parts, materials, or test equipment necessary to perform the procedures including safety precautions.

2. The draft copies of the O&M Manuals shall be submitted by system or item of equipment. Manuals shall be organized into sections, and shall include a complete table of contents of items presented in the manual.

3. Final O&M Manuals shall include the approved draft copies of the O&M Manuals assembled into binders/volumes by specification section number. The format of the Final O&M Manuals shall be as follows:

a. Final O&M Manuals shall include the following:

(1) JOB NAME, CONTRACT NUMBER, AND VOLUME NUMBER indicated on spine and front cover.

(2) Title page giving Owner's name, contract number, and location of facility.

(3) A table of contents for the complete set of O&M Manuals at the front of each volume.

(4) Index tabs for each system/item of equipment and all sub-sections.

(5) Copies of shop drawings previously submitted for review and approval and comments as originally noted thereon.

b. All items listed above that are of a sheet size of 8-1/2 inches by 11 inches or can be folded (no more than twice) to this size shall be bound in slant-ring, D- type loose leaf view binders with black plastic-coated covers, 4 inch capacity. Binders shall be Recycled EasyOpen Slant-D Ring Binder of Cardinal, or similar product of Cardinal, Avery, or equal. Pages shall be linen reinforced on binding edge.

c. Shop Drawings 24 inches by 36 inches in size shall be folded to approximately 12 inches by 9 inches with drawing title box exposed along either edge. Shop Drawings descriptive of a single item of equipment shall be grouped together. Shop Drawings shall be placed in accordion-type, 9-1/2 inch by 14-3/4 inch folders similar to Smead File Pocket of Smead Manufacturing Co., or equal, and fully indexed on the outside of the folder in a neat and uniform manner. Clear, vinyl, top-loading sheet protectors such as manufactured by C-Line Products, Inc., or equal, may be substituted for the accordion type folders.

C. Approval:

1. Subsequent to the Engineer's approval and return of the final manual, the Contractor shall submit five (5) complete sets of manuals to the Engineer.

2. Conditional Acceptance and/or Beneficial Occupancy will positively not occur until approved Final O&M Manuals have been submitted. Partial approvals of the final manual will not be made.

3. Delivery of manufacturer's service O&M Manuals and installation instructions satisfactory to the Engineer are prerequisite to approval of final payment on the delivery of that equipment. Incomplete or inadequate manuals will be returned to the Contractor for correction and/or resubmission.

## 1.25 MANUFACTURER'S CERTIFICATES

A. General

1. As specified in the various sections of the Contract Book, the Contractor shall furnish the Engineer with manufacturer's certificates for all items of equipment and products listed in the various sections of this Contract Book, stating that the equipment and products have been installed under either the continuous or periodic supervision of the manufacturer's field representative, that they have been adjusted and initially operated in the presence of the manufacturer's field representative, and that they are operating in accordance with the specified requirements, to the manufacturer's satisfaction.

2. A copy of all manufacturer's certificates shall be bound in each Operation and Maintenance Manual.

3. A certificate submitted for equipment, a product, or a component of a product shall indicate test results providing that the equipment, product, or component of a product meet the requirements of the Contract Documents. An affidavit consisting of a sworn statement by an official of the company manufacturing the equipment or product indicating that the information on the certificate is true and accurate shall accompany the certificate.

4. A statement originating from the Contractor, or any of his subcontractors, suppliers, or any other agent which merely indicates that a particular item or equipment, product, or component of a product meets the requirements of the Contract Documents shall not be considered a certificate. Such a submittal will not be approved and the corresponding equipment, product, or component of a product shall not be finally accepted.

B. Manufacturer's Representatives

1. The definition of "manufacturer's representative" shall be as follows: a representative from the manufacturer's plant, familiar with the actual problems of manufacturing, installing, and operating the particular equipment or product and with enough years of experience in this field to determine the successful operation of the equipment or product. Sales representatives or agents of the manufacturers will not be acceptable.

2. As related to his obtaining the manufacturer's certificates, the Contractor shall include in this Contract price the cost of furnishing competent and experienced manufacturer's representatives who shall represent the manufacturer on equipment and products furnished and installed under this Contract, to assist the Contractor to install, adjust,

start up, and test the equipment and products in conformity with the Contract Documents. After the equipment and products have been operated through the trial period for each phase of construction and before being put into permanent service by the Engineer, such manufacturer's representatives shall make all adjustments and tests required to provide that such equipment and products are in proper and satisfactory operating condition, and meet the requirements for issuing the manufacturer's certificate.

1.26 RECORD DRAWINGS

During the progress of the work, the Contractor shall keep a careful record at the job site of all changes and corrections to the information shown on the Contract Drawings and approved shop drawings. The Contractor shall immediately enter such changes and corrections on one set of Contract Documents. The record drawings shall indicate, in addition to all changes and corrections, the actual location of all installed subsurface utilities referenced from two permanently fixed surface structures. These documents shall be available to the Engineer at any time for his inspection and use. Prior to beneficial occupancy of the facilities involved under this Contract, the Contractor shall submit to the Engineer one set of record drawings showing the aforementioned data. If the Contractor fails to maintain the record drawings as required herein, final payment will be withheld until proper record drawings have been furnished to the Engineer.

1.27 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 "EROSION AND SEDIMENT CONTROL", included in Section 308 of the Standard Specifications. 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.

1.28 SOIL EROSION AND SEDIMENT CONTROL

A. Adequate control of soil erosion and sedimentation of both a temporary and permanent nature or 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 Resources Administration. The Contractor shall also be responsible to adhere to the Sediment and Erosion Control Plan in the Contract Drawings as approved by the Baltimore County Soil Conservation District.

C. In addition, the Baltimore County Inspector will keep a daily record of sediment control failures or problems; and these problems must be corrected immediately. No construction work shall proceed while failures or problems exist in the sediment control measures.

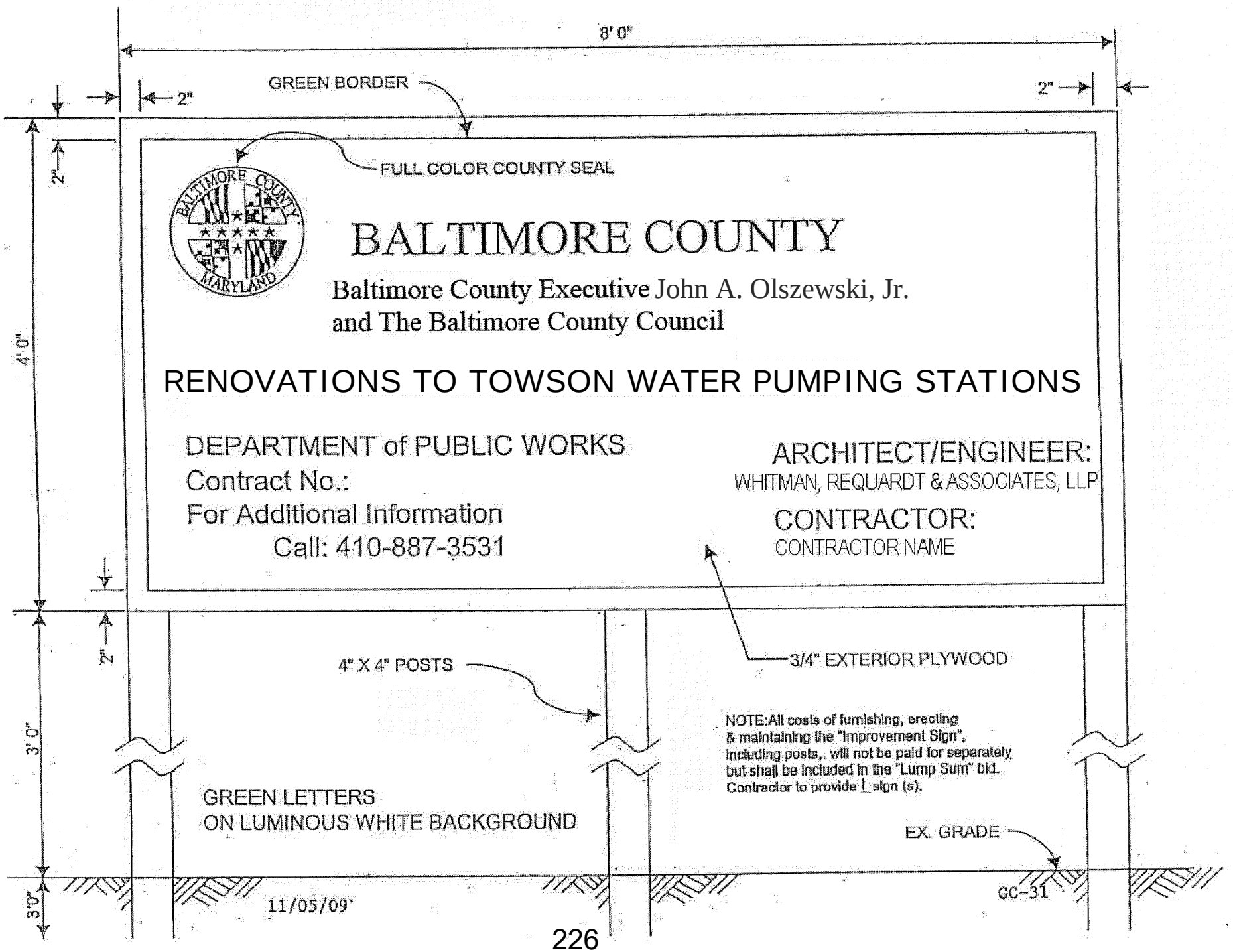
**PART 2 - MATERIALS**

Not Used

**PART 3 - EXECUTION**

Not Used

END OF SECTION


8' 0"
GREEN BORDER
2"
2"
2"
FULL COLOR COUNTY SEAL
BALTIMORE COUNTY
MARYLAND
BALTIMORE COUNTY
Baltimore County Executive John A. Olszewski, Jr.
and The Baltimore County Council
RENOVATIONS TO TOWSON WATER PUMPING STATIONS
DEPARTMENT of PUBLIC WORKS
Contract No.:
For Additional Information
Call: 410-887-3531
ARCHITECT/ENGINEER:
WHITMAN, REQUARDT & ASSOCIATES, LLP
CONTRACTOR:
CONTRACTOR NAME
4' 0"
2"
3' 0"
3'0"
4" X 4" POSTS
3/4" EXTERIOR PLYWOOD
NOTE:All costs of furnishing, erecting & maintaining the "Improvement Sign", including posts, will not be paid for separately but shall be included in the "Lump Sum" bid. Contractor to provide 1 sign (s).
GREEN LETTERS
ON LUMINOUS WHITE BACKGROUND
EX. GRADE
11/05/09'
GC-31

**SECTION 02050**

**DEMOLITION**

PARAGRAPH INDEX

**SECTION 02050**

**DEMOLITION**

## PART 1 - GENERAL

1.01 DESCRIPTION

A. This section includes general requirements for demolition and removal of structures, equipment and utilities to the limits as indicated, in accordance with the Contract Documents.

B. The demolition work is shown, but is not necessarily limited to, those noted items, on the Contract Drawings.

1.02 QUALITY ASSURANCE

A. Prior to execution of any demolition work,

1. Coordinate with the County and the appropriate utility companies.

2. Confirm if the material or equipment to be demolished is identified as hazardous. See Specification Sections: 02080, 02082, 02084 and 02087 related to different types of hazardous material removal.

3. Provide warning signs, barricades and safety barriers required to protect personnel and pumping station operations. Provide fire safety measures at all times in areas where burning torches are being used.

4. Disconnect all mechanical and electrical services effected by the work. Interconnecting piping and electrical services that are to remain in service either permanently or temporarily shall be capped, rerouted, locked out or reconnected in a manner that will not interfere with the operation of the existing facilities to remain and the demolition work.

B. See Division 16 for additional provision related to Electrical Demolition activities.

1.03 SUBMITTALS

A. Before the start of any demolition, submit the following in accordance with Section 01900 of these Technical Specifications:

1. Demolition work schedule and coordination with other work in progress including disconnection schedule of utility services and sequence of operations.

2. If indicated on the Drawings or elsewhere in the Documents for select equipment and structures: Submit the method of demolition, removal

of waste and removal of items to be salvaged including detailed description of methods and equipment.

3. Submit inspection reports of existing structures, items to be salvaged and equipment that will remain after demolition in accordance with Section 01900 of these Technical Specifications.

1.04 SITE CONDITIONS

A. Existing Conditions

1. For demolition work within the limits of the existing Towson Pumping Station structures (Buildings and Vaults), coordinate demolition operations to minimize interruption of the facility operations and interference with operating (City Pumping Section) personnel.

2. Coordinate disconnections and disruptions of utility services with requirements of utility company and the Engineer.

B. Protection

1. Provide scaffolding, protective coverings, temporary walks, shoring and bracing during demolition to protect personnel, structures and equipment.

2. Provide adequate lighting at all times during demolition operations.

3. Provide and maintain barriers of cloth, plastic or wood, in order to prevent debris, dust and moisture/water spray associated with the demolition work from leaving the demolition area.

a. Dust and water spray shall be controlled such that no demolition related dust enters into any operating electrical or control equipment, (i.e. motors) and any electrical or control equipment cabinets/enclosures.

b. Contractor shall verify locations of ventilated openings on all existing electrical and control equipment and enclosures in the vicinity of demolition work, and protect those openings as needed form dust and water spray entry.

4. Provide warning signs as required, for personnel and the public.

**PART 2 - MATERIALS**

Not used.

## PART 3 - EXECUTION

### 3.01 INSPECTION

Before demolition begins, the Contractor shall inspect existing structures, equipment, paving, etc. that will remain in-place within and adjacent to the demolition area for existing defects and damage. Record and notify the Engineer of defects and damage found during this inspection. Photographs shall be taken of these areas for record-keeping purposes, as specified in Section 01900.

### 3.02 MATERIAL TO BECOME PROPERTY OF CONTRACTOR

All existing materials which require permanent removal by the Contractor, including piping, valves, fittings and equipment as shown and specified, shall become the property of the Contractor and shall be removed from the site immediately, unless otherwise indicated during construction as items to be turned over to the County. Permanently removed items shall not be reused as part of any new work. Items which are only to be temporarily removed and reinstalled by the Contractor shall be as indicated on the Drawings.

### 3.03 MATERIAL TO BE TURNED OVER TO THE OWNER

Where indicated in the Drawings, specified or identified during construction by the County (with the input of City Pumping Section Personnel), items which are to be salvaged and turned over to the Owner, shall be transported by the Contractor to the Baltimore City DPW, Pumping Section Maintenance Facility, located at 3501 Hillen Road, Baltimore MD, 21218. Contractor shall provide a minimum three (3) days notice prior to any delivery of salvaged items to this facility. Facility contact name and number to be provided by the City Pumping Section Personnel.

### 3.04 GENERAL

A. Provide County minimum seven (7) days notice prior to the start of any segment of demolition or removal work. Demolition work requiring equipment to be out of service shall not be initiated until the Contractor has demonstrated that all equipment and materials are on site to initiate the related new work.

B. Perform demolition so adjacent structures, equipment, paving and materials, which are to remain, shall not be damaged. If damage occurs, Contractor shall repair or replace the adjacent structures, equipment, paving and materials as directed by the Engineer. Existing utilities damaged by demolition shall be replaced with the same material and quality as the existing utilities.

1. Where a section of concrete paving is to be removed, saw cut along limiting lines to a depth of at least half the slab thickness so damage to the remaining concrete paving is held to a minimum.

2. Unless noted otherwise, all material and items removed shall become the property of the Contractor and shall be removed from the site.

3.05 DEMOLITION OPERATIONS

A. Before the demolition operation begins, provide and have in place all protective devices and dust covers.

B. Disconnect, deactivate and deenergize all mechanical and electrical connections before demolition begins.

C. All minor work and utilities, including electrical and instrumentation shall be provided concurrently as required to service the respective equipment. Also, all work shall be phased to service the facility operations when required.

D. Due to obstruction or timing, some permanent connections may be impractical at the time required. The Contractor shall make any temporary connections required or shown for the work sequence shown. Temporary connecting piping may be PVC or any material the Contractor selects, so long as it is appropriate for the service intended, is approved by the County and the Engineer and will not damage the site surroundings. Any temporary electrical connections shall comply with National Electrical Code requirements.

E. As required, wet down areas being demolished to control dust. Do not let dust enter any existing or new to be installed electrical equipment.

F. Leave the work area at the end of each day broom clean. Remove waste, litter and debris from the work site and place in dumpster type containers.

G. As required, confine demolition apparatus, equipment and operations of workers to areas that will not interfere with continued use and operation of the facility.

H. As required for partially dismantled structures, provide protection from inclement weather for materials, equipment and personnel.

3.06 EXTERIOR DEMOLITION

A. Structures: Sidewalks, curbs, gutters and street light bases shall be removed as indicated.

B. Utilities and Related Equipment:

1. Notify Engineer and County to turn off affected services at least 48 hours before starting demolition or renovation activities.

2. Remove existing utilities as indicated and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by Engineer.

3. When utility lines are encountered that are not indicated on the Drawings, notify Engineer prior to further work in that area.

4. Remove meters and related equipment and deliver to a location as determined by the Engineer.

C. Paving and Slabs:

1. Remove concrete and asphaltic concrete paving and slabs as indicated.

2. Provide neat sawcuts at limits of pavement removal as indicated.

3.07 CONCRETE DEMOLITION

A. Existing reinforcing steel which is not required for splices or which is not shown to be embedded in the new concrete shall be neatly trimmed as required to allow surface patching.

B. All concrete equipment pads, bases, pipe supports and concrete of similar use shall be completely removed wherever the associated equipment or piping is indicated to be removed.

3.08 EQUIPMENT DEMOLITION

A. Equipment shown or designated for demolition shall be completely removed, along with all appurtenances, such as, equipment bases, piping, valves, electrical equipment, conduit, wiring and controls. Demolition shall be performed in a manner to not impact the operation of remaining equipment, unless directed otherwise by the Engineer.

B. Unless specifically shown or indicated otherwise, existing lines are to remain in service in their current configuration. When the existing services are disconnected due to a required relocation or ongoing demolition/construction, temporary connections of these service lines to other portions of the facility shall be provided and maintained by the Contractor until such time as the lines can be reconnected or permanently installed as required in their new locations.

C. Existing piping shall be protected from damage during the demolition work, and all other work, included under this Contract. This shall include protection from freezing.

D. In general, all existing electrical equipment is to be removed unless otherwise noted. Removal shall include all wiring and all exposed conduit back to source unless otherwise noted.

E. Where indicated in the Documents, concealed conduit shall be removed flush to surface, capped and the surface patched as needed to match the adjacent surrounding surface.

3.09 ELECTRICAL:

A. CAUTION: Electrical system components (e.g., lamps, batteries, ballasts, bulbs, capacitors, switches, thermostats, meters) may contain hazardous

constituents (e.g., mercury, lead, oils, PCBs, DEHP). Identify and recover regulated materials intact for salvage and EPA-compliant management, as required.

B. Cut off concealed or embedded conduit, boxes, or other materials a minimum of 3/4 inch below final finished surface.

C. When removing designated equipment, conduit and wiring may require rework to maintain service to other equipment.

D. Rework existing circuits or provide temporary circuits as necessary during renovation to maintain service to existing lighting and equipment not scheduled to be renovated. Existing equipment and circuiting shown are based upon limited field surveys. Verify existing conditions, make all necessary adjustments, and record the Work on the Record Drawings. This shall include, but is not limited to, swapping and other adjustments to branch circuits and relocation of branch circuit breakers within panelboards as required to accomplish the finished work.

E. Reuse of existing luminaires, devices, conduits, boxes, or equipment will be permitted only where specifically indicated.

F. Raceways and cabling not scheduled for reuse.

G. Inaccessibly Concealed: Cut off and abandon in place.

H. Exposed or Concealed Above Accessible Ceilings: Remove.

I. Raceways and Cabling Scheduled for Future Use: Cap/seal and tag.

J. Relocating Equipment: Extend existing wiring or run new wiring from the source.

K. Where the existing raceway is concealed, the outlet box shall be cleaned, and a blank cover plate installed.

L. Where the concealed raceway is uncovered, remove raceway (or extended to new location, if specified).

M. Provide new typewritten panelboard circuit directory cards, where applicable.

3.10 DUST AND DEBRIS CONTROL:

A. Prevent the spread of dust and debris to occupied portions of the building and avoid the creation of a nuisance or hazard in the surrounding area. Do not use water if it results in hazardous or objectionable conditions such as, but not limited to, ice, flooding, or pollution.

B. Vacuum and dust the work area daily.

C. Sweep pavements as often as necessary to control the spread of debris that may result in foreign object damage potential to vehicular traffic.

3.11 RESTORATION

A. Demolition of piping and conduits passing through walls, floors and overhead slabs

1. Any resulting hole through a wall, floor or overhead surface resulting from any demolition activity, which will not be required for new work, shall be patched using material compatible without surrounding wall, floor of overhead surface.

B. Demolition of wall, floor or overhead mounted equipment,

1. Any small hole resulting from demolition activities, such as but not limited to, demolition of mounting hardware such as anchor bolts, mounting screws, mounting brackets, etc, shall be patched using material compatible with the surrounding wall, floor or overhead surface.

C. Demolition of embedded electrical panels, wiring devices, etc.

1. Any hole or cavity resulting from embedded electrical equipment demolition activities, shall be patched using material compatible with the surrounding wall, floor of overhead surface

D. Non-shrink grout shall be used where the surrounding surface is concrete construction.

E. Patched areas shall be coated where required and specified by Section 09900.

3.12 CLEANUP

A. Provide dumpster type containers located in convenient locations approved by the Engineer for offsite removal of waste, litter and debris. Empty containers offsite as soon as they are full or at regular intervals of at least once a week. Keep area around containers clean. During filling and emptying of containers, spillage shall be immediately picked up and area cleaned.

B. After demolition is complete, remove protective devices and dust covers. Remove dust created from demolition operation that may have passed dust covers. All areas shall be swept, vacuumed and wiped down as needed for dust removal.

3.13 FIELD QUALITY CONTROL

A. Engineer will visually inspect demolition and adjacent areas for completeness of demolition, damage that may have resulted from the demolition operation and for completeness of clean-up.

B. New construction shall not begin until the inspection by the Engineer is completed and found acceptable.

END OF SECTION

**SECTION 02080**

**IMPACT TO LEAD PAINTED SURFACES, REMOVAL AND DISPOSAL**

PARAGRAPH INDEX

## SECTION 02080

## IMPACT TO LEAD PAINTED SURFACES, REMOVAL AND DISPOSAL

### PART 1 - GENERAL

1.01 SUMMARY

A. Work Includes:

1. Contractor and Subcontractors shall comply with OSHA's "Lead in Construction Standard", 29 CFR 1926.62.

2. Components containing coatings not otherwise included in the Limited Hazardous Materials Survey shall be presumed to contain lead in paint.

3. Proper disposal of waste materials containing lead paint.

1.02 RELATED DOCUMENTS

A. Specific sections include:

1. Section 01529 – Health & Safety

B. Limited Hazardous Materials Survey, Towson Water Pumping Stations No. 2 & No. 3, 401 Hillen Road, Towson, MD 21286, dated August 13, 2012, EBA Engineering, Inc. This report included as an appendix to these Technical Specifications.

1.03 APPLICABLE STANDARDS AND GUIDELINES

A. It shall be the duty and responsibility of the Contractor and all of its subcontractors to be familiar and comply with all requirements of all applicable local, State and Federal regulations, including but not limited to:

1. Federal:

a. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA)

i. 29 CFR 1926.62 – Lead;

b. Environmental Protection Agency (EPA)

i. 40 CFR 117.3 – Determination of Reportable Quantities

ii. 40 CFR 260 – Hazardous Waste Management System: General

iii. 40 CFR 268 – Land Disposal Restrictions: General

iv. 40 CFR 273 – Universal Waste Regulations

v. 40 CFR 302 – Reportable Quantities, and Notification;

vi. EPA Guidance Document SW-846 Test Methods for Evaluating Solid Waste, Physical/Chemical Methods".

c. U. S. Department of Transportation (DOT)

i. 49 CFR 171-180 – General Awareness and Training Requirements for Handlers, Loaders, and Drivers.

2. State Requirements:

d. Code of Maryland Annotated Regulations (COMAR)

i. COMAR 09.12.20 – Occupational Safety and Health Authority

ii. COMAR 26.13 – Disposal of Controlled Hazardous Substances

iii. COMAR 26.16 – Code of Maryland Annotated Regulations Title 26 Department of the Environment, Subtitle 16 Lead

1.04 DEFINITIONS

Terms defined by OSHA Regulation 29 CFR 1926.62 and COMAR Regulation 26.16 have the same meaning when used in this section.

1.05 SUBMITTALS AND NOTICES

A. Prior to commencement of work: Submit the following to the Engineer for review. Work will not and shall not start until these submittals are returned with the Engineer's written approval indicating that the submittal is returned for unrestricted use.

1. Lead Compliance Program meeting the requirements of 29 CFR 1926.62 (e) for each subcontractor who will disturb Lead-Based Paint (LBP). Elements include but are not limited to:

a. A description of each activity in which lead is emitted.

b. The means to be used to achieve compliance and engineering plans and studies used to determine the engineering controls selected where they are performed.

c. Information on the technology considered to meet the Permissible Exposure Limit (PEL).

d. Air monitoring data that document the source of lead emissions.

e. A detailed schedule for implementing the program.

f. A work practice program.

g. An administrative control schedule, if applicable.

h. Arrangements made among contractors on multi-contractor sites to inform employees of potential lead exposures.

2. Lead Waste Management Plan. This plan must identify each waste stream impacted by lead-based paint and state how each such waste stream will be handled for waste disposal. Examples of potential waste streams include but are not limited to disposable PPE, plastic drop cloths, paint stripping waste, dust and paint chips from paint, and steel coated with lead-based paint. For each waste stream, the plan shall indicate:

   a. Training certificate for Contractor personnel who will handle or ship hazardous waste as required by 49 CFR 172 Subpart H, the hazardous waste shipping regulation of the Department of Transportation.

   b. Packaging and labeling of waste.

   c. A copy of the shipping manifest that will accompany hazardous waste. State the generator's ID number that will be used, the proper shipping name of the waste, and indicate how the Owner's Signature will be obtained for the manifest.

   d. Means of secure on-site storage of waste while it is accumulated.

   e. Testing protocol (if any). Plan must indicate how the Contractor will determine if the waste is hazardous for lead and if the paint contains PCBs which are known to have been an additive for some lead-based paint. Indicate who will collect samples, how samples will be collected, the laboratory that will analyze the samples, the analytical method, and the standard to which results will be compared.

   f. Hazardous waste shipping company, their contact information, and their hazardous waste shipping identification number.

   g. Transfer facility (if any), their contact information, and their RCRA identification number.

   h. Final disposal site, their contact information, and their Resource Conservation and Recovery Act (RCRA) identification number.

3. Record(s) of any citation(s) issued by local, State and Federal regulatory agencies relating to LBP abatement activity. Contractor must include projects, dates, and resolutions.

4. Liability insurance certificate with the statement of coverage that indicates pollution coverage is included. Occurrence type insurance is required. Minimum coverage shall be at least $1,000,000 per occurrence.

1.06 LEAD HEALTH RISK

Where in the performance of the work, workers, supervisory personnel, subcontractors, or consultants may encounter, disturb, or otherwise function in the immediate vicinity of any identified LBP, take appropriate continuous measures as necessary to protect all workers, building occupants, or other people from the risk of exposure to LBP. Such measures shall include the procedures and methods described herein, and compliance with regulations of applicable federal, state, and local agencies.

**PART 2 - MATERIALS AND EQUIPMENT**

NOT USED

**PART 3 - EXECUTION**

3.01 METHODS OF COMPLIANCE

Contractor shall adhere to the Lead Compliance Program and Lead Waste Management Plans submitted.

END OF SECTION

**SECTION 02082**

**ASBESTOS ABATEMENT**

PARAGRAPH INDEX

**SECTION 02082**

**ASBESTOS ABATEMENT**

## PART 1 - GENERAL

1.01 SUMMARY

A. Work Includes

1. The work covered by this Section includes the furnishing of all materials and equipment and the performing of all labor for the removal and disposal of asbestos-containing building materials as reported in the Limited Hazardous Materials Survey, Towson Water Pumping Stations No.2 & No.3, 401 Hillen Road, Towson, MD 21286 dated August 13, 2012. The location and type of asbestos-containing building materials known to be present at the worksite are detailed in this section of the specifications.

2. Quantities presented in this Section are estimates only. Contractor shall field verify quantities prior to submitting a bid or accept the estimates as accurate.

3. Requirements of this Section are designed for the safe removal and disposal of Asbestos-Containing Materials (ACM) and/or Presumed Asbestos-Containing Materials (PACM). Regulatory standards and best industry practices may contain other requirements that must be followed.

4. The Contractor must adhere to the requirements of MDE and view MDE's determinations as final.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Sections apply to this Section.

1. Section 01529 – Health & Safety

B. Limited Hazardous Materials Survey, Towson Water Pumping Stations No. 2 & No. 3, 401 Hillen Road, Towson, MD 21286, August 13, 2012, EBA Engineering, Inc.

1.03 APPLICABLE STANDARDS AND GUIDELINES

A. The most recent edition of a relevant regulation, standard, or code shall be in effect. Where a conflict exits between the regulations, standards, codes, or these specifications, the more stringent requirements shall be utilized.

B. Contractor must adhere to all regulations impacting this work including those listed in this subsection and all applicable regulations that are not listed.

1. US Environmental Protection Agency (EPA)

   a. 40 CFR 61 – Subpart M – NESHAP

   b. 40 CFR 763 – AHERA

2. US Occupational Safety and Health Administration (OSHA)

   a. 29 CFR 1926.1101 – Asbestos in Construction

3. US Department of Transportation (DOT)

   a. 49 CFR 170-180 – Hazardous Waste Transportation

4. Maryland Department of the Environment

   a. COMAR 26.11.21 – Control of Asbestos

   b. COMAR 26.11.23 – Asbestos Accreditation of Individuals

   c. COMAR 26.13 – Disposal of Controlled Hazardous Substances

1.04 DEFINITIONS

Terms defined by OSHA Regulation Title 29 CFR Part 1926.1101 or by EPA Regulation Title 40 CFR Part 61 Subpart M have the same meaning when used in this section.

1.05 SUBMITTALS AND NOTICES

A. Prior to commencement of work, submit to the Engineer the items listed below for review. Work shall not start until these submittals are returned with the Engineer's written approval indicating that the submittal is returned for unrestricted use.

1. Qualifications

   Project contact sheet for key personnel including name, cell phone, and e-mail for:

   a. General Contractor

   b. Abatement Contractor

2. Abatement Contractor

   c. Asbestos Abatement License

   d. Liability insurance certificate with the statement that coverage includes asbestos. Occurrence type insurance is required. Minimum coverage shall be at least $3,000,000 per occurrence.

   e. Submit certification signed by an officer of the abatement contracting firm that exposure measurements, medical

surveillance, and worker training records are being kept in conformance with 29 CFR 1926.

f. Submit certification signed by an officer of the abatement contracting firm that the respiratory protection program is being kept in conformance with 29 CFR 1910.134.

g. Record(s) of any citation(s) issued by local, State and Federal regulatory agencies relating to asbestos abatement activity within the past 5 years. Contractor must include projects, dates, and resolutions.

3. Abatement Supervisor and Workers

a. Resume of abatement supervisor

b. Training certification, medical approval certification, and fit test certification of supervisor and all workers

4. Waste Disposal

a. Company, contact name, phone number, e-mail address, and license to haul asbestos waste

b. Company, contact name, phone number, e-mail address, and license or permit of landfill to accept asbestos waste

c. If non-regulated ACM will be disposed of in a construction and debris (C & D) landfill, submit a letter from the landfill indicating that they will accept the waste.

5. Abatement Work Plan

a. Notification - Copy of notification submitted to EPA and MDE.

b. Signs - State number of 3-day signs (as required by COMAR 26.11.21), location of 3-day signs, and schedule for posting 3-day signs.

c. For each regulated area describe location, signs, means to control access, and means to capture debris from the work.

d. Describe engineering controls.

e. List all required personal protection equipment. For respirator, describe respirator and cartridge.

f. Describe work procedures including the method that will be used to remove each type of asbestos containing material.

g. Describe procedures for bagging and removal of wastes. Be sure to include how the waste will be moved from the roof to the ground.

h. Describe temporary storage facility for waste prior to removal from site. Include description of signs on storage facility.

6. Equipment and Supplies

a. Submit MSDS sheets for all chemicals.

b. Manufacturer's certification that HEPA vacuums, pressure differential ventilation units and other local exhaust ventilation systems to be used on the project conform to ANSI Z9.2-2006.

7. Emergency Plans

a. Submit an emergency plan that meets the requirements of 29 CFR 1926.35.

B. During Abatement Activities, the Contractor shall submit:

1. Waste shipment records at time of pickup.

2. Daily job progress reports each day detailing abatement activities including a review of the estimated percentage of completion, major problems or delays and taken or planned corrective action, injury reports, equipment breakdowns, etc..

3. The Contractor shall maintain on site daily work site entry logbooks with information on worker and visitor access. A compiled copy shall be submitted after work is completed.

4. The Contractor shall maintain on site air monitoring records that shall be made available to Engineer upon request. A compiled copy shall be submitted after work is completed.

C. Project Closeout Submittal shall include

1. Statement of completion in compliance with specifications.

2. Compiled set of daily job progress reports.

3. Compiled set of site entry logs.

4. Final waste disposal manifests.

5. Air monitoring data and IH daily logs, including clearance sampling.

6. All air sampling cassettes used during the project. Cassettes shall be returned to the box they came in and stored in date order with earliest sample in the upper left corner. The outside of the box shall be labeled with the date range included in the box. Each cassette shall have a date and sample number that corresponds to air monitoring data submitted.

1.06 ASBESTOS HEALTH RISK

Where in the performance of the work, workers, supervisory personnel, subcontractors, or consultants may encounter, disturb, or otherwise function in the immediate vicinity of any identified ACM, take appropriate continuous measures as necessary to protect all building occupants from the risk of exposure to airborne asbestos. Such measures shall include the procedures and methods described herein, and compliance with regulations of applicable federal, state and local agencies.

1.07 WORKER TRAINING REQUIREMENTS

A. AHERA Worker Accreditation: All workers are to be accredited by MDE as Abatement Workers or as Abatement Supervisors as required by the EPA Model Accreditation Plan (MAP) asbestos abatement worker training (40 CFR Part 763, Subpart E, Appendix C).

B. AHERA Contractor/Supervisor Accreditation: All Contractor/Supervisors are to be accredited by MDE as Abatement Contractor/Supervisors as required by the EPA Model Accreditation Plan (MAP) asbestos abatement worker training (40 CFR Part 763, Subpart E, Appendix C.

C. Additional worker licenses, certifications, training, and documentation shall be in accordance with Contractor's submittals in Paragraph 1.06.

1.08 MEDICAL SURVEILLANCE REQUIREMENTS

All employees who will perform asbestos work and/or wear a respirator shall participate in a medical surveillance program meeting the requirements of 29 CFR 1926.1101 and 29 CFR 1910.134.

1.09 INDUSTRIAL HYGIENIST

The Contractor shall retain an independent industrial hygienist (IH) to monitor asbestos abatement.

1.10 REQUIRED AIR SAMPLES

A. The IH shall be responsible for air monitoring as required to meet OSHA requirements for 8 hour Permissible Exposure Limits and 30-minute Short Term Excursion.

B. The IH shall be responsible for background sampling and area sampling during abatement. IH shall determine appropriate locations for samples during abatement.

C. All air sampling cassettes shall be saved and delivered to the Engineer at the end of the project. Engineer may elect to evaluate representative samples to verify results.

1.11 STOP ACTION LEVELS

A. Inside Work Area

The Contractor shall stop work and re-evaluate engineering controls if any one sample in the work area or any personal sample exceeds a fiber concentration of 0.05 fibers per cubic centimeter (f/cc).

B. Outside Work Area

If any air sample taken outside of the Work Area exceeds 0.01 f/cc, immediately and automatically stop all work except corrective action.

1.12 AUTHORITY TO STOP WORK

A. The Engineer and the IH have the authority to issue a work stoppage at any time during the abatement work if the Engineer or IH deems that conditions are in violation of these specifications or any local, state, or federal regulations.

B. Once a work stoppage has been issued, the Contractor shall take corrective steps including but not limited to the following:

1. Cease all asbestos removal activities, or any other activities that disturbs ACM.

2. Repair any fallen, ripped or otherwise failed work area isolation measures.

3. Maintain in operation all work area isolation measures.

4. Maintain all worker protection.

5. Fog the air in the work area with a mist of amended water to reduce airborne fiber levels.

C. The Contractor shall not recommence work until conditions have been corrected and authorized in writing by the Engineer.

D. Delays, stand-by time, and expenses necessary for Contractor to take corrective action, resolve any violations of these specifications or applicable laws shall be at the Contractor's expense.

**PART 2 - MATERIALS AND EQUIPMENT**

2.01 PROTECTIVE CLOTHING

A. General

1. Provide disposable full-body coveralls with integral head and foot covers, and require that they be worn by all workers in the Regulated Area. Provide a sufficient number for all required changes, for all workers in the Regulated Area.

2. Provide each worker with the additional protective clothing as required by the site specific Health and Safety Plan. This may include, but is not necessarily limited to:

a. Hardhats

b. Cold weather gear

c. Gloves

d. Boots

e. Eye Protection (i.e. face shield, safety glasses, and/or goggles)

f. Hearing Protection

3. In addition, disposable coverall with head cover and footwear covers shall be provided by the Contractor for the Engineer, Emergency Personnel, and other authorized representatives who may inspect the job site.

2.02 RESPIRATORY PROTECTION

A. The Contractor shall provide at no cost to the employee respiratory protection against airborne concentrations of asbestos during this abatement project.

B. The Contractor's respiratory protection program shall be in place in accordance with the Contractor's submittal as detailed in Section 1.06 and in compliance with 29 CFR 1910.134.

C. Respirators are required to be used for all asbestos work.

2.03 PRODUCTS

A. Amended Water

1. Provide water to which a surfactant has been added.

2. Use a mixture of surfactant and water which results is adequately wetting the ACM (see Section 1.05 "Adequately Wet" definition) by use of one ounce of a surfactant consisting of 50% polyoxyethylene ester and 50% polyoxyethylene ether mixed with five gallons of water.

B. Encapsulants

1. Encapsulants (sealants) shall meet the latest requirements of the EPA.

C. Polyethylene Sheet

1. Polyethylene film designed for asbestos abatement with a minimum 6 mil thickness.

2. Polyethylene film shall be designed as fire resistant by the manufacturer.

D. Waste Bags

1. Shall include required OSHA, EPA, and DOT asbestos labels.

2. Shall be a minimum of 6-mil thickness.

E. Miscellaneous Materials

1. Duct tape in 2” or 3” widths as indicated, with an adhesive which is formulated to aggressively stick to sheet polyethylene.

2. Spray adhesive, which is specifically formulated to stick tenaciously to sheet polyethylene.

**PART 3 - EXECUTION**

3.01 ASBESTOS CONTAINING MATERIALS (ACM) AND PRESUMED ASBESTOS CONTAINING MATERIALS (PACM)

| Material Type | Location | Quantity | Action |
|---|---|---|---|
| Exterior Window Glazing - White | Pump Station No.3 | 36 linear feet | Remove All |

3.02 ENGINEERING AND WORK PRACTICE CONTROLS

A. The Contractor shall implement engineering and work practice controls to reduce and maintain employee exposure to asbestos to or below the Permissible Exposure Limit (PEL of 0.1 f/cc) to the extent that such controls are feasible. Engineering and work practices shall be reviewed and approved by the Engineer. Respirators are required for all asbestos abatement even if engineering controls maintain exposures below the PEL. NOTE: It is possible that this work may be accomplished without the use of negative pressure enclosures.

B. All abatement work shall be done using wet methods. Water shall be sprayed on all materials to be removed during this procedure and shall continue to be sprayed on the material until placed into a waste container or roll-off.

C. HEPA vacuum.

D. Prompt cleanup.

3.03 SIGNAGE AND WARNINGS

A. Contractor shall display 3-Day Notice sign as required by MDE at all entrances into the building.

B. The Contractor may use signs required by other statutes, regulations or ordinances in addition to, or in combination with, signs required by this specification. The Contractor shall assure that no statement appears on or near any sign required by this specification, which contradicts or detracts from the meaning of the required sign.

C. Warning signs that demarcate the regulated area in each work area shall be provided and displayed by the Contractor. A regulated area is defined as an area where an employee’s exposure may be above the PEL.

D. Warning signs shall also be required outside the work area at the proposed and secured waste storage.

E. Warning signs shall be posted at such a distance from such a location that an employee or other authorized personnel may read the signs and take necessary protective steps before entering the area marked by the signs.

F. Warning signs are required by 29 CFR 1926.1101.Z.(k).(7).(ii).[A] and shall bear the following information:

**DANGER**
**ASBESTOS**
**MAY CAUSE CANCER**
**CAUSES DAMAGE TO LUNGS**
**AUTHORIZED PERSONNEL ONLY**

G. Warning signs are required by 29 CFR 1926.1101.Z.(k).(7).(ii).[B] and shall bear the following information where the use of respirators and protective clothing is required in the regulated area:

**DANGER**
**ASBESTOS**
**MAY CAUSE CANCER**
**CAUSES DAMAGE TO LUNGS**
**AUTHORIZED PERSONNEL ONLY**
**WEAR RESPIRATORY PROTECTION AND PROTECTIVE CLOTHING**
**IN THIS AREA**

H. The Contractor shall assure that all signs required by this paragraph are illuminated and cleaned as necessary so that the legend is readily visible.

I. Warning signs are required to be placed on trucks during loading of asbestos waste by 40 CFR 63 Subpart M.

3.04 LABELS

A. The Contractor shall affix the label(s) to all products and containers containing asbestos, including waste containers or drums.

1. The label(s) shall be clearly visible printed in large, bold letters on a contrasting background. The label(s) are required by 29 CFR 1926.1101.Z.(k).(8).(iii) and shall bear the following information:

**DANGER**
**CONTAINS ASBESTOS FIBERS**
**MAY CAUSE CANCER**
**CAUSES DAMAGE TO LUNGS**
**DO NOT BREATHE DUST**
**AVOID CREATING DUST**

2. Additional requirements and considerations as per 29 CFR 1926.1101.Z.(k).

3. Additional requirements as per COMAR 26.11.21

3.05 SITE PREPARATION

A. Site preparation prior to abatement consists of the following steps:

1. Posting signs on all exterior doors 3 days prior to abatement.

2. Posting warning signs at entrances and exits to work area and secured waste storage area.

3. Removing or protecting all furnishings.

4. Set up containment necessary to protect surfaces and contain dust and debris.

5. Pre-clean all surfaces in the work area.

6. Provide a wash area for the crew at the site. All members of the abatement crew must wash after removing and properly disposing of their protective clothing.

3.06 ABATING THE ASBESTOS CONTAINING MATERIAL

Removal of ACM shall be performed according to Contractor's Standard Operating Procedure and applicable regulations.

3.07 DAILY CLEANUP

A. All asbestos waste must be bagged at the end of each day and any asbestos debris on the floor must be vacuumed at the end of each day.

B. All supplies and equipment must be maintained in a neat and orderly condition.

C. The daily cleanup activity shall be scheduled for the same time at the end of each workday after active abatement has ceased and sufficient time must be allowed for a thorough and complete cleanup.

D. Under no circumstances shall active abatement be proceeding while the daily cleanup is in progress.

3.08 FINAL CLEARANCE PROCEDURES

A. All waste must be bagged and all bags removed from the work area.

B. All glazing must be removed from the ground outside or the floor inside.

C. The roof must be HEPA vacuumed with minimal dust remaining.

D. Perform a final visual inspection from the third party industrial hygienist.

E. Perform any additional cleaning required by the industrial hygienist.

F. Encapsulation is not required

G. Final clearance air sampling is not required.

3.09 STORAGE OF ACM WASTE

The Contractor shall make provisions for the safe storage of waste on site prior to disposal. For security reasons, waste storage areas must be treated as regulated areas and access shall be restricted. Waste dumpsters and/or trailers may remain on site during the abatement process.

3.10 DISPOSAL OF ACM WASTE

A. Execution

1. All waste shall be maintained in an adequately wet condition and sealed in air and leak tight containers.

2. Prior to removing waste from the work area, each bag of waste shall be sealed and placed entirely within a second bag, which shall also be sealed in a manner to prevent leakage.

3. All waste is to be hauled by a waste hauler with all required licenses from all federal, state, and local authorities.

4. Load all ACM waste material in disposal bags, leak-tight drums, or other containers as described in Contractor's submittal.

5. Post "Danger Asbestos" signs on vehicle while loading.

6. Protect interior of truck or dumpster with a double layer of 6-mil poly sheeting.

7. Carefully load containerized waste in fully enclosed dumpsters, trucks or other appropriate vehicles for transport. Exercise care before and during transport, to ensure that "no unauthorized" persons have access to the material.

8. Ensure asbestos waste storage and disposal complies with all applicable aspects of Federal, State and local asbestos regulation, particularly regarding time periods for removing waste from project site and temporary storage. Ensure compliance with all aspects of COMAR 26.11.21.08, particularly regarding time periods for removing waste from project site and temporary storage.

9. Complete a waste manifest at the time of shipment. Contractor's competent person shall sign the "Generator's Certification" unless directed otherwise. Submit copy of pickup receipt to IH on each day that waste is shipped.

B. Disposal

1. All asbestos waste shall be disposed of at a landfill approved by the Engineer.

2. Sealed plastic bags may be carefully unloaded from the truck. If bags are broken or damaged, return to work site for re-bagging within a containment area. The entire truck and contents must be cleaned using damp cleaning methods and mopping or with a HEPA vacuum.

3. After completion of delivery, truck must be cleaned using damp cleaning methods and mopping or with a HEPA vacuum.

4. Contractor shall retain receipts from landfill or processor for material disposed of.

5. The Contractor shall, no later than 45 days after shipment of each load, submit copy(s) of waste manifest, chain of custody or cradle to grave form, and landfill receipt to the Engineer.

3.11 PROJECT COMPLETION

A. When the Abatement Contractor has completed all removal, a final walkthrough inspection with the Engineer will be arranged. Abatement Contractor shall correct any conditions identified during this inspection.

B. Abatement Contractor shall remove all equipment, supplies, and waste from the project site.

C. The project will be considered complete when all required submittals have been received.

END OF SECTION

**SECTION 02084**

**POLYCHLORINATED BIPHENYL (PCB) EQUIPMENT REMOVAL AND DISPOSAL**

PARAGRAPH INDEX

## SECTION 02084

## POLYCHLORINATED BIPHENYL (PCB) EQUIPMENT REMOVAL AND DISPOSAL

### PART 1 - GENERAL

1.01 SUMMARY

A. Work Includes:

1. The work covered by this Section includes the furnishing of all materials and equipment and the performing of all labor for the removal and disposal of polychlorinated biphenyl (PCB) containing equipment as reported in the Limited Hazardous Materials Survey, Towson Water Pumping Stations No.2 & No.3, 401 Hillen Road, Towson, MD 21286 dated August 13, 2012. The location and type of PCB containing equipment known to be present at the worksite are detailed in this section of the specifications.

2. Quantities presented in this Section are estimates only. Contractor shall field verify quantities prior to submitting a bid or accept the estimates as accurate.

3. Requirements of this Section are designed for the safe removal and disposal of PCB containing equipment. Regulatory standards and best industry practices may contain other requirements that must be followed.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General Conditions, apply to this Section. Specific sections include:

1. Section 01529 – Health and Safety

B. Limited Hazardous Materials Survey, Towson Water Pumping Stations No. 2 & No. 3, 401 Hillen Road, Towson, MD 21286, August 13, 2012, EBA Engineering, Inc. This report included as an appendix to these Technical Specifications.

1.03 APPLICABLE STANDARDS AND GUIDELINES

It shall be the duty and responsibility of the Contractor and all of its subcontractors to be familiar and comply with all requirements of all applicable local, State and Federal regulations, including but not limited to:

A. Federal:

1. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA)

   a. 29 CFR 1910.12 – Construction Work

   b. 29 CFR 1910.132 – General Requirements

   c. 29 CFR 1910.147 – Control of Hazardous Energy (lockout/tagout).

   d. 29 CFR 1926.59 – Hazard communication

   e. 29 CFR 1926.95-102 – Criteria for personal protective equipment

2. Environmental Protection Agency (EPA)

   a. 40 CFR 260 – Hazardous Waste Management System: General

   b. 40 CFR 271 – Requirements For Authorization of State Hazardous Waste Programs

   c. 40 CFR 761 – PCB Manufacturing, Distribution In Commerce, and Use Prohibitions

   d. U. S. Department of Transportation (DOT)

   e. 49 CFR 171-180 – General Awareness and Training Requirements for Handlers, Loaders, and Drivers

B. State Requirements:

1. Code of Maryland Annotated Regulations (COMAR)

   a. COMAR 09.12 Division of Labor and Industry

   b. COMAR 26.13 Disposal of Controlled Hazardous Substances

1.04 DEFINITIONS

A. Terms defined by EPA Regulation 40 CFR 761 have the same meaning when used in this Section.

1.05 SUBMITTALS AND NOTICES

A. Prior to commencement of work: Submit the following to the Engineer for review. Work is not to start until these submittals are returned with Engineer's action stamp indicating that the submittal is returned for unrestricted use.

1. Workplan - Describe work procedures to be used for this portion of this project. Workplan shall include but not limited to:

   a. Methods for removal, storage, transport, and disposal of PCB containing equipment.

   b. U.S. EPA Identification Number of waste hauler.

c. Name and address of waste disposal facility where hazardous waste materials are to be disposed including:

i. Contact person and telephone number;

ii. Copy of state license and permit; and,

iii. Disposal facility permits.

2. Copy of forms required by state and local agencies.

3. Sample of disposal label to be used.

4. Training Program: Submit a course outline of the site-specific worker training course. Include date and time course was given, name and title of teacher.

5. Contractor statement indicating final disposition of equipment will be recycling.

B. During Work: Submit the following as required by the work.

1. Submit copies of all executed manifests and disposal receipts to the Owner.

C. Closeout Submittal: Submit the following as required by the work:

1. Transporter certification of notification to EPA of their PCB waste and stored chemical activities and EPA ID numbers;

2. Certificate of Decontamination;

3. Certificate of Disposal and/or Recycling;

4. Testing results (if any).

## PART 2 - MATERIALS AND EQUIPMENT

2.01 MATERIALS AND EQUIPMENT

A. Provide in quantities necessary to accomplish work of this section.

1. Disposal Bags: Provide 6 mil thick leak-tight polyethylene bags.

2. Small Quantity Storage Containers: five (5) gallon or less capacity for small quantity waste segregation, manufactured with structurally durable materials compatible with the hazardous waste type(s) used.

3. DOT Hazardous Waste Disposal Drums: in accordance with DOT regulations Title 49 CFR Parts 173, 178, and 179.

4. DOT Hazardous Waste Labels: in accordance with DOT regulations Title 49 CFR.

2.02 PERSONAL PROTECTIVE EQUIPMENT

A. Person(s) conducting the removal of equipment known to be or presumed to contain PCBs are required to be aware of the possible health hazards present and wear appropriate personal protective equipment (PPE) that includes but is not limited to:

1. Chemical resistant eye goggles
2. Disposable coveralls;
3. Rubber boots; and,
4. Neoprene gloves (Note: gloves made of natural rubber latex and polyethylene materials are not acceptable.)

B. Employers are required to inform the workers of the potential hazard(s) as per OSHA Directive CPL 02-02-038 Inspection Procedures for Hazard Communication, 29 CFR 1910.1200.

## PART 3 - EXECUTION

### 3.01 PCB CONTAINING EQUIPMENT AND QUANTITIES

| Item | Location | Quantity | Action |
|---|---|---|---|
| Light Ballasts | Pump Station No.2 | 17 each | Remove All |
| Light Ballasts | Pump Station No.3 | 19 each | Remove All |
| Leaking Light Ballasts | Pump Station No.3 | 4 each | Remove All |

### 3.02 PROCEDURES FOR REMOVAL OF PCB CONTAINING EQUIPMENT

A. Light Ballast

1. Power, if applicable, to the PCB containing equipment shall be discontinued before any work is started. Follow OSHA Lockout/Tagout (LOTO) procedures (29 CFR 1910.147) after electrical power is disabled.
2. After terminating the power, the ballast shall be removed as follows:
   a. All wires connecting the ballast to the fixture shall be disconnected.
   b. After the connecting wires have been disconnected, the bolts or screws that hold the ballast in position are to be loosened.
   c. While loosening the bolts or screws, the person removing the ballast is to maintain a firm grip on the ballast in order to prevent the ballast from falling and creating a spill situation.

d. When the bolts or screws have been removed and the ballast has been dislodged from the light fixture, it must be placed into a storage/disposal drum immediately.

e. Proceed to the next light fixture, and repeat the removal procedure.

3.03 STORAGE AND TRANSPORTATION OF PCB CONTAINING EQUIPMENT

A. Storage and disposal of PCB containing equipment shall be done in accordance to all applicable requirements listed in 40 CFR 761 Subpart D Storage and Disposal, Section 761.65: Storage for disposal; 40 CFR Parts 260, 261, et al.: Hazardous Waste Management including but not limited to General, Identification, Listing, Standards, etc; 40 CFR Part 271: Requirements For Authorization of State Hazardous Waste Programs; and, DOT regulations Title 49 CFR Subchapter C Part 171, 173, 178, and 179 Title 49 Code of Federal Regulations Transportation: Hazardous Materials Regulations.

B. Before shipment of the waste materials, an EPA Uniform Hazardous Waste Manifest must be filled out as required by the EPA 40 CFR Parts 260, 261, et al. This manifest will contain information regarding the type and quantity of waste, the generator/owner, the transporter, and its ultimate destination. Copies of this manifest are available from landfills and other hazardous material disposal sites.

1. The transporter of the materials must be a licensed hazardous waste carrier capable of handling this specific material.

2. Each party involved in any part of the generation, transportation, and disposal of the waste material must be given and keep available a copy of the shipping manifest. Copies are to be kept at least three years after receipt of disposal certificate.

3.04 DISPOSAL OF PCB CONTAINING EQUIPMENT

A. The PCB containing equipment referenced in these specification must be disposed of as PCB bulk waste in accordance with 40 CFR 761.62 and disposed of in a TSCA-approved disposal facility 40 CFR 761.71. The Contractor shall also ensure that disposal activities are in accordance to 49 CFR Subchapter C Parts 171, 173, 178, and 179.

B. In addition, CERCLA (the Comprehensive Environmental Response, Compensation and Liability Act of 1980; also known as Superfund) regulates the disposal of non-leaking PCB ballasts. CERCLA requires waste generators to notify the National Response Center at (800) 424-8802 when disposing of a pound or more of PCBs in a 24 hour period. (NOTE: No matter which method is approved, the disposal location/facility must be certified by the EPA).

3.05 LABELING OF WASTE CONTAINERS

A. Label waste containers with the following:

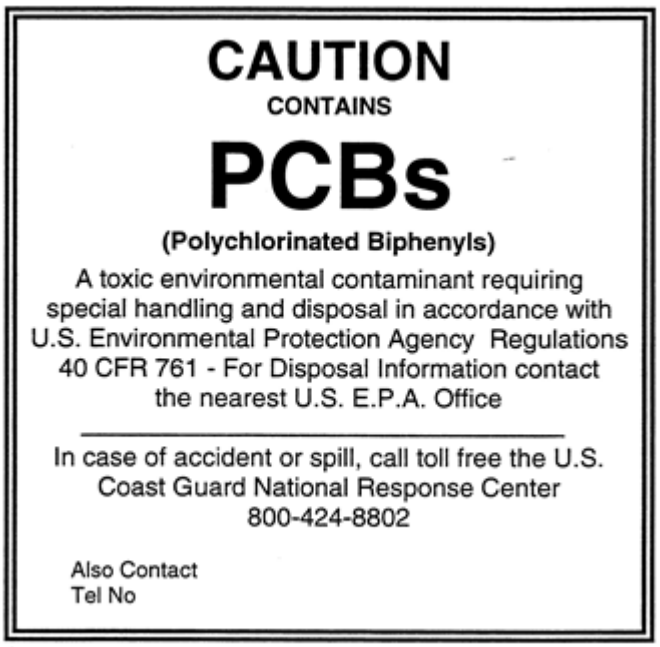
1. Date the item was placed in storage and the name of the cognizant activity/building.

2. A Non-Resource Conservation and Recovery Act (RCRA) Hazardous Waste Label with the Shipper name, address, city, state, zip and contents should be affixed to container prior to shipment.

3. Marking of transformers

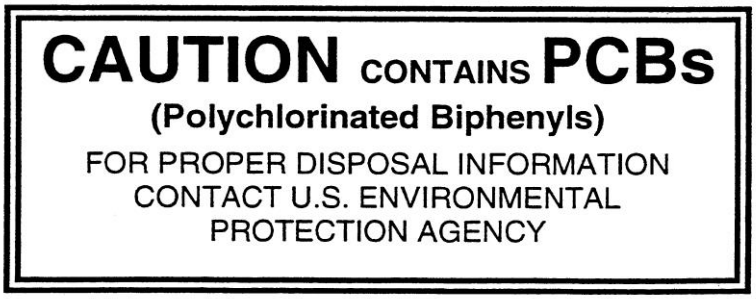
a. Two formats may be used as the PCB mark. These marks are known in the environmental regulations as the large PCB mark (ML) and the small PCB mark (MS). A description of each mark is as follows:

i. Large PCB Mark: The ML mark consists of the letters and striping on a white or yellow background, and shall be sufficiently durable to equal or exceed the life of the transformer (including storage for disposal). The mark is square and must measure at least 6 inches on each side. If the equipment is too small to accommodate this size, the mark may be reduced in size to a minimum of 2 inches on each side.




ii. Small PCB Mark: The MS mark consists of the letters and striping on a white or yellow background, and shall be sufficiently durable to equal or exceed the life of the

transformer (including storage for disposal). The mark is rectangular and measures 1 inch by 2 inches. If the equipment is too small to accommodate this size, the




mark may be reduced in size to a minimum of 0.4 inch by 0.8 inch.

b. All PCB transformers (transformers containing 500 ppm or greater PCBs) must be marked. Marking of PCB-contaminated transformers (transformers containing between 50 and 500 ppm PCBs) is not required.

c. All marks must be placed in a position on the exterior of the transformer so that the marks can be easily read by persons inspecting.

d. If the PCB transformer is too small to accommodate the smallest allowable of the ML mark, then the MS mark may be used.

3.06 IDENTIFICATION NUMBER

Federal regulations 40 CFR 761, and 40 CFR 263 require that generators, transporters, commercial storers, and disposers of PCB and hazardous waste possess U.S. EPA identification numbers. The Contractor shall verify whether the Owner has an EPA identification (I.D.) number for the work to be performed as part of this specification. The Contractor shall also insure that the Owner has an EPA I.D. for waste before shipment of PCB transformers. If not, the Contractor shall assist the Owner in obtaining an I.D. number from MDE prior to commencement of removal work.

3.07 TRANSPORTER CERTIFICATION

Comply with disposal and transportation requirements outlined in 40 CFR 761 and 40 CFR 263. Before transporting the waste, the transporter shall sign and date the manifest acknowledging acceptance of the waste from the Owner and/or Owner's representative. Return a Transporter and Generator signed copy to the Owner and/or Owner's representative before leaving the job site. Ensure that the manifest accompanies the waste at all times

3.08 RECORD KEEPING

A. All record keeping shall be done in accordance to all applicable requirements listed in 40 CFR 761 Subpart J: Records and Reports, Section 761.180: General Records and Monitoring.

B. All paperwork associated with the removal, transportation, and disposal of the PCB containing equipment is required to be kept by the generator/owner for a period of not less than three (3) years after the removal and include the following:

1. Generator/Owner Information;
2. Equipment Information (Make, Model, ID number, & total number of each type);
3. Waste Transportation Company Information;
4. Copy of the Uniform Hazardous Waste Manifest;
5. Waste Disposal Site/Facility Information;
6. Reports of Analysis (if applicable); and,
7. Additional information as required by 40 CFR 761, Subpart J Records and Reports, Section 761.180 General Records and monitoring.

END OF SECTION

**SECTION 02087**

**UNIVERSAL WASTE REMOVAL AND DISPOSAL**

PARAGRAPH INDEX

**SECTION 02087**

**UNIVERSAL WASTE REMOVAL AND DISPOSAL**

## PART 1 - GENERAL

1.01 SUMMARY

A. Work Includes:

1. The work covered by this Section includes the furnishing of all materials and equipment and the performing of all labor for the removal and disposal of Universal Wastes (UWs) as reported in the Limited Hazardous Materials Survey, Towson Water Pumping Stations No.2 & No.3, 401 Hillen Road, Towson, MD 21286 dated August 13, 2012. The location and type of UWs known to be present at the worksite are detailed in this section of the specifications.

2. Quantities presented in this Section are estimates only. Contractor shall field verify quantities prior to submitting a bid or accept the estimates as accurate.

3. Requirements of this Section are designed for the safe removal and disposal of Universal Wastes. Regulatory standards and best industry practices may contain other requirements that must be followed.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Sections apply to this Section. Specific sections include:

1. Section 01529 – Health and Safety

B. Limited Hazardous Materials Survey, Towson Water Pumping Stations No. 2 & No. 3, 401 Hillen Road, Towson, MD 21286, August 13, 2012, EBA Engineering, Inc.

1.03 APPLICABLE STANDARDS AND GUIDELINES

It shall be the duty and responsibility of the Contractor and all of its subcontractors to be familiar and comply with all requirements of all applicable local, State and Federal regulations, including but not limited to:

A. Federal:

1. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA)

a. 29 CFR 1910.12 – Construction Work

b. 29 CFR 1910.132 – General Requirements

c. 29 CFR 1910.147 – Control of Hazardous Energy (lockout/tagout).

d. 29 CFR 1926.59 – Hazard communication

e. 29 CFR 1926.95-102 – Criteria for personal protective equipment

2. Environmental Protection Agency (EPA)

a. 40 CFR 260 – Hazardous Waste Management System: General

b. 40 CFR 268 – Land Disposal Restrictions: General

c. 40 CFR 273 – Universal Waste Regulations

3. U. S. Department of Transportation (DOT)

a. 49 CFR 171-180 – General Awareness and Training Requirements for Handlers, Loaders, and Drivers.

B. State Requirements:

1. Code of Maryland Annotated Regulations (COMAR)

a. COMAR 09.12.20 – Occupational Safety and Health Authority

b. COMAR 26.13 – Disposal of Controlled Hazardous Substances

c. COMAR 26.13.10.06 – 26.13.10.25 – Universal Waste.

1.04 DEFINITIONS

A. Terms defined by EPA Regulation Title 40 CFR Part 273 and by Code of Maryland Regulations 26.13 have the same meaning when used in this Section.

1.05 SUBMITTALS AND NOTICES

A. Before Start of Work: Submit the following to the Engineer for review. Work shall not start until these submittals are returned with Engineer's action stamp indicating that the submittal is returned for unrestricted use.

1. Describe work procedures to be used for this portion of this project. Workplan shall include but not be limited to:

a. Methods for removal, storage, transport, and disposal of Universal Wastes.

b. Copy of state and local licenses for waste hauler.

c. Information about the waste disposal facility where universal waste materials are to be disposed including:

i. Name and address of the facility;
ii. Contact person and telephone number;

iii. Copy of state license and permit; and,
iv. Disposal facility permits.

d. Specimen copy of Uniform Hazardous Waste Manifest form.

e. Sample of disposal label to be used.

f. Training Program: Submit a course outline of the site-specific worker training course. Include date and time course was given, name and title of teacher.

g. Contractor statement indicating final disposition of equipment will be recycling.

B. During Work: Submit the following as required by the work.

1. TCLP test results, as required to characterize waste for segregation and packaging purposes.

2. Submit copies of all waste manifest pickup receipts to the Engineer on the same day that the waste is picked up.

C. After work is complete submit the following to Engineer:

1. Waste manifests signed by waste disposal/recycling facility.

1.06 UNIVERSAL WASTE HEALTH RISKS

A. Mercury

Mercury is a virulent poison. Short-term or long-term exposures to mercury can lead to serious problems, including death. Most mercury exposures occur by breathing the odorless/colorless vapors emitted in air, absorption through direct skin contact, or by ingesting foods or liquids contaminated with mercury.

B. Lead-Acid Batteries

A typical lead-acid battery electrolyte is approximately 60% water, 40% sulfuric acid, and contains traces of lead.

1. Lead is a toxic metal that was used for many years in products found in and around our homes. Lead also can be emitted into the air from motor vehicles and industrial sources, and lead can enter drinking water from plumbing materials. Lead may cause a range of health effects, from behavioral problems and learning disabilities, to seizures and death. Children six years old and under are most at risk.

2. Sulfuric acid is a clear, colorless, oily liquid that is very corrosive. If you are exposed to concentrated sulfuric acid in air, your nose will be irritated and it may seem like sulfuric acid has a pungent odor. When concentrated sulfuric acid is mixed with water, the solution gets very hot. Concentrated sulfuric acid can catch fire or explode when it

comes into contact with many chemicals including acetone, alcohols, and some finely divided metals. When heated it emits highly toxic fumes, which include sulfur trioxide. It is also called sulphine acid, battery acid, and hydrogen sulfate. It is used in the manufacture of fertilizers, explosives, other acids, and glue; in the purification of petroleum; in the pickling of metal; and in lead-acid batteries (the type commonly used in motor vehicles).

## PART 2 - PRODUCTS OR EQUIPMENT

2.01 MATERIALS AND EQUIPMENT

A. Provide in quantities necessary to accomplish work of this section.

1. Disposal Bags: Provide 6 mil thick leak tight polyethylene bags.
2. Small Quantity Storage Containers: five (5) gallon or less capacity for small quantity waste segregation, manufactured with structurally durable materials compatible with the hazardous waste type(s) used
3. DOT Hazardous Waste Disposal Drums: in accordance with DOT regulations Title 49 CFR Parts 173, 178, and 179.
4. DOT 17-H Open-Top Drums (55 gallon).
5. DOT Hazardous Waste Labels: in accordance with COMAR 26.13.03.05 - Pre-Transport Requirements.

## PART 3 - EXECUTION

3.01 UNIVERSAL WASTE TYPES AND QUANTITIES

| Item | Location | Quantity | Action |
|---|---|---|---|
| 4’ - Fluorescent Light Tubes | Pump Station No. 2 | 32 each | Remove All |
| 1’ - Fluorescent Light Tubes | Pump Station No. 2 | 1 each | Remove All |
| Batteries | Pump Station No. 2 | 4 each | Remove All |
| **Item** | **Location** | **Quantity** | **Action** |
| HID Light Bulbs | Pump Station No. 3 | 14 each | Remove All |
| 4’ - Fluorescent Light Tubes | Pump Station No. 3 | 41 each | Remove All |
| 2’ - Fluorescent Light Tubes | Pump Station No. 3 | 1 each | Remove All |
| Batteries | Pump Station No. 3 | 2 each | Remove All |

3.02 REMOVAL OF UNIVERSAL WASTE

A. Person(s) conducting the removal are required to be aware of the possible health hazards present and wear appropriate personal protective equipment (PPE) when working with universal waste.

1. Required personal protective equipment includes but is not limited to:

a. Chemical resistant eye goggles

b. Disposable coveralls;

c. Rubber boots; and,

d. Neoprene gloves (Note: gloves made of natural rubber latex and polyethylene materials are not acceptable.)

e. Respirator will be required in the event of a mercury spill. (NIOSH/MSHA approved respirator with mercury specific cartridges)

f. Employers are required to inform the workers of the potential hazard(s) as per OSHA Directive CPL 02-02-038 Inspection Procedures for Hazard Communication, 29 CFR 1910.1200.

B. Power, if applicable, to the UW containing item shall be discontinued before any work is started. Follow OSHA Lockout/Tagout (LOTO) procedures (29 CFR 1910.147) after electrical power is disabled.

C. After the power has been terminated, the UW containing item shall be removed as follows:

1. If the UW containing item is a mercury containing fluorescent bulb(s), carefully remove bulb(s) from the light fixture and immediately place bulb(s) into a disposal drum as described in Part 3.

3.03 DISPOSAL OF UNIVERSAL WASTE

A. Segregate, package, and label hazardous waste in accordance with COMAR 26.13.03.

B. DOT 17-H Open-Top Drums with Polyethylene Disposal Bag liners:

1. Fill liner bags with Waste Type H, but not others (do not mix waste streams). Neck liner bags down into DOT 17-H Open-Top Drum and seal with duct tape.

2. Install Gasket on Lid, Apply Lock Ring, and Seal.

3. Apply Hazardous Waste Label to Drum Side.

4. Enter DOT Shipping Data as follows;

a. For Waste Type H; RQ Hazardous Waste Solid, NOS, 9, NA3077, PG-III, (D009).

5. Adjacent to each label, enter the date indicating when waste was first placed in each drum.

C. Sealed and labeled containers shall remain sealed. Do not re-open sealed containers. Place no additional waste in sealed containers.

3.04 TEMPORARY STORAGE

A. Partially filled containers of hazardous waste may be stored at the work site provided:

1. Each container is properly labeled when it is first placed in service; and,

2. Each container remains closed at all times except when compatible waste types are added.

3.05 REMOVAL OF WASTE

A. Immediately seal containers of hazardous waste as each container is filled.

B. Complete paperwork including a "Uniform Hazardous Waste Manifest" form.

C. Filled containers shall be transported from the work site to an approved disposal/recycling center by an approved transportation company.

D. Continuously maintain custody of all hazardous material generated at the work site including security, short-term storage, transportation, and disposition until custody is transferred to an approved disposal site or recycling center. Document continuous chain-of custody.

E. At completion of hauling and disposal of each load submit copy of waste manifest, chain of custody form, and landfill receipt to Engineer.

3.06 RECYCLING AND RECOVERY

A. Turn over waste that contains materials for which recovery and/or recycling is possible to an approved recycling center. Materials subject to recycling include:

1. Mercury Vapor Light Bulbs

2. Batteries

END OF SECTION

**SECTION 02200**

**EARTHWORK, EXCAVATION, TRENCHING AND BACKFILLING**

PARAGRAPH INDEX

**SECTION 02200**

**EARTHWORK, EXCAVATION, TRENCHING AND BACKFILLING**

## PART 1 - GENERAL

1.01 DESCRIPTION

A. The Contractor shall provide all labor, materials, equipment and services necessary for, and incidental to, preparing the site, excavating, trenching, excavation support and dewatering systems, drainage, pumping, proofrolling, laboratory testing, backfilling, compacting, in-place field compaction testing, grading, paving, topsoiling, sodding, seeding, mulching and protection of the work as shown on the Drawings, as herein specified, and in accordance with the STANDARD SPECIFICATIONS, as defined below.

B. The Contractor shall accept the site in the condition that it exists at the time of the award of the Contract.

C. All materials excavated shall be unclassified, as described in Paragraph 3.04 EXCAVATION AND SUBGRADE PREPARATION. The Engineer will determine whether materials that are to be used in the work are suitable or unsuitable, as defined in Paragraph 2.01 FILL AND BACKFILL MATERIAL, after reviewing the test results as required in Paragraph 1.04 MONITORING AND TESTING. All excess or unsuitable materials excavated shall be removed from the site by the Contractor and disposed of at a permitted off-site disposal location of its own choosing, at no additional cost to the Owner.

D. The Contractor shall be aware that the work shall also include requirements described in the following Paragraphs of this section:

1.07 TEMPORARY EXCAVATION SUPPORT SYSTEMS

3.12 HOT MIX ASPHALT (HMA) PAVEMENT

1.02 RELATED WORK INCLUDED ELSEWHERE:

Section 01010 SUMMARY OF WORK

Section 01025 MEASUREMENT AND PAYMENT

Section 01900 SUBMITTALS

Section 02605 UNDERGROUND PIPING, VALVES AND APPURTENANCES

Section 03300 CAST-IN-PLACE CONCRETE

1.03 QUALITY ASSURANCE

A. Standard Specifications and Details

Reference in this Section to STANDARD SPECIFICATIONS or STANDARD DETAILS shall mean the following, and are hereby made part of this specification:

1. Maryland Department of Transportation, State Highway Administration (MDSHA), "Standard Specifications for Construction and Materials", dated July 2008, with the latest incorporated revisions.

2. The official Book of Standards for Highway and Incidental Structures, edited by the Maryland Department of Transportation, State Highway Administration (MDSHA), with the latest incorporated revisions.

3. "2000 Maryland Stormwater Design Manual, Volumes I and II", prepared by the Center for Watershed Protection and the Maryland Department of the Environment, with the latest incorporated revisions.

In case of conflict between the STANDARD SPECIFICATIONS or STANDARD DETAILS and this contract specification, this contract specification shall govern.

B. Codes and Standards

The following Standards in effect on the date bids are received form a part of this Specification to the extent indicated by the following references:

American Association of State Highway and Transportation Officials (AASHTO):

M 6 Fine Aggregate for Portland Cement Concrete

M 43 Standard Sizes of Coarse Aggregate for Highway Construction

M 145 Classification of Soils and Soil-Aggregate Mixtures

T 88 Particle Size Analysis of Soils

T 89 Determining the Liquid Limit of Soils

T 90 Determining the Plastic Limit and Plasticity Index of Soils

T 119 Slump of Portland Cement Concrete

T 180 Moisture-Density Relations of Soils Using 10-lb. Ram and 18-inch Drop

T-99 Moisture-Density Relations of Soils Using 5-lb. Ram and 12-inch Drop

T 191 Density of Soil In-Place by the Sand-Cone Method

T 206 Penetration Test and Split-Barrel Sampling of Soils

T 238 Density of Soils and Soil-Aggregate In-Place by Nuclear Methods

T 239 Moisture Content of Soil and Soil-Aggregate In-Place by Nuclear Methods

T 265 Laboratory Determination of Moisture Contents of Soils

American Society for Testing and Materials (ASTM):

D421-85(98) Standard Practice for Dry Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants

D422-63(98) Standard Test Method for Particle-Size Analysis of Soils

D698-00 Compaction Characteristics of Soil Using Standard Effort

D1557-00 Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3))

D2216-98 Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

D2487-00 Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)

D2922-01 Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

D3740-01 Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction

D4318-00 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

D5261-92(03) Standard Test Method for Measuring Mass Per Unit Area of Geotextiles

E329-00b Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

E548-94e1 Standard Guide for General Criteria Used for Evaluating Laboratory Competence

All work shall comply with Occupational Safety and Health Regulations for Construction of the Code of Federal Regulations.

1.04 MONITORING AND TESTING

A. Monitoring

The Contractor shall perform excavation, subgrade preparation, and construction of fills and backfills under the direct monitoring and approval of the Engineer. The Contractor shall allow safe access for the Engineer to all parts of the project at all times.

B. Testing

The Contractor shall be responsible for all testing of concrete, pavement and soils, including field sampling, laboratory testing, and inspection and field testing. The Contractor shall employ the services of an independent, professional testing consultant to perform the work. Inspections and test results shall be certified by the testing consultant's licensed professional engineer, stating that the tests and observations were performed by the consultant or under the direct, supervision of the consultant, that the results are representative of the materials or conditions being certified by the tests, and that the results are in conformance with the these Specifications. All costs for inspection and testing will be incidental to the Proposal and additional payment will not be made.

C. Testing Facilities

The testing consultant shall provide the services of an approved commercial testing laboratory. Approval of testing facilities shall be based on requirements described in ASTM D 3740 and ASTM E 329.

D. Laboratory Testing

Test reports or material certifications shall be submitted to the Engineer prior to use of any material in the work. Any change in the source or change in the character of the material shall require the Contractor to retest and resubmit for approval. Material certifications and laboratory test reports shall include the following:

1. Source of Material
2. Particle Size Analysis (AASHTO T88)
3. Modified Proctor (AASHTO T180)
4. Natural Moisture (AASHTO T265)
5. Atterberg Limits (AASHTO T89 and T90)

E. In-Place Field Compaction Testing

1. Nuclear gauge calibration checks of both density and moisture shall be performed by the Contractor's consultant at the beginning of the project, and at intervals as directed by the Engineer. The calibration curves shall be checked and adjusted if necessary by the procedure described in ASTM D 2922 paragraph "Adjusting Calibration Curve". Copies of calibration curves and results of calibration tests

shall be furnished to the Engineer within 24 hours of the conclusion of tests.

2. The Contractor's consultant shall perform inspection and in-place field compaction tests of the density and moisture content of fill and backfill. Upon completion of each layer of fill in a designated area, the Contractor shall be required to allow time for the Engineer to inspect the tests performed by the testing consultant. Copies of test results shall be furnished to the Engineer within 24 hours of the conclusion of tests.

3. The Engineer or Engineer's qualified testing consultant may perform and pay for additional tests to check the Contractor's work. The Contractor shall provide a smooth surface at any point requested by the Engineer on which to perform the compaction test.

4. Tests performed by the Contractor's consultant shall be in randomly selected locations and in sufficient numbers to verify that the specified density is being obtained. The following number of field density tests shall be the minimum acceptable for each type operation:

   a. Fills: One test per lift per 10,000 square feet or fraction thereof.

   b. Backfill Against Structures: One test per lift per 100 linear feet.

   c. Trench Bedding and Backfill: One test per lift per 200 linear feet.

5. If the compaction test results do not meet those specified, the material shall be removed, replaced, recompacted, and retested to meet the specification requirements.

1.05 JOB CONDITIONS

A. Subsurface Investigations

1. The Owner has had a number of subsurface test borings made at various locations shown on the Drawings. Geotechnical data, including Driller's boring logs and laboratory test results, are part of the Geotechnical Report, and are in the Appendix. The geotechnical data have been included for informational purposes to the Contractor. The Contractor shall be responsible for making any interpretations or conclusions drawn from the information contained therein. Neither the Engineer nor the Owner will be responsible for the conclusions drawn by the Contractor from the information presented or implied.

2. Boring samples are presently being stored by the office of Whitman, Requardt and Associates in Baltimore, Maryland and they may be reviewed at a time acceptable to the Owner and the Engineer.

3. The Contractor shall be responsible for reading the geotechnical data, and shall become familiar with the site and the subsurface conditions. Ignorance of conditions will not be accepted as a basis of claim for additional compensation. The Owner does not warrant or guarantee that the conditions actually encountered in the prosecution of the work under this contract will be the same as the conditions indicated by the geotechnical data. No additional compensation will be allowed the Contractor because of subsurface conditions actually encountered in the work.

4. The Contractor shall determine to its own satisfaction the ground water conditions and character and type of soil, decomposed rock, rock and other material to be encountered in the work to be done under this Contract.

5. If the Bidder determines, after visiting the site and reading the geotechnical data, that the data is not sufficient for bid preparation, the bidder may make its own investigation and tests, at a time acceptable to the Owner and as specified elsewhere. All government and private approvals and/or permits shall be obtained in writing by the Contractor prior to performing any investigations or tests.

B. Existing Utilities

1. The existing utilities shown on the Drawings are from available records and field surveys. The Contractor shall verify all information to its own satisfaction, and shall notify the Engineer and utility owner of any impact to the work. The Contractor shall test pit existing utilities that impact construction two weeks in advance of excavation after the approval of the Engineer. These test pits shall be performed at no additional cost to the Owner and are incidental to the Proposal.

2. Should uncharted piping or other utilities be encountered during excavation, the Contractor shall notify the Engineer and the utility owner immediately. The Contractor shall cooperate with the Engineer and the utility owners in keeping services and facilities in operation.

3. Utilities designated to remain in place or that serve adjacent structures are to be protected and maintained at all times during construction. Active utility lines damaged in the course of construction operations shall be repaired or replaced immediately at no additional cost to the Owner, the Engineer, or utility owner.

4. The Contractor shall demolish and completely remove from the site existing underground utilities that are designated to be removed.

Where existing utilities interfere with placement of the work, the Contractor shall relocate utilities as a part of the work, as directed by the Engineer.

1.06 DEWATERING, DRAINAGE AND PUMPING

A. During construction, the grading operations shall be performed in such a manner that the excavations shall be well drained at all times. Sufficient grading shall be performed during the progress of the work so that no water, at any time, is allowed to flow towards the walls of the structures or trenches. The entire site shall be well drained and free from water pockets. When necessary, sumps shall be provided and pumped continuously. The Contractor shall maintain and keep all ditches open and free from soil and debris while in service or until final acceptance of the work and all grading shall be done on neat, regular lines. All work shall be done in proper sequence with all other associated operations. Before any slab or surfacing is placed, all utilities to be covered shall be installed and all drainage facilities shall be installed that are required to allow free and uninterrupted flow of the surface and ground water from the site or to pumping sumps.

B. The Contractor shall provide and continuously operate and maintain all temporary dewatering, drainage and pumping systems required to satisfactorily perform all work under the Contract. Water shall be controlled to such an extent as may be necessary to keep excavations free from water during construction and to maintain a minimum of 12 inches dry below the bottom of pipes and structures. The Contractor shall be entirely responsible for the design and adequacy of the dewatering system.

C. Dewatering systems required to perform the work shall be provided, operated and maintained by the Contractor at no additional cost to the Owner.

D. The Contractor shall exercise every precaution to prevent flotation of any of the work constructed under this Contract, and the Contractor shall be responsible for all damage due to flotation.

E. Such grading shall be done as necessary to prevent surface water from flowing into trenches or other utility excavations, and any water accumulating therein shall be continuously removed and properly filtered to remove sediment.

F. The method of water disposal shall be in accordance with State of Maryland sediment and storm water management requirements, and in compliance with all other erosion and sediment control regulations and regulatory agencies.

G. Methods of dewatering excavations shall be at the Contractor's discretion. Continuous investigations and checks shall be made by the Contractor to assure that the dewatering system employed is functioning properly, and not causing damage or settlement to adjacent surfaces or structures. Temporary pipes or flumes shall be used to carry surface water across open and/or

unstabilized construction areas. The system shall be modified as required and repairs for damage caused by the system shall be the responsibility of the Contractor.

H. Should the Contractor's dewatering operations affect any existing private water supply well or spring used as a water source, the Contractor shall, at no additional cost to the Owner, take whatever steps are necessary to provide uninterrupted water service, including the installation of temporary water lines or the installation of permanent wells with treatment systems, if required. The Contractor shall provide bottled water immediately to residents whose private wells are damaged during construction.

1.07 TEMPORARY EXCAVATION SUPPORT SYSTEMS

The Contractor shall temporarily support the sides and ends of all excavations, where necessary, with braces, sheeting, shoring, stringers or other methods of the type, size and quality required. The Contractor shall be entirely responsible for the design and adequacy of the excavation support system.

Pile driving hammers or vibratory hammers shall only be used to drive or extract temporary excavation support systems when approved in writing by the Engineer. However, the Contractor shall be responsible for any damage caused by operations involving vibrations.

Direction by the Engineer to leave portions of the temporary excavation support systems in-place, or the absence of direction by the Engineer to leave portions in-place, does not relieve the Contractor from its responsibility to protect existing structures and facilities.

A. Unless otherwise specified on the Drawings or directed by the Engineer, temporary excavation support systems shall be removed as refilling proceeds, in a manner so as not to damage any structures, roadbed, fill or private property.

Payment will not be made for use of temporary excavation support systems; the cost will be incidental to the bid items in the Proposal.

B. If, where specified on the Drawings, excavation support systems are to be left in-place after backfill has been completed, they shall be cut off 2 feet below finished grade.

Payment will not be made for excavation support systems specified on the Drawings to be left in-place; the cost is included in the bid items in the Proposal.

C. If the Engineer determines that removal of temporary excavation support systems will jeopardize any existing facilities or any of the work performed under this Contract, the Engineer may direct the Contractor to leave all or

part of the temporary excavation support systems in-place and to cut them off 2 feet below finished grade.

Additional payment for temporary excavation support systems directed by the Engineer to be left in-place will be in accordance with the cost approved by the Owner.

D. Although not directed by the Engineer, if the Contractor determines that removal of temporary excavation support systems will jeopardize any existing facilities or any of the work performed under this Contract, the Contractor may, with the written approval of the Engineer, leave all or part of the temporary excavation support systems in-place and shall cut them off 2 feet below finished grade.

Payment will not be made for temporary excavation support systems requested by the Contractor to be left in-place.

1.08 RESPONSIBILITY FOR CONDITION OF EXCAVATIONS

A. The Contractor shall be entirely responsible for the condition of all excavations performed by the Contractor, for the entire period of the Contract. All slides, caves or other unacceptable conditions shall be promptly corrected whenever they occur, without extra compensation.

B. The neglect, failure or refusal of the Engineer to order or approve any excavation support system shall not in any way or to any extent relieve the Contractor of any responsibility concerning the conditions of excavations or of any of its obligations under the Contract; nor shall any delay whether caused by an action or want of action on the part of the Contractor or by any action or want of action of the Owner or its agents or employees, or the Engineer, resulting in the keeping of an excavation open longer than would otherwise have been necessary, relieve the Contractor from the necessity of properly and adequately protecting the excavation from caving or slipping, nor from any of its obligations under the Contract relating to injury of persons or property nor entitle it to any claim for extra compensation.

1.09 PROTECTION OF PROPERTY, STRUCTURES AND UTILITIES

The Contractor shall, at its own risk and at no additional cost to the Owner, maintain, support-in-place, and protect all pipes, poles, cables, utilities, walls, buildings, and other structures or property in the vicinity of its work, whether above or below ground, or that may appear in the excavation. The Contractor shall at all times have available on site sufficient quantity of timber, planks, beams, chains, ropes, etc., and shall use them as necessary for supporting any structures and utilities that are uncovered, undermined, endangered, threatened or weakened. The Contractor shall be responsible for all damage, shall take all risks, and shall assume all expense for injury or damage, to any person or property of every kind and description, caused

directly or indirectly by the Contractor's work, whether such structures or utilities are or are not shown on the Drawings. In the event that the Contractor damages any existing utility lines the Contractor shall notify the Engineer and the utility owner immediately.

1.10 SUBMITTALS

The Contractor shall submit the following in accordance with the Proposal.

A. Qualifications of the independent, professional testing consultant and commercial testing laboratory shall be submitted to the Engineer for approval prior to use in the work, in accordance with Paragraph 1.04 MONITORING AND TESTING.

B. Material certifications and laboratory test reports shall be submitted to the Engineer for approval prior to use in the work, in accordance with Paragraph 1.04 MONITORING AND TESTING.

C. Manufacturer's product catalog data for geosynthetics (geotextiles, geogrids, geocomposites, geomembranes, etc.) to be furnished, shall be submitted to the Engineer for approval, showing compliance with the specification requirements of PART 2 - PRODUCTS. The submittal shall be provided a minimum of two weeks prior to the planned installation of the materials, shall include two samples of each material to be furnished, and shall be labeled appropriately with the Manufacturer's name and product identification.

D. A Compaction Plan shall be submitted to the Engineer for approval, including a list of proposed compaction equipment to be used, Manufacturer's specifications and catalog data, and the Contractor's plan for compaction in the work.

E. Delivery tickets shall be submitted by the Contractor for each load of material brought to the site under the authorization of the Engineer showing the following information:

1. Name and location of supplier or source.

2. Type and amount of material delivered by volume and weight.

3. Test information on the material as required by this Specification Section.

F. Copies of nuclear gauge calibration curves and results of calibration tests shall be furnished to the Engineer within 24 hours of conclusion of tests.

G. Copies of test results and re-test results of in-place field compaction shall be furnished to the Engineer within 24 hours of conclusion of each test.

H. Excavation Support Systems and Dewatering Systems

1. Contractor shall submit working drawings and calculations for the design of all excavation support systems and dewatering systems to be utilized for the project.

The working drawings and calculations shall be performed by an engineer obtained and paid for by the Contractor. The Contractor's engineer shall be a professional engineer engaged in such practice and licensed in the State of Maryland, and shall sign and seal all drawings and calculations. Signed and sealed drawings and calculations submitted to the Engineer will be for information only.

2. The working drawings and calculations for the dewatering systems shall include the following information:

   a. Planned method of dewatering.

   b. Excavation plan.

   c. Location of the water table before and during dewatering.

   d. Location and capacity of such facilities as dewatering wells, well points, sumps, collection and discharge lines, proposed standby unit, and protective fills and ditches required for control of ground water and surface water.

3. The Contractor shall obtain and submit copies of all permits that may be required for installation and operation of pumps, well points and dewatering wells.

4. The Contractor shall be responsible for determining the existing subsurface conditions for the excavation support systems and dewatering systems. The Owner does not guarantee or warrant the conditions actually encountered on this project. The Owner will not be held responsible for the basis of claims by the Contractor or any other parties in the execution of these systems. The Contractor's submittals of the excavation support systems and dewatering systems, prepared by the Contractor's engineer, are for information purposes only.

## PART 2 - PRODUCTS

2.01 FILL AND BACKFILL MATERIAL

A. Fill and backfill material shall be suitable material from on-site excavations or from other sources, unless otherwise shown on the Drawings. The material shall be clean earth. The material shall be free from vegetable matter, organic material, sludge, grit, trash, muck, roots, logs, stumps, frozen material or other deleterious substances. Rubber, ashes, cinders and other miscellaneous inorganic fill substances removed from required excavations within the project and that in the judgment of the Engineer will decompose, consolidate further, or shrink appreciably within the fill may not be

incorporated in the fill. Rubble and construction debris shall not be used in the work.

B. Except as otherwise specified or approved, the material shall not contain rocks or lumps larger than 6 inches in greatest dimension. No rocks or lumps larger than 3 inches in greatest dimension will be allowed within 12 inches of subgrade, or within 12 inches of pipes in all directions, or within 24 inches of any structure during backfill. The material shall not contain mica in quantities that, in the judgment of the Engineer, are sufficient to affect compaction characteristics. Materials having a maximum dry density of less than 100 pounds per cubic foot (AASHTO T180), and materials having a plasticity index (AASHTO T90) greater than 30, shall not be used unless specifically approved in writing by the Engineer.

C. Suitable material is any material that is not frozen, that has a moisture content at the time it is placed that enables the material to be compacted to the density specified, and that meets the quality requirements specified above for the particular location and application specified. Unsuitable material is any material not meeting all the requirements for suitable material.

2.02 BORROW MATERIAL

Borrow material, from off-site sources, shall meet the following requirements and shall be used only where specified on the Drawings or as required by the Engineer, and shall be furnished from a specific source or sources approved in writing by the Engineer:

A. Granular Borrow (AASHTO M145 Soil Groups A-2-4, A-2-5, A-2-6, A-2-7)

2.03 FINE SAND

Fine Sand shall meet the following requirements and shall be used only where specified on the Drawings or as required by the Engineer, and shall be furnished from a specific source or sources approved in writing by the Engineer:

A. Fine Sand (AASHTO M145 Soil Group A-3)

2.04 DENSE GRADED AGGREGATE (DGA)

Dense Graded Aggregate shall meet the following requirements and shall be used only where specified on the Drawings or as required by the Engineer, and shall be furnished from a specific source or sources approved in writing by the Engineer:

A. MDSHA GAB (Graded Aggregate Base)

B. MDSHA CR-6 (Crusher Run Aggregate)

2.05 OPEN GRADED COARSE AGGREGATE (OGCA)

Open Graded Coarse Aggregate shall meet the following requirements and shall be used only where specified on the Drawings or as required by the Engineer, and shall be furnished from a specific source or sources approved in writing by the Engineer:

A. MDSHA No. 57 Aggregate (AASHTO M43)

2.06 TOPSOIL

Topsoil shall meet the requirements of Paragraph 3.11 TOPSOIL, SODDING, SEEDING, AND MULCHING.

2.07 GEOTEXTILE

Geotextile shall be used only where specified on the Drawings or as required by the Engineer, and shall meet the following requirements.

Geotextile shall be a nonwoven fabric consisting of continuous filaments of polyester or polypropylene formed into a stable network by needle punching. It shall be inert to commonly encountered chemicals and hydrocarbons, mildew and rot resistant, and insect and rodent resistant. The fabric shall have a mass per unit area of at least 6 ounces per square yard as determined by ASTM D5261.

The geotextile shall provide a permeable layer or media, while retaining the soil matrix. It shall be provided in rolls wrapped with protective covering to protect the fabric from mud, dirt, and debris. The geotextile shall be TC Mirafi 160N or approved equal.

2.08 HOT MIX ASPHALT (HMA)

Hot Mix Asphalt (HMA) shall meet the requirements of Paragraph 3.12 Hot Mix Asphalt (HMA) Pavement and shall be used only where specified on the Drawings or as required by the Engineer, and shall be furnished from a specific source or sources approved in writing by the Engineer.

## PART 3 - EXECUTION

3.01 SITE PREPARATION

All rubble, trash, unusable and unsuitable material, pavements, concrete structures, piping, sludge, grit, etc., within areas required to be filled, excavated or graded, except as otherwise specified or shown, shall be fully removed from the site and disposed of by the Contractor, at no additional cost to the Owner. Such material may exist on the site. The Contractor shall obtain and pay for all necessary permits related to this disposal.

3.02 CLEARING AND GRUBBING

Trees outside of the immediate area of construction shall be protected from damage. All materials resulting from the clearing and grubbing operation; all trees, stumps, roots, brush, etc., within the areas required to be filled, excavated or graded, except as otherwise specified or shown, shall be fully removed from the site and disposed of by the Contractor, at no additional cost to the Owner. The Contractor shall obtain and pay for all necessary permits related to this disposal.

3.03 ROCK EXCAVATION

Blasting is not allowed on this project.

3.04 EXCAVATION AND SUBGRADE PREPARATION

A. A. Excavation shall be unclassified, and shall consist of the excavation of whatever material is encountered to the lines, grades, and sections shown on the Drawings and specified, including such excavation as is necessary for grading, pavements, walls, piers, slabs, footings, structures, trenches, utility systems and their appurtenances, ditches, curbs and other features. Excavation is included in the bid items in the Proposal, and in accordance with the contingent unit price items.

B. B. Suitable material removed from the excavation shall be reused as fill and backfill in the grading, filling, backfilling and preparation of subgrade for pavements, structures, and trenches and at such other places as directed, to the extent required to complete the work, unless otherwise shown on the Drawings. On-site excavated material that is determined to be unsuitable due to inadequate or excessive moisture content, shall be made suitable by thawing the material if it is frozen, or by aerating the material if it is too wet, or by spraying the material if it is too dry, to bring the moisture content within the required range. The material shall then be thoroughly mixed for uniform distribution of moisture content prior to placement and compaction, all at no additional cost to the Owner.

The Contractor shall properly store or stockpile and protect in approved manner, all materials that are to be reused in the work. The Contractor shall replace, at his own expense, material that was suitable when excavated, which has subsequently become unsuitable because of careless, neglectful, wasteful or unprotected storage. All unsuitable or excess material removed from the excavation shall be removed from the site and disposed of by the Contractor, at no additional cost to the Owner, except where disposal on the site is specifically provided for and approved in writing by the Engineer.

C. Subgrade Definitions

1. Subgrade for structures shall be as defined in Paragraph 3.06 FILLS AND BACKFILLS FOR STRUCTURES.

2. Subgrade for trenches shall be as defined in Paragraph 3.08 TRENCH BACKFILL.

3. Subgrade for areas to receive topsoil shall be as defined in Paragraph 3.11 TOPSOIL, SODDING, SEEDING AND MULCHING.

4. Subgrade for pavement shall be as defined in Paragraph 3.12 HOT MIX ASPHALT (HMA) PAVEMENT.

D. Where, in the opinion of the Engineer, unsuitable subgrade conditions are encountered under foundations, slabs, footings, pavements, structures, or utilities, a determination will first be made by the Engineer whether the condition is due to the in-situ condition, or is caused by the Contractor's construction methods.

1. Unsuitable foundation materials, which in the judgment of the Engineer are due to in-situ conditions, shall be excavated when ordered in writing by the Engineer, to the extent directed by the Engineer. All unsuitable material shall be removed to a firm bottom below subgrade elevations. The excavation below subgrade shall be refilled using suitable material as defined in PART 2 - PRODUCTS, and compacted in accordance with Paragraph 3.05 COMPACTED FILLS AND BACKFILLS. Under these conditions, payment for excavation below subgrade and backfill will be made in accordance with the applicable contingent unit price items included in the Proposal.

2. Unsuitable foundation conditions or areas disturbed or rendered unstable, which in the judgment of the Engineer are caused by the Contractor's construction methods or equipment, shall be corrected by the Contractor to the satisfaction of the Engineer,. These corrections shall include all necessary excavations and backfills, all at no additional cost to the Owner.

3. Overexcavation: Where excavations are made to a depth below the subgrade elevations shown on the Drawings or specified, without authorization, the excess excavation shall be filled to the required level as described above, at no additional cost to the Owner.

E. Preparation of the surface: Before depositing fill material, the surface of the ground shall be cleared of all refuse, rubble, and other debris. All organic matter, mud, muck, sludge and unsuitable soils shall be removed from the surfaces upon which fills are to be placed and the surface shall be leveled. Openings, animal burrows, stump holes, old pipes and other holes and depressions shall be eliminated, filled or cleaned as required.

F. Subgrade areas shall be proof rolled with a minimum of 3 slow passes of a large, smooth drum, vibratory roller capable of exerting a dynamic force of 4500 lbs/LF resulting in a net minimum dynamic force of 20,000 lbs (10 tons) or greater. Proof rolling shall be performed to densify the areas and to locate soft areas. Soft areas shall be removed, under direction of the

Engineer, and replaced with controlled, compacted fill as hereinafter specified.

G. Subgrade for all foundations, slabs, footings, pavements, structures, and utility excavations, shall be firm, undisturbed earth/rock except where drainage courses or compacted fills are specified or are required in areas where unsuitable material has been removed.

H. Whenever a condition is encountered where subgrade is at the bottom of a structure and subgrade is part rock and part soil, the rock shall be removed to a depth of 6 inches below subgrade and replaced with suitable material as directed by the Engineer and as defined in PART 2 - PRODUCTS, and compacted in accordance with Paragraph 3.05 COMPACTED FILLS AND BACKFILLS.

I. Where fills are made on hillsides or slopes, the slope of the original ground upon which the fill is to be placed shall be plowed or scarified deeply or where the slope ratio of the original ground or rock surface is steeper than five horizontal to one vertical, the ground or rock shall be stepped or benched.

3.05 COMPACTED FILLS AND BACKFILLS

Prior to placing any fill or backfill, notice shall be given the Engineer so that the work may be inspected, and filling or backfilling shall not proceed without the Engineer's approval. Unless otherwise noted in this Section, placing, spreading and compacting suitable material for fills and backfills shall be as follows:

A. Fill and backfill material shall be placed in approximately horizontal layers that, before compaction, shall not exceed 8 inches in thickness. Fill and backfill material within 5 feet of structures shall be placed in approximately horizontal layers that, before compaction, shall not exceed 6 inches in thickness. Each layer shall be spread uniformly and evenly. All rocks shall be distributed throughout the earth materials and all voids shall be carefully filled and the material properly compacted by rolling, tamping, vibratory compactors, or other methods specified herein and approved by the Engineer. Compaction by heavy rollers or other heavy equipment is prohibited within 5 feet of any structure.

B. Moisture content of fill and backfill material shall be within 2% above or below the optimum moisture content for the material while placing and during compaction. After each layer has been placed, mixed and spread evenly, it shall be thoroughly compacted to not less than the following:

1. 92% of maximum dry density for cohesive soils,

2. 95% of maximum dry density for cohesionless soils,

3. 97% of maximum dry density for fills and backfills within 12 inches of slab or roadway subgrade.

Cohesionless soils are defined as granular soils containing less than 15% by weight passing the No. 200 sieve. Optimum moisture content and maximum dry density shall be determined by AASHTO T 180. Weaving or creeping of the soil beneath the roller shall be sufficient evidence that the moisture content of the fill or subsoils is excessive, and that required compaction has not been achieved.

C. The fill or backfill shall be constructed in such a manner that the surface will be sloped to drain at all times and shall be sealed by rolling at the completion of each day or prior to rain. Materials containing free water or having a moisture content higher than specified shall not be deposited upon the fill or backfill until after they have been dried to the specified moisture content.

D. No fill or backfill shall be placed, spread or rolled while it is frozen or thawing or be placed upon frozen or thawing ground or during unfavorable weather conditions. Any compacted layer that has been previously frozen shall be reworked or removed before the next layer is placed.

3.06 FILLS AND BACKFILLS FOR STRUCTURES

A. Subgrade for structures is defined as the bottom of the granular bedding material, 6 inches below the underside of the slab or structure, unless otherwise noted on the Drawings.

B. Bedding material for structures shall be 6 inches of MDSHA No. 57 Aggregate, as defined in PART 2 - PRODUCTS, unless otherwise noted on the Drawings.

C. After completing the construction of structure foundations, footings, walls, etc., below finished grade, all forms shall be removed and the excavation cleaned of all trash and debris. The excavation shall not be used for the disposal of refuse. Any refuse or other foreign materials shall be removed before backfilling. Prior to placing any backfill, notice shall be given to the Engineer so that the work may be inspected, and backfilling shall not proceed without the Engineer's approval. No backfill shall be placed against any structure until the structure is complete and the concrete has reached its specified strength, or the structure has been properly braced and has sufficient strength to support the applied load.

D. The fill or backfill for structures shall be MDSHA GAB (Graded Aggregate Base), as defined in PART 2 - PRODUCTS, unless otherwise noted. Compaction shall be in accordance with Paragraph 3.05 COMPACTED FILLS AND BACKFILLS.

E. If contingent unit price items are used for backfill of structures, measurement will be based on the actual in-place volume of material not exceeding vertical planes 18 inches outside of the structure, and payment will be in accordance with Paragraph 3.10 CONTINGENT BORROW AND AGGREGATE.

3.07 TRENCH EXCAVATION

A. The length of trench opened at any one time or location in advance of the completed placement of the pipelines shall be not more than three pipe lengths of trench, unless by written permission of the Engineer. The Engineer shall be empowered at any time to require the backfilling of open trenches over completed pipe lines if, in his judgment, such action is necessary. The Contractor shall have no claim for extra compensation, even though to accomplish said filling, he is compelled temporarily to stop excavation, or other work at any place.

B. If work is stopped on any trench for any reason except by order of the Engineer, and if, in the opinion of the Engineer, the excavation is left open for an unreasonable length of time in advance of construction, the Contractor shall, if so directed, backfill the trench at no additional cost to the Owner, and shall not again open the trench until ready to complete the construction therein. If the Contractor refuses or fails to backfill the trench completely within twenty-four (24) hours after said notice, the Engineer shall be authorized to have the work done by others, and the Owner shall charge the cost thereof to the Contractor and retain the same out of any monies due or to become due to the Contractor under the Contract.

C. In roadway areas, length of open trench shall be limited to only that length sufficient to advance the trench box or sheeting ahead of the pipe construction operation and to provide a minimum safe working distance between the backfilling operation and the pipe construction operation. No trenches are to be left open after working hours. Trenches shall be backfilled or plated in such a manner as to not impede pedestrians or vehicles.

D. The width, depth, and clearances of trenches shall be excavated as necessary, as specified or directed, and as may be shown on the Drawings or the Standard Details. The clearance between each face of trench and external surface of barrel of pipe or hubs shall not be less than indicated. The sides of the trenches shall be vertical to the top of the pipe and practically plumb above this point and under no circumstances will they be allowed to be sloped except with the approval of the Engineer.

E. In case the Engineer shall direct that the location of a trench be changed from that shown on the Drawings on account of the presence of an obstruction or from other cause, or if changed location shall be authorized upon the Contractor's request, the Contractor shall not be entitled to extra compensation or to a claim for damage provided that the change is made before the excavation is begun.

3.08 TRENCH BACKFILL

Trench backfill is included in the Proposal. Payment for trench backfill using contingent unit price items will be in accordance with Paragraph 3.10 CONTINGENT BORROW AND AGGREGATE, and will be based on the

measurement of the actual in-place volume of material, but in no instance greater than the width shown on the Drawing details, for the full depth of the trench.

During backfilling, great care shall be taken not to disturb the pipes by dropping or throwing anything on them from the bank above, or by walking on top or alongside of them.

A. Trench Subgrade

1. Subgrade for trenches is defined as the bottom of the granular bedding material, 6 inches below the underside of the pipe barrel for soil subgrade or 12 inches below for rock subgrade, or the underside of the pipe barrel if the pipe is laid on a natural foundation, as shown on the Drawing details and as described below.

2. The trench subgrade shall be firm and stable undisturbed earth such as to provide a uniform and continuous bearing and support for the pipe and bedding.

B. Undercut and Refill

1. The Contractor shall undercut below trench subgrade, where in the opinion of the Engineer, unsuitable, soft or unstable material is encountered. The Contractor shall remove the unsuitable, soft or unstable material to a firm bottom or to the extent directed by the Engineer. Any part of the bottom of the trench excavated below the specified subgrade shall be corrected as described herein.

2. Refill material, up to trench subgrade, shall be any Dense Graded Aggregate (DGA) meeting the requirements as defined in PART 2 – PRODUCTS.

3. Refill material shall be compacted in accordance with Paragraph 3.05 COMPACTED FILLS AND BACKFILLS. Normal bedding and pipe shall be placed directly onto the compacted refill.

4. Payment for undercut and refill will be in accordance with the contingent unit price item(s) included in the Proposal.

C. Pipe Bedding

1. Bedding depth shall be from trench subgrade, up to the dimension above the underside of the pipe barrel, as shown on the Drawing details for each trench condition.

2. Bedding material, for all types of pipe, shall be any Dense Graded Aggregate (DGA) meeting the requirements as defined in PART 2-PRODUCTS.

3. Bedding material shall be compacted using approved hand-operated mechanical tampers or approved compaction equipment before laying

the pipe and during placement of the haunch, in accordance with Paragraph 3.05 COMPACTED FILLS AND BACKFILLS.

Compacted bedding material shall provide a uniform and continuous bearing and support for the full length of each pipe, except for that portion under the bell. Bell holes shall be excavated in the bottom and sides of bedding to allow for the proper making of joints, without extra payment.

4. Payment for pipe bedding is included in the Proposal.

D. Initial Backfill

1. Initial backfill depth shall be from the top of the pipe bedding to 1 foot above the crown of the pipe, as shown on the Drawing details for each trench condition.

2. Initial backfill material, for all types of pipe, shall be suitable on-site backfill material excavated from the trench, or borrow material, or any Dense Graded Aggregate (DGA) meeting the requirements as defined in PART 2 – PRODUCTS.

3. Initial backfill material shall be placed in 6-inch layers and compacted using approved hand-operated mechanical tampers or approved compaction equipment in accordance with Paragraph 3.05 COMPACTED FILLS AND BACKFILLS.

4. Payment for initial backfill is included in the Proposal or the contingent unit price items.

E. Final Backfill

1. Final backfill depth shall be from 1 foot above the crown of the pipe to finished subgrade, as defined in Paragraph 3.04 EXCAVATION AND SUBGRADE PREPARATION, and as shown on the Drawing details for each trench condition.

2. Final backfill material, for all types of pipe, shall be suitable on-site backfill material excavated from the trench, or borrow material, or any Dense Graded Aggregate (DGA) meeting the requirements as defined in PART 2 – PRODUCTS. No rock or lump greater than 6 inches in greatest dimension shall be used for final trench backfill.

3. For this project, all areas shall be considered as improved areas, and final backfill material shall meet the following requirements:

Final backfill material shall be placed in 6-inch layers and compacted to 92% or 95% of the maximum dry density in accordance with Paragraph 3.05 COMPACTED FILLS AND BACKFILLS.

4. Payment for final backfill is included in the Proposal or the contingent unit price items.

3.09 THRUST RESTRAINTS FOR PIPE

Excavation for thrust blocks or buttresses, thrust collars, and combination buttress/structure, shall be to the limits shown or described on the Drawings or in the STANDARD DETAILS. Subgrade shall be the bottom of the buttress, collar or buttress/structure, whether on soil or rock, and the bottom and face shall be poured against stable undisturbed earth, unless otherwise noted. Thrust blocks or buttresses, and the limits designated for restrained joints, shall be as shown on the Drawings.

3.10 CONTINGENT BORROW AND AGGREGATE

A. If the Engineer determines that sufficient suitable, on-site, fill or backfill material is not available from the required excavations to perform the work required, the Engineer will direct that the Contractor shall furnish borrow material from approved off-site sources. Borrow material shall not be used unless all available suitable excavated material has been utilized for the work. If on-site excavated material is determined to be unsuitable due to inadequate or excessive moisture content, the Contractor shall make the material suitable as specified in Paragraph 3.04 EXCAVATION AND SUBGRADE PREPARATION.

B. The Engineer may direct the use of any additional quantity of borrow and/or aggregate to be used below subgrade or at locations other than as specified on the Drawings.

C. Borrow and/or aggregate shall be as specified in PART 2 – PRODUCTS. Placement and compaction of these materials shall be in accordance with Paragraph 3.05 COMPACTED FILLS AND BACKFILLS. Payment will be in accordance with the appropriate contingent unit price item of the Proposal.

3.11 TOPSOIL, SODDING, SEEDING AND MULCHING

A. The Contractor shall be responsible for stripping all topsoil to depths in which found. The topsoil shall be carefully segregated from the trench materials and stockpiled for reuse in the work. Upon completion of the excavation work, the Contractor shall replace the topsoil to the depths in which found and to a minimum depth of 4 inches. The Contractor shall provide the hauling, grading and topsoil, as needed from approved off-site sources, and as required and necessary to provide the specified topsoil depth, all at the Contractor’s expense and at no additional cost to the Owner.

B. Subgrade for topsoil is defined as the surface upon which the topsoil is placed. Salvaged topsoil shall be existing topsoil stripped from the site within the prescribed limits. Furnished topsoil shall be the Contractor's responsibility to obtain from approved off-site sources.

C. For all non-paved disturbed areas of the site, place a 4-inch depth of topsoil on areas to be seeded and a 2-inch depth of topsoil on areas to be sodded, unless otherwise noted on the Drawings, or specified. The Contractor shall

provide grading and fine grading as required to restore the site. Upon completion of grading and prior to final seeding and mulching all debris shall be cleaned up and removed from the site.

D. Fine grading, salvaged or furnished topsoil, sodding, seeding and mulching, and the placement thereof, shall in accordance with Sections 208, 701, 702, 703, 705, 708, and 920 of the STANDARD SPECIFICATIONS.

E. Payment will not be made; the cost will be incidental to the lump sum price or unit prices in the Proposal.

3.12 HOT MIX ASPHALT (HMA) PAVEMENT

A. The Contractor shall provide all labor, materials, equipment and services necessary for, and incidental to, the construction of all paved areas, or repair of all paved areas disturbed by the work on this project, as shown on the Drawings or as specified herein, and in accordance with the requirements of the STANDARD SPECIFICATIONS.

B. Asphalt concrete surface courses for paved areas shall not be placed until completion of all earthwork, backfilling and finish grading. Upon completion, tracked vehicles shall be prohibited from traveling on pavements.

C. Subgrade for pavement is defined as the bottom of the pavement cross-section, in accordance with the details shown on the Drawings, and shall be prepared in accordance with Paragraph 3.04 EXCAVATION AND SUBGRADE PREPARATION.

D. Hot Mix Asphalt (HMA) Pavement shall be constructed to the finished grades, cross-section, and requirements shown on the Drawings, and shall be in accordance with PART 2 – PRODUCTS, the STANDARD SPECIFICATIONS, and the following minimum depths. Bituminous Tack Coat and Bituminous Prime Coat shall be in accordance with the STANDARD SPECIFICATIONS.

1. Asphalt Concrete Surface Course:

   2 inches of MDSHA HMA Superpave 12.5 mm, PG 64-22, Level 2

2. Asphalt Concrete Base Course:

   4 inches of MDSHA HMA Superpave 25.0 mm, PG 64-22, Level 2

3. Dense Graded Aggregate Base Course:

   6 inches of MDSHA DGA, compacted to a density of at least 97% of maximum dry density as determined by AASHTO T-180, and Paragraph 3.05 COMPACTED FILLS AND BACKFILLS.

E. Payment will not be made; the cost will be incidental to the lump sum price or unit prices in the Proposal.

END OF SECTION

**SECTION 02600**

**UNDERGROUND PIPING, FITTINGS, AND VALVES**

**PARAGRAPH INDEX**

## SECTION 02600

## UNDERGROUND PIPING, FITTINGS, AND VALVES

### PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Underground pipe and fittings shall be in accordance with the Standard Specifications, the Contract Drawings, and the Standard Details, except as modified herein.

B. Earthwork shall be in accordance with Section 02200 of these Special Provisions.

1.02 DESCRIPTION

A. The Contractor shall furnish all labor and materials required to construct and test piping for water supply and distribution system as shown on the Contract Drawings and as specified herein.

B. The Contractor shall furnish and install all necessary fittings and special pieces required for closures, bends, branches, joint restraints, and connections to other pipes.

C. Ductile iron pipe (DIP) and Prestressed Concrete Cylinder Pipe (PCCP) and fittings shall be in accordance with the Standard Specifications except as modified herein.

1.03 SUBMITTALS

A. The Contractor shall make all submittals in accordance with Section 01900 of these Special Provisions.

B. Shop Drawings shall be required for all pipe, fittings, closure pieces, valves and appurtenances and shall include but not necessarily be limited to the following:

1. Certification that the pipe, fittings and appurtenances are in conformance with the applicable standards and design criteria as specified herein and include details of special fittings, joints, and gasket dimensions. When items can be clearly identified by manufacturer's standard catalog cuts or other descriptive data, this material will be satisfactory.

2. Complete dimensions, showing intended orientation of valves and operators and clearly identifying the location at which the appurtenance is to be installed.

C. The Contractor shall submit manufacturer's operation and maintenance manuals and certificates for valves.

1.04 QUALITY ASSURANCE

A. Quality control shall be in accordance with Section 01400 of these Special Provisions.

B. Certificates of compliance must be supplied in accordance with the Standard Specifications. The manufacturer shall provide an affidavit certifying that the underground pipe, fittings, and appurtenances comply with the standards cited in the piping and fittings schedule.

1.05 EXISTING UTILITIES

A. For the convenience of the Contractor, existing and planned utilities have been indicated on the Contract Drawings in accordance with the best available information. The County expressly disclaims any responsibility for accuracy or completeness of information shown. Existing utilities and services shall be carefully protected. Any damage to utilities caused by the work under this Contract shall be immediately repaired by the Contractor to the satisfaction of the Engineer, using materials of the kind damaged.

B. The Contractor shall bear the entire cost of any and all monetary penalties which may be assessed by utilities whose facilities are damaged by the Contractor and/or taken out of service during the prosecution of the work under this Contract.

**PART 2 - PRODUCTS**

2.01 GENERAL

A. All pipe and fittings shall be new, of the sizes indicated on the Contract Drawings or as specified herein.

2.02 PIPE SCHEDULE

| SERVICE | SIZE | PIPE MATERIAL |
|---|---|---|
| Water Main | 16” thru 30” | Ductile Iron, AWWA C151/ANSI A21.51, Ductile Iron Fittings AWWA C110/ANSI A32.10 |

2.03 DUCTILE IRON PIPE AND FITTINGS

A. Pipe

Pipe shall be thickness Class 54 for the water mains and tank drain, as shown in

Table 3 of AWWA C151.

B. Joints

1. Pipe and pipe fitting joints shall be rubber gasketed push-on type, conforming to AWWA C111.

2. Where restrained joints are indicated on the Contract Drawings, the joints shall be TR FLEX, as manufactured by United States Pipe and Foundry Company; Lok-Ring, as manufactured by American Cast Iron Pipe Company; or equal, for push-on type joints.

3. Mechanical joints shall conform to AWWA C111. Connection to mechanical joint ductile iron fittings, where restrained, shall be by means of a mechanical joint restraint gland for use with ductile iron pipe. Restraint gland shall be Mega-Lug 1100 Series, as manufactured by EBAA Iron, Inc., or equal. Restraint glands shall be ductile iron and factory epoxy coated. Bolts shall be field coated with bituminous seal coat after installation.

4. Flanged joints shall be of ductile iron construction, drilled and faced for Class 125, in accordance with ANSI B16.1.

5. All flanged joint systems (bolts, nuts, gaskets and installation) are to be suitable for the intended service and have a minimum pressure rating of 250 psi.

C. Fittings

Fittings shall be designed and manufactured to withstand a pressure of not less than that of the adjacent pipe. Fittings shall have a minimum pressure rating of 150 psi.

D. Lining

All pipe and fittings shall be cement-lined, double thickness, in accordance with AWWA C104. The lining shall be sealed with a bituminous seal coat.

E. Coating

1. All pipe shall be asphalt coated in accordance with AWWA C151, unless otherwise noted

2. All fittings shall be asphalt coated in accordance with AWWA C110, unless otherwise noted.

F. Specials

1. Where required or shown, the Contractor shall provide ductile iron or PCCP specials, such as closures, less than standard lengths of pipe,

combination of ends, and non-standard fittings. The specials shall conform in material, thickness, and finish to the pipe in which they are installed, or connected to.

2. Drawings show the likely arrangement of fittings and specials, but these details cannot be guaranteed due to existing field conditions.

3. Verify the size and dimensions of the existing pipe and fittings, and provide pipe and fittings with the correct dimensions to connect to the existing pipe, fittings, or to complete a closure. Detailed Drawings for these purposes shall be submitted by the Contractor for review and approval.

G. Each piece of ductile iron pipe shall have the weight and class designation conspicuously painted on it as near as possible to the flanged or bell end of the pipe and these designations shall be clearly legible.

H. The mechanical joint shall consist of a rubber or composition tapered gasket, a cast iron gland ring and cast iron T- head bolts. The joint shall be in accordance with AWWA C600-99 or the latest revision thereof.

2.04 PRESTRESSED CONCRETE CYLINDER PIPE FITTINGS

4. Prestressed concrete cylinder pipe fittings shall be in accordance with AWWA C-301. Pipe shall be joined using flanged, mechanical joint, vitaulic, or bell and spigot ends as shown on drawings.

5. Closure pieces and end fittings shall conform in material, thickness, finish and design pressure to the pipe to which they are connected.

2.05 BUTTERFLY VALVES

A. Valves

1. Butterfly valves shall comply with AWWA C-504, except as modified by these Special Provisions. Valves shall be Class 250B, suitable for direct burial, and designed for a differential pressure across the valve of two hundred fifty (250) psi, and a minimum flow of fifteen feet (15') per second for opening and closing. The rating shall be based on a design stress of three to one (3 to 1) on the yield strength or five to one (5 to 1) on a tensile strength of the materials used. Valves shall be furnished with mechanical joint ends (conforming to AWWA C110/ANSI A21.11 and AWWA C-111) complete with bolts, nuts, retainer glands, lug and grip rings restraints and gaskets or flanged joint ends (ANSI B16.1 Class 250), where noted in the Contract Documents. In any and all cases of conflict between these Special Provisions and AWWA C-504, these Special Provisions shall govern but only to the extent of such conflict.

2. Disk: The Valve disc shall be designated and tested in accordance with AWWA C504.00. The valve disc shall be constructed of stainless steel ASTM A-296, Grade CF8M; cast iron ASTM A-48, Class 40 or ASTM A-436, Type I; or ductile iron ASTM A-536, Grade 65-45-12. The disc edge shall have a stainless steel; type 316 edges, for mating with the rubber seat. Discs shall be of the flow through design with no internal cores or ribs transverse to the flow.

3. Seat: The valve seat shall be of a rubber compound complying with AWWA C504.00, Section 8. Valve seats shall be located in the valve body or on valve disk. Valves employing snap rings, retaining rings or screws that penetrate the rubber will not be accepted. Seats shall be a full 360 degrees without interruption and have a plurality of grooves mating with a spherical disc edge seating surface. Valves thirty inch (30") diameter and larger shall have adjustable seats of a design that permits replacement in the field without removal of the valve from the line.

4. Shaft: Shall be horizontal when the valve is installed in the water main. Valve shafts shall be stainless steel ASTM A-564, type 630, and condition H-1100. Stub shafts or through shafts are acceptable. The valve shaft/disc connection shall be made through the use of on center taper pins. Taper pins shall be made of the same material as the shaft. The material shall be ASTM A-564, type 630, condition H-11 00. Shafts seals shall be split V-type, self-adjusting. O-rings are not acceptable. Valves shall be supplied with one and one-quarter inch (1-1/4") square or round extension shafts, in ten foot (10') lengths, which are to be cut and assembled in the field installations.

5. Actuators: All actuators shall meet design requirements as specified in AWWA C504.00. Mechanical stops shall be provided in accordance with AWWA C504.00 maximum input load requirements and capable of adjustment for ninety degrees (90°) plus or minus five percent (± 5%) of valve travel. The valve actuator shall be suitable for buried service. The gearing shall be such as to locate the operating nut in the vertical position. All actuator gears shall be for quarter turn valve applications. The input shaft shall be stainless steel with bronze bushings at the out put drive sleeve and shall also be equipped with adjustable mechanical stops to prevent over travel of the valve disc in the open and closed position. A stop limiting device shall be provided in the input to the operators for open and closed position and all operator components between the input and these stops shall be designed to withstand without damage an input torque of three hundred (300) foot pounds. Gearing provided on the valves shall be such as to provide operation with an average eighty (80) foot pounds input torque at the operating nut. The valve operator shall be sized to operate the valve with the specified flow and pressure in either direction. Valve actuators may be worm gear or traveling nut type with a two inch (2") square operating nut, which shall turn right (clockwise) to open.

Actuators shall be fully enclosed in a gasketed grease filled enclosure suitable for direct burial.

6. All butterfly valves shall be supplied with an over torque protector, which will indicate size of valve, direction to open and valve turn count.

7. Body: The valve body shall be constructed of cast iron ASTM A-126 Class B. Minimal body wall thickness shall be equal to that specified in AWWA Standard C504, Table 1 for Class 250B Gray Iron body material. Valves shall have "250" cast into the valve body casting. The entire valve body, both internal and external surfaces, except for the seating surface, shall be epoxy coated. The epoxy coating shall be a minimal of seven (7) mils nominal of NSF approved two (2) part epoxy.

8. Buried valves shall be furnished with an extension stem terminating twelve inches (12") below finished grade.

| **TABLE I:** APPROVED BUTTERFLY VALVES | | |
|---|---|---|
| | | |
| Manufacturer | Valve | Acceptable |
| Pratt | Triton HP-250 | 30" – 72" |
| Mueller | Lineseal XP | 30" – 72" |
| DeZurik | AWWA - BFV | 30" – 72" |
| Val-Matic | American - BFV | 30" – 72" |
| | | |

| **TABLE II:** ACCEPTED BUTTERFLY VALVE ACTUATORS | | |
|---|---|---|
| | | |
| Manufacturer | Valve | Acceptable |
| Pratt | MDT Series | 30" – 48" |
| Mueller | MDT Series | 30" – 48" |
| DeZurik | LA Series | 30" – 48" |
| Val-Matic | American - BFV | 30" – 48" |
| | | |

## 2.06 SCREW TYPE ROADWAY VALVE BOXES AND COVERS

1. Roadway valve boxes and covers shall be made of gray iron conforming to the requirements of ASTM A48, Class 35B, and shall be rated for traffic service.

2. Castings shall be free from sand holes, gas holes, shrinkage, cracks and other surface defects.

3. Each casting shall be identified and show, at a minimum, the following information: name of the producing foundry, country of manufacture "Made in USA", ASTM A48, CL 35B, part number, cast or heat date. Lettering on the cover shall read "WATER". Valve box assembly shall be EJ Series 8550, or an approved equal.

## PART 3 - EXECUTION

3.01 GENERAL

A. The Contractor shall provide all equipment and facilities for unloading, hauling and distributing the pipe, fittings, and appurtenances at the site. The pipe and fittings shall be handled with equipment, such as wide canvas slings and wide padded skids, designed to prevent damage to the lining or coating. Bare cables, chains, hooks, metal bars, or narrow skids shall not be permitted to come in contact with the lining or coating.

B. Pipe, fittings, and appurtenances shall be stored properly and supported on padded wooden blocks above ground. All pipe shall be securely wedged so the pipe can not roll. Any pipe which has been improperly placed and must be moved longitudinally along the trench shall be moved by such means that meet with the approval of the Engineer. Any coated pipe shall not be rolled or dragged lengthwise under any conditions, and all skids shall be so arranged as to prevent injury to the coating when the pipe is rolled upon them. Any visible damaged to the coating of pipe, fittings, and appurtenances shall be repaired to the satisfaction of the Engineer before the pipe is lowered into the trench.

C. Ductile iron pipe and fittings shall be unloaded, handled, and stored in accordance with AWWA C600.

D. Any pipe, fittings, coating, lining, or other appurtenance that has been damaged in loading, hauling, or distributing shall, be repaired to the satisfaction of the Engineer. If in the judgment of the Engineer the pipe cannot be properly repaired, the damaged material will be rejected and shall be removed from the site of the work.

E. Where new piping is to be connected to existing piping, the Contractor shall drain or purge the existing piping and cut, grind, and prepare the existing piping in every respect in order that it be suitable for connecting to the new piping.

F. 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 or capped using retainer glands or plugged with concrete as required. Utilities that have been removed shall be hauled offsite and disposed of by the Contractor.

3.02 WATER DISTRIBUTION SYSTEM

A. General

1. Before joints are made, each pipe shall be well bedded and no pipe shall be brought into position until the preceding length has been thoroughly bedded and secured in place. Pipe shall be bedded for the full length of barrel between bells.

2. Pipe joints shall be made in strict accordance with the pipe manufacturer's specifications.

B. Ductile Iron Pipe and Fittings

1. No closures are shown on the Plans. Location of closure pieces are to be determined by the Contractor.

2. Joint deflection angles shall not exceed 1/2 the values listed in Table 4 AWWA C600 for push-on-type joints. The Engineer may authorize additional deflection of the joints to make field adjustments. In no case shall joint deflections exceed the maximum values listed in Table 4 of AWWA C600. Where restrained joints are indicated, deflections shall not exceed 1/2 of the manufacturer's recommendations.

C. Prestressed Concrete Cylinder Pipe (PCCP) and Fittings

1. Drawings show the likely arrangement of fittings and specials, but these details cannot be guaranteed due to existing field conditions. Verify the size and dimensions of the existing pipe and fittings, and provide new pipe and fittings with the correct dimensions to connect to the existing pipe, fittings, or to complete a closure. Separate Measurement and Payment will not be provided for Test Pits to obtain the existing dimensions.

2. Detailed Drawings showing the arrangement of new fittings and closure pieces that connect to the existing pipe and fittings shall be submitted by the Contractor for review and approval.

D. Testing

1. Testing shall be in accordance with the Standard Specifications and AWWA C600 except as modified herein. Test pressure shall be 150 psi.

2. The Contractor shall provide all materials and equipment and shall test all piping systems under pressures indicated on the plans or specified herein. The Engineer shall be furnished written advance notification of all tests and all tests shall be conducted to his entire satisfaction.

3. All defects revealed by the tests shall be corrected without cost to the County. Tests and repairs shall be continued until test requirements are 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 have been disclosed and corrected.

4. All piping shall be adequately braced and supported during the tests so that no movement, displacement, or damage will result from the application of the test pressure. Relief devices in the various systems shall be capped or plugged during the tests.

5. All equipment used in testing shall be provided by the Contractor, shall be subject to the approval of the Engineer, and shall 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. Disinfection.

1. The Contractor shall completely disinfect all new piping prior to connection to the existing system. Disinfection of the water distribution system piping shall be performed in accordance with AWWA C651, Standard Specification Section 1003, and as described herein.

2. All piping necessary for connection to the existing system shall be disinfected prior to connection in accordance with AWWA C651, Section 9.1.

3. The Contractor shall submit his selected form of chlorine and method of chlorination to the Engineer for his record.

END OF SECTION

**SECTION 02820**

**RAINBOX**

**SECTION 02820**

**RAINBOX**

## PART 1 - GENERAL

1.01 DESCRIPTION

This section includes furnishing and installation of a 75-gallon RainBox and required appurtenances as shown on the Contract Drawings or per manufacturer's recommendations.

1.02 RELATED DOCUMENTS

A. Section 5.5 of the Maryland Stormwater Design Manual

B. Manufacturer's recommendations found at: www.aquabarrel.com

1.03 SUBMITTALS

A. Product Data: Manufacturer's cut sheets, product details including sizes and appropriate certifications, warrantee information, and finishes.

## PART 2 - MATERIALS

2.01 RAINBOX

A. Aquabarrel 75-gallon RainBox as manufactured by Aquabarrel, Gaithersburg, Maryland or approved equal.

B. 12" x 12" Concrete Patio Blocks

C. Pea Gravel: ASTM-D-448, No. 8 of No. 9 (1/8" to 3/8")

D. Geotextile Filter Fabric – PE Type 1 nonwoven

E. Stainless #8 x 1" Self-Piercing Screws

F. 4" Flexible HDPE Drain Pipe

## PART 3 - EXECUTION

3.01 INSTALLATION

A. RainBox is to be installed as shown on the Contract Drawings or per manufacturer's recommendations.

B. Prepare a flat, level area for the RainBox by performing the following steps: Excavate 28" x 28" wide and 3" deep adjacent to the downspout locations,

Place geotextile filter fabric, fill with pea gravel, spread pea gravel evenly and pack it down, place the 4 concrete patio blocks to create a single level surface, add more pea gravel between the blocks to prevent blocks from shifting,

C. Set up RainBox on concrete blocks and make sure the top is level. Install the RainBox in accordance with the manufacturer's recommendations as shown on the Contract Drawings or as directed by the Engineer.

D. Secure 4" Flexible HDPE Drain Pipe to bottom of diverter box with screws. Direct overflow toward stabilized pervious area.

END OF SECTION

**SECTION 03100**

**CONCRETE FORMWORK**

PARAGRAPH INDEX

**SECTION 03100**

**CONCRETE FORMWORK**

## PART 1 -GENERAL

1.01 DESCRIPTION

A. This Section includes requirements for providing formwork for cast in place concrete in accordance with ACI 301, as modified and supplemented herein, and in accordance with the Contract Documents.

B. See other Sections of Specifications for concrete related work specified elsewhere:

1. Section 03210 – Reinforcing Steel;
2. Section 03215 – Doweling for Concrete;
3. Section 03251 – Concrete Joints and Accessories;
4. Section 03300 – Cast in Place Concrete.

C. The following is a list of American Concrete Institute (ACI) standards which may be referenced in this section.

1. ACI 117, Standard Specifications for Tolerances for Concrete Construction and Materials.
2. ACI 318/318R, Building Code Requirements for Reinforced Concrete.
3. ACI 347, Formwork for Concrete.
4. ACI 301, Specifications for Structural Concrete.

1.2 QUALITY ASSURANCE.

A. Comply with applicable portions of Section 01400.

B. Comply with applicable standards including, but not limited to the most recent edition of the following:

1. ACI 347 – Guide to Formwork for Concrete;
2. ACI 318 – Building Code Requirement for Structural Concrete and Commentary;
3. APA Form V345 – Concrete Forming;
4. ANSI A10.9 – Safety Requirements for Concrete and Masonry Work;
5. OSHA Regulations, Part 1926, Subpart Q – Concrete and Masonry Construction;

C. Design to provide satisfactory performance under the specified operating conditions.

D. Coordinate formwork design with all trades requiring the attachment of components to formwork.

E. Field Requirements.

1. Obtain and maintain on site a copy of appropriate documents referred to therein.
2. Provide all labor, material and methods necessary to fabricate, erect and remove forms to construct the cast-in-place concrete structures shown on the Contract Drawings.

3. The Work includes but is not limited to the following:

a. Form design;
b. Forms;
c. Shoring;
d. Ties;
e. Form Coating;
f. Appurtenances and accessories.

1.3 SUBMITTALS

Make all submittals to the Engineer.

A. Provide the following information:

1. Engineering data and manufacturer's literature for the following:

a. Form ties;
b. Spreaders;
c. Bar supports;
d. Form coatings;
e. Pre-fabricated steel forms;
f. Special liners (if applicable).

2. Form Design. Provide sizing calculations for all formwork sealed by a structural engineer registered in the State of Maryland.

a. Design all formwork necessary to construct the cast-in-place concrete shown on the Drawings. Use a licensed structural engineer registered in the State of Maryland to design the formwork;
b. Analyze and determine the erection stresses imposed or induced upon the structure, its elements, and the supporting foundations during all phases of the construction;

3. Shop Drawings. Show the following:

a. Termination details;
b. Back-up, rustications, reveals, and chamfer strip locations;
c. Jointing, form tie location and placement pattern.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING.

A. Store form materials and accessories above ground on framework or blocking.

1. Cover with a suitable waterproof covering;
2. Provide adequate air circulation and ventilation.

**PART 2 - PRODUCTS**

2.1 FORMS.

A. General.

1. For surfaces that will be exposed to view when construction is complete, use the following:

a. Prefabricated plywood panel forms.

1) Normal: Face adjacent to concrete Grade B or better;
2) Architectural: Face adjacent to concrete Grade B or better with plastic overlay.

b. Job-built plywood forms.
c. Forms that are lined with plywood or fiberboard.

2. For surfaces that are normally submerged or not ordinarily exposed to view, plywood or lined forms are not required.

a. Steel or unlined wooden forms may be used.
b. Forms are required for all extended footings.

3. Job-built plywood forms.

a. Reuse of Job Built Plywood Forms allowed only when specifically approved by the Engineer.
b. Place plywood in 48-inch widths and in uniform lengths of not less than 96 inches, except where the dimension of the member is less.

1) Use plywood panels at least 5/8" thick where plywood is attached directly to studs or joists.
2) Size and space studs to prevent bulging of the plywood sheeting.

B. Materials.

1. Prefabricated Steel Forms.

a. Symons "Steel Ply";
b. Universal Building Products "Quick Form";
c. Or approved equal.

2. Wooden Forms.

a. Plywood.

1) Product Standard PS1;
2) Waterproof;
3) Resin-bonded;
4) Exterior type Douglas fir.

3. Lumber.

a. Straight;
b. Dressed all sides;
c. Uniform width and thickness;
d. Free from knots, offsets, holes, dents and other surface defects;
e. Douglas fir;
f. No. 2 Grade with grade stamp clearly visible.

4. Fiberboard.

a. ANSI A135.4, Class 1;
b. Tempered;
c. Waterproof;

d. Screenback;
e. Concrete form hardboard.

5. Chamfer Strips.

a. Clear white pine;
b. Plane the surface against the concrete.

2.2 FORM TIES.

A. Use the snap cone or she-bolt with cone types as manufactured by a recognized manufacturer of concrete forming accessories.

1. Form ties to be approved by the Engineer.
2. Select cones so that they leave a hole or depression in the concrete no larger than 7/8" in diameter.
3. Do not use plain snap ties or flat bar ties, unless otherwise approved by the Engineer.

B. Ties to be of a type that will accurately tie, lock, and spread the forms.

1. Select the tie spacing to withstand concrete pressures without bulging, spreading, or lifting of the forms.
2. After removal of the external tie parts, no remaining metal to be left within 1-½" of any surface.
3. Ties shall be hot dip galvanized or stainless steel only. If stainless steel ties are used, metal may be within 1" of any surface.
4. Construct permanently embedded portions of form ties that are not provided with threaded ends so that the removable ends are readily broken off without damage to the concrete.
5. Design to maintain positive contact with forming material.
6. Furnish units that will leave no metal closer than 1 inch to concrete surface when forms, inserts, and tie ends are removed.
7. Flat bar ties for panel forms, furnish plastic or rubber inserts with minimum 1-inch depth and sufficient dimensions to permit patching of tie hole.

C. Water Stop Ties.

1. For water-holding structures, basements, pipe galleries, and accessible spaces below finish grade, furnish one of the following:

a. Integral steel water stop 0.103 inch thick and 0.625 inch in diameter tightly and continuously welded to tie.
b. Neoprene water stop 3/16 inch thick and 15/16-inch diameter whose center hole is 1/2-diameter of tie, or molded plastic water stop of comparable size.
c. Orient water stop perpendicular to tie and symmetrical about center of tie.
d. Design ties to prevent rotation or disturbance of center portion of tie during removal of ends and to prevent water leaking along tie.
e. Through-Bolts Tapered minimum 1-inch diameter at smallest end.

f. Dry pack tie holes with non-shrink grout using steel hammer and steel tool to compact grout to high density. Cure grout with water.

2.3 FORM SURFACE PREPARATION.

A. Thoroughly clean form surfaces that will be in contact with concrete or that have been in contact with previously cast concrete, dirt, and other surface contaminants prior to coating surface.

B. Apply form release agent as recommended by the manufacturer for all exposed wood forms in contact with concrete.

C. Apply form release agent to steel forms as soon as they are cleaned to prevent discoloration of concrete from rust.

2.4 FORM COATINGS.

A. Coat forms with a non-staining form release agent before placing reinforcement and concrete.

B. Release agent shall not bond with, stain, or adversely affect concrete surfaces, and shall not impair subsequent treatments of concrete surfaces when applied to forms.

C. A ready-to-use water based material formulated to reduce or eliminate surface imperfections, containing no mineral oil or organic solvents. Environmentally safe, meeting local, state, and federal regulations and can be used in potable water facilities.

D. Acceptable Form Coatings:

1. Nox-Crete Form Coating by Nox-Crete Products Group;
2. Debond by L&M;
3. Clean Strip (J-1) by Dayton Superior;
4. Rheofinish by Master Builders, Inc.;
5. Crete-Lease 20-VOC by Cresset Chemical Company;
6. Or approved equal.

E. Rustication Grooves and Beveled Edge Corner Strips shall use nonabsorbent material, compatible with form surface, fully sealed on all sides prohibiting loss of paste or water between the two surfaces.

**PART 3 -** EXECUTION

3.1 GENERAL.

A. Formwork shall be capable of containing concrete in its plastic state without loss of water or cement paste, and be removable without damage to concrete surface or edges.

B. Design, engineering, construction and removal of formwork shall be the responsibility of the Contractor.

C. Design and construct to support loads in accordance with ACI 347 within the tolerances specified in ACI 301.

D. Provide form coatings as required to produce desired finish.

E. Design Requirements.

1. Design formwork in accordance with ACI 347 and ACI 318 to provide concrete finishes specified in Section 03300.
2. When high range water reducer (super plasticizer) is used in concrete mix, forms shall be designed for full hydrostatic pressure per ACI 347.
    a. Make joints in forms watertight.
    b. Limit panel deflection to 1/360-th of each component span to achieve tolerances specified.

3.2 FABRICATION AND ERECTION.

A. Fabricate, erect, and remove forms as specified herein.

1. Unless specified otherwise, follow applicable recommendations of ACI 347.
2. Erect forms true to line and grade in accordance with the tolerances specified in Section 03300 - Cast-in-Place Concrete.
3. Make the forms mortar tight and sufficiently rigid to resist deflection during concrete placement.
4. Make the surfaces of forms smooth and free from irregularities, dents, sags, and holes that would deface the finished surfaces.

B. Brace or tie forms as required maintaining the desired position, shape, and alignment during and after concrete placement.

1. Size and space walers, studs, internal ties, and other form supports so that proper working stresses are not exceeded.
2. Bolt form joints tightly and ensure that they bear on solid construction.
3. Construct forms so they can be removed without hammering, wedging, or prying against the concrete.
4. Space form ties in exposed surfaces uniformly and uniformly align them in horizontal and vertical rows.
5. Design and erect the forms to produce finished surfaces that are free from offsets, ridges, waves, and concave or convex areas.

C. Thoroughly clean and repair forms that are to be reused. Do not use split, frayed, delaminated, or otherwise damaged forms.

D. Inspect form surfaces prior to installation to assure conformance with specified tolerances.

E. Place all form panels in a neat, symmetrical pattern with horizontal joints level and continuous.

1. Mate forms to previously placed walls so as to eliminate steps or rough transitions.
2. Use the largest practical size of form panel to minimize joints and to improve rigidity.
3. Locate form joints in an uninterrupted uniform pattern

F. Provide a ¾-in by ¾-in chamfer formed by a wood or metal chamfer strip along all salient corners and edges of beams, columns, walls, slabs, and curbs; unless otherwise shown on the Drawings. Where beveled edges on existing adjacent structures are other than 3/4 inch, obtain Engineer's approval of size prior to placement of beveled edge.

G. Coat steel forms and forms for exposed surfaces with a non-staining form-release agent.

1. Apply just before placement of steel reinforcement.
2. Remove surplus form-release coating from the form surface.
3. Thoroughly wet wood forms for unexposed surfaces with water in lieu of coating.

a. Wet immediately before concrete placement.
b. Do not use in freezing weather. Instead use a form-release coating.

H. Form Tolerances.

1. Provide forms in accordance with ACI 117, ACI 347 and ACI 318 and the following tolerances for finishes specified.
2. Wall Tolerances.

a. Straight Vertical or Horizontal Wall Surface Flat planes within tolerance specified.
b. Plumb within ¼-inch in 10 feet or within 1 inch from top to bottom for walls over 40 feet high.
c. Depressions in Wall Surface Maximum 5/16-inch when 10-foot straightedge is placed on high points in all directions.
d. Thickness Maximum ¼-inch (-) or ½-inch (+) from dimension shown.
e. Form Offset between adjacent pieces of formwork, facing material shall not exceed 1/8-inch.

3. Slab Tolerances.

a. Exposed Slab Surfaces Comprise of flat planes as required within tolerances specified.
b. Slab Finish Tolerances and Slope Tolerances Crowns on floor surface not too high as to prevent 10-foot straightedge from resting on end blocks, nor low spots that allow block of twice the tolerance in thickness to pass under supported 10-foot straightedge.
c. Finish slab elevation shall slope to floor drain and gutter (if applicable) and adequately drain regardless of tolerances.
d. Thickness Maximum ¼-inch (-) or ½-inch (+) from thickness shown. Where thickness tolerance will not affect slope, drainage, or slab elevation, thickness tolerance may exceed ½-inch (+).
e. Slab Flatness and Levelness. Floor finish tolerances shall meet requirements specified herein, and as measured in accordance with ASTM E1155.

f. Levelness tolerance, Fl, shall not apply to slabs placed on un-shored form surfaces or shored form surfaces after removal of shores. Levelness tolerances, Fl, shall not apply to cambered or inclined surfaces, and shall be measured within 72 hours after slab concrete placement.

g. Slab Elevation and Thickness.

1) Finish Slab Elevation. Slope slabs to floor drains and gutter. Slabs shall adequately drain regardless of tolerances.

2) Thickness. Maximum ¼-inch (-) or ½-inch (+) from thickness shown. Where thickness tolerance will not affect slope, drainage, or slab elevation, thickness tolerance may exceed ½-inch (+).

I. Take immediate corrective action if misalignment or excessive deflection of forms or screeds occurs; or if displacement of reinforcement occurs during concrete placement.

1. Ensure that the concrete maintains acceptable lines and the structure is constructed to the required dimensions and cross sections.
2. If any forms bulge or show excessive deflection in the opinion of the Engineer, remove the concrete and both rebuild and strengthen the forms.

J. Where forms are inadequately braced or improperly built, the Engineer shall stop work until defects are satisfactorily remedied.

3.3 INSERTS, EMBEDDED PARTS AND OPENINGS.

A. Provide formed openings where required for items to be embedded in or passing through concrete work.

B. Locate and set items in place which will be cast directly into concrete.

C. Coordinate the forming and placing of openings, slots, reglets, recesses, sleeves, bolts, anchors, and other inserts and components of other work with the work of other sections.

D. Install accessories in accordance with manufacturer's instructions; straight, level and plumb. Ensure items are not disturbed during concrete placement.

E. Install waterstops in accordance with manufacturer's instructions.

1. Make continuous without displacing reinforcement.
2. Heat seal PVC waterstop joints watertight.
3. Protect hydrophilic waterstop from rain and moisture to avoid expansion before placing fresh concrete.

3.4 FORM CLEANING.

A. Clean forms as erection proceeds to remove foreign matter.

B. Clean formed cavities of debris prior to placing concrete.

C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through cleanout ports.

D. During cold weather, remove ice and snow from within forms.

1. Do not use de-icing salts.
2. Do not use water to clean out forms unless formwork and concrete construction proceed within heated enclosure.
3. Use compressed air or other means to remove foreign matter.

3.5 FORM REMOVAL.

A. Do not remove or disturb forms until the concrete has attained sufficient strength to safely support all dead and live loads.

B. Leave shoring beneath beams or slabs in place.

C. Reinforce as necessary to carry any construction equipment or materials placed thereon.

D. Do not remove any forms without the approval of the Engineer.

E. In general and under normal conditions the Engineer will approve removal of forms after the following time after placement has elapsed:

1. Elevated slabs and beams - 14 days, during which the temperature of the air surrounding the concrete is above 50 deg.
2. Columns and walls - per ACI 347;
3. Additionally, column and wall forms shall not be removed until a job cured specimen has reached a minimum strength of 3,000 psi.

F. When ambient air temperatures during any day of the curing period fall below 45o F, remove forms based on job-cured test cylinder strength only.

G. Make additional concrete cylinders to determine if concrete has developed required strength.

1. Make in sets of three;
2. Test earlier than 28-days, as required.

H. Take care when removing forms to avoid surface gouging, corner or edge breakage, or other damage to the concrete.

1. Repair any damaged or imperfect work immediately after form removal.
2. Make repairs as specified in Section 03300 - Cast-in-Place Concrete.
3. Provide Forms, Falsework, and Centering per ACI 347.

I. Schedule for Removal of Forms, Falsework and Centering.

1. Forms, Falsework, and Centering shall remain in place for the minimum time periods listed below under ordinary conditions. These periods represent cumulative number of days or fractions thereof, not necessarily consecutive, during which the temperature of the air surrounding the concrete is above 50□F. The minimum time periods listed below are based on Type I or Type II cement being used in the mix with no retarding agents.
2. The minimum time shall be not less than required by relation between design Live Load (LL) and Dead Load (DL):

| | LL<DL | LL>DL |
|---|---|---|
| Joist, Beam, or Girder Soffits | | |
| Less than 10 ft. clear span between supports | 7 days*** | 4 days |
| 10 to 20 ft. clear span between supports | 14 days*** | 7 days |
| Over 20 ft. clear span between supports | 21 days*** | 14 days |
| One Way Floor Slabs | | |
| Less than 10 ft. clear span between supports | 4 days*** | 3 days |
| 10 to 20 ft. clear span between supports | 7 days*** | 4 days |
| Over 20 ft. clear span between supports | 10 days*** | 7 days |

* Where such forms also support formwork for slab or beam soffits, the removal times of the latter shall govern.

** Of the type which can be removed without disturbing forming or shoring.

*** Where forms may be removed without disturbing shores, use half of values shown but not less than three days.

- Shoring and re-shoring multi story structures shall be done in accordance with ACI 347.
- Where forms for cantilever beams or slabs are to be removed, the Contractor shall multiply clear span by two to determine span for removal of forms.

a. The Engineer will approve removal of the forms, falsework, and centering for the forms under unordinary conditions, form types not listed above, concrete made with cement other than Type I or Type II, concrete made with retarders, provided the concrete has attained the proper design strength, and the Contractor meets the following requirements:

1) Submit to the Engineer Working Drawings showing the concrete strength to be attained at the proposed time of removal of formwork, falsework, and centering. Working Drawings in this paragraph means calculations. Calculations shall be sealed and signed by a Professional Engineer registered in the State of Maryland.

2) Include in the calculations all loads and the resultant stresses and deformations to which the concrete and reinforcing steel will be subject at the time of removal, and subsequent to the removal of forms, falsework, and centering, until the concrete has attained its design strength.

3) The concrete strength attained prior to removal of forms, falsework, and centering shall be determined from tests of job cured cylinders which shall be cured under conditions which are not more favorable than the most unfavorable conditions for the portions of concrete which the specimens represent. Tests shall be in accordance with ASTM C31 except as modified herein. Provide three cylinders per pour or per 1,000 square feet of form contact area, whichever is less, for testing by an independent testing laboratory paid for by the Contractor. Submit a certified test report of these cylinders to the Engineer. Do not start removal of forms, falsework, and centering without permission from the Engineer.

4) It shall be the responsibility of the Contractor to demonstrate conclusively that the strength of concrete specified has been attained. The minimum strength level required for each cylinder shall equal the specified f'c.

5) After removal of forms, falsework, and centering and before attainment of design strength by concrete, do not alter loading conditions to exceed permissible stresses and deformations at attained strength of concrete.

6) Minimum strength level required for each cylinder: 28 days compressive strength.

b. Subsequent to removal of forms, falsework, and centering and prior to attainment of design strength by the concrete, do not alter the loading conditions so as to exceed the permissible stresses and deformations at the attained strength of concrete.

c. Immediately after forms are stripped, all defects shall be repaired in accordance with ACI 301.

3. The use of earth cuts as forms for small foundations will be permitted provided cuts are vertical, sharp, true and approved by the Engineer.

4. Provided concrete has attained proper design strength, and Contractor meets requirements below, Engineer will approve removal of forms, falsework, and centering for:

a. Forms under unordinary conditions.
b. Concrete made with cement other than Type I or Type II.
c. Concrete made with GGBF slag.
d. Concrete made with retarders.

5. Determine concrete strength attained before removal of forms, falsework, and centering from tests of job cured cylinders, cured under conditions not more favorable than most unfavorable conditions for portions of concrete which specimens represent.

a. Test following ASTM C31 except as modified herein.

b. Provide 3 additional cylinders for each pour or for each 1,000 square feet of form contact area, whichever is less, for testing.

1) See Section 01450.
2) Submit certified test report of cylinders to Engineer.

6. Chamfer all exposed concrete corners of edges not less than 3/4 inch in each dimension.
7. Removable form ties will not be permitted in water retaining structures.

3.6 FIELD QUALITY CONTROL

A. All Quality Control shall be done as required by section 01400.

B. Inspect erected formwork, shoring and bracing to ensure that work is in accordance with formwork design and that supports, fastenings, wedges, ties and items are secure.

C. Do not reuse formwork more than three (3) times for concrete surfaces to be exposed to view.

D. Do not patch formwork.

END OF SECTION

Page intentionally blank.

**SECTION 03210**

**REINFORCING STEEL**

PARAGRAPH INDEX

**SECTION 03210**

**REINFORCING STEEL**

## PART 1 - GENERAL

1.01 DESCRIPTION

A. Section includes requirements for providing reinforcing steel for concrete structures.

B. See other Sections of Specifications for concrete related work specified elsewhere:

1. Section 03100 – Concrete Formwork;
2. Section 03215 – Doweling for Concrete;
3. Section 03251 – Concrete Joints and Accessories;
4. Section 03300 – Cast in Place Concrete.

1.02 REFERENCES

A. The following is a list of standards that may be referenced in this section:

1. American Concrete Institute (ACI):
   a. 318, Building Code Requirements for Structural Concrete and Commentary.
   b. SP 66, Detailing Manual.
   c. 301 Specifications for Structural Concrete

B. American Welding Society (AWS): D1.4/D1.4M, Structural Welding Code - Reinforcing Steel.

C. ASTM International (ASTM):

1. A185/A185M – Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
2. A615/A615M – Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
3. A82 – Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
4. A497 – Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement.
5. A767/767M – Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.

D. Concrete Reinforcing Steel Institute (CRSI):

1. Placing Reinforcing Bars.
2. Manual of Standard Practice.

E. International Code Council (ICC): Evaluation Services Report.

F. Wire Reinforcement Institute (WRI): WWR-500 – Manual of Standard Practice, Structural Welded Wire Reinforcement.

1.03 SUBMITTALS

A. Provide prior to fabrication:

1. Shop Drawings prepared in accordance with CRSI Manual of Standard Practice and ACI SP 66:

a. Bar lists and schedules.
b. Bending lists.
c. Placing drawings.

2. Welded, metallic sleeve splice, and mechanical threaded connection.

B. Informational Submittals:

1. Lab test reports for reinforcing steel showing stress-strain curves and ultimate strengths.

2. Mechanical Threaded Connections:

a. Current ICC Evaluation Services Report or equivalent code agency report listing findings to include acceptance, special inspection requirements, and restrictions.
b. Verification device threads have been tested and meet requirements for thread quality, in accordance with manufacturer's published methods.
c. Manufacturer's instructions.

3. Test results of field testing.

1.04 QUALITY ASSURANCE

Refer to section 01400, Quality Control for Contract requirements.

A. Prior to welding, submit welder qualifications and nondestructive testing procedures.

B. Welder Qualifications: Certified in accordance with AWS D1.4/D1.4M.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Unload, store, and handle bars in accordance with CRSI publication "Placing Reinforcing Bars."

**PART 2 - PRODUCTS**

2.01 MATERIALS

A. Deformed Billet-Steel Reinforcing Bars:

1. Includes stirrups, ties, dowels, and spirals.

2. ASTM A615/A615M, Grade 60.

B. Welded Wire Fabric:

1. ASTM A185 and ACI 318, using ASTM A82 wire of 75 ksi minimum tensile strength.

2. Furnish flat sheets only, rolled sheets not permitted.

2.02 ACCESSORIES

A. Tie Wire:

1. Black, soft-annealed 16 gauge wire.

2. Nylon , epoxy , or plastic-coated wire.

B. Bar Supports and Spacers:

1. Use precast concrete bar supports and side form spacers, unless noted otherwise. Do not use other types of supports or spacers.

2. Bar supports shall have sufficient strength and stiffness to carry loads without failure, displacement, or significant deformation. Space bar supports so minimum concrete cover is maintained for reinforcing between supports.

3. Use only precast concrete bar supports where concrete surfaces are exposed to weather, earth, water, chloride intrusion, or corrosive chemicals. Bar supports shall be nonconductive and have geometry and bond characteristics that deter movement of moisture from the surface to the reinforcement.

4. Precast concrete supports shall have same minimum strength and shall be made from same materials as that of the concrete in which they are to be embedded. Precast concrete supports shall be cast and properly cured for at least 7 days before use and shall have a wire or other device cast into each block for the purpose of attaching them securely to reinforcing steel.

5. In Beams, Columns, Walls, and Slabs Exposed to View after Form Removal: Use small precast concrete blocks made of same color as concrete in which they are embedded.

6. Design and fabricate special bar supports for top reinforcing bars in slabs where standard bar supports do not possess necessary geometry, strength, or stiffness.

C. Mechanical Splice Couplers: ACI 318, Type 2, same material of reinforcing bar being splice.

2.03 FABRICATION

A. Follow CRSI Manual of Standard Practice.

B. Bend bars cold.

## PART 3 - EXECUTION

3.01 PREPARATION

A. Notify Engineer when reinforcing is ready for inspection and allow sufficient time for inspection prior to placing concrete.

B. Clean reinforcing bars of loose mill scale, oil, earth, and other contaminants.

C. Coat wire projecting from precast concrete bar supports with dielectric material, epoxy, or plastic.

3.02 INSTALLATION

A. Bundle or space bars, instead of field bending where construction access through reinforcing is necessary.

B. Spacing and Positioning: Conform to ACI 318.

C. Location Tolerances: In accordance with CRSI publication, "Placing Reinforcing Bars."

D. Splicing:

1. Follow ACI 318.

2. Use lap splices, unless otherwise shown or permitted in writing by Engineer.

3. Stagger splices in adjacent bars where indicated.

E. Tying Reinforcing Bars:

1. Tie every other intersection on mats made up of Nos. 3, 4, 5, and 6 bars to hold them firmly at required spacing.

2. Bend tie wire away from concrete surface to provide clearance of 1 inch from surface of concrete to tie wire.

F. Reinforcement around openings: On each side and above and below pipe or opening, place an equivalent area of steel bars to replace steel bars cut for opening. Extend steel reinforcing a standard lap length beyond opening at each end.

G. Welding Reinforcement:

1. Only ASTM A706/A706M bars may be welded.

2. Do not perform welding until welder qualifications are approved.

H. Straightening and Re-bending: Field bending of reinforcing steel bars is not permitted.

I. Unless permitted by Engineer, do not cut reinforcing bars in field.

J. All reinforcement shall have a clear cover from the outside of the bar to the concrete surface as required.

3.03 WELDED WIRE FABRIC INSTALLATION

A. Use only where specifically shown.

B. Extend fabric to within 2 inches of edges of slab, and lap splices at least 1 1/2 courses of fabric or minimum 8 inches.

C. Tie laps and splices securely at ends and at least every 24 inches with tie wire.

D. Place welded wire fabric on concrete blocks and rigidly support equal to that provided for reinforced bars. Do not use broken concrete, brick, or stone.

E. Follow ACI 318 and WRI WWR-500.

F. Do not use fabric that has been rolled. Install flat sheets only.

3.04 TESTS AND INSPECTION

A. Perform as required by section 01400, Quality Control.

END OF SECTION

**SECTION 03215**

**DOWELING FOR CONCRETE**

PARAGRAPH INDEX

**SECTION 03215**

**DOWELING FOR CONCRETE**

## PART 1 - GENERAL

1.01 DESCRIPTION

A. This Section includes requirements for providing post installed doweling for cast in place concrete in accordance with ACI 301, as modified and supplemented herein, and in accordance with the Contract Documents.

B. See other Sections of Specifications for concrete related work specified elsewhere:

1. Section 03100 – Concrete Formwork;
2. Section 03210 – Reinforcing Steel;
3. Section 03251 – Concrete Joints and Accessories;
4. Section 03300 – Cast in Place Concrete;

1.02 REFERENCES

A. The following is a list of standards that may be referenced in this section:

1. ASTM International (ASTM):
   a. C881/C881M – Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
   b. A193 – Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service.
   c. A307 – Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
   d. C882 – Standard Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear.
   e. D648 – Standard Test Method for Deflection Temperature of Plastics Under Flexural Load.
   f. D695 - Standard Test Method for Compressive Properties of Rigid Plastics.
2. American Concrete Institute (ACI)
   a. ACI 318/318R – Building Code Requirements for Reinforced Concrete.
   b. ACI 347 – Formwork for Concrete.
3. American National Standards Institute (ANSI).
4. International Code Council (ICC): Evaluation Services Report.

1.03 DEFINITIONS.

A. ICBO Reports Published by ICBO for concrete anchor manufacturers.

B. Testing Agency - The Contractor shall provide an independent testing agency to perform testing of adhesive dowels.

C. Special Inspector - Qualified person who shall demonstrate competence, to satisfaction of building official, for inspection of Work specified within this section.

1.04 SUBMITTALS

A. Action submittals:

1. Product Data: Manufacturer's catalog information.

2. Samples: Two random Samples of each batch of products delivered to site, for independent testing.

3. Manufacturer's qualifications; include client name, address, contact person, phone number, project location, and description of work.

4. Manufacturer's instructions for preparation, placement, drilling of holes, installation of anchors and adhesive, and handling of cartridges, nozzles, and equipment.

5. Manufacturer's written letter of certification identifying installer's qualifications to install products.

6. ICC Evaluation Services Report:

a. Doweling system manufacturer.
b. Detailed step-by-step instructions for Special Inspection procedure.

7. Special Inspection report.

8. Manufacturer's Certificate of Proper Installation.

9. Copy of manufacturer's operation and repair manuals for each type of equipment delivered to site.

1.05 QUALITY ASSURANCE.

A. Comply with applicable portions of Section 01400 – Quality Control.

B. Comply with applicable industry standards.

C. Qualifications:

1. Manufacturer: At least three similar projects with same products within last 3 years.

2. Installer: Trained and certified by manufacturer.

D. Field Requirements.

1. Obtain and maintain on site a copy of appropriate documents referred to therein.

2. Provide all labor, material and methods necessary.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING.

A. Deliver, handle and store in accordance with Contract specifications and manufacturer recommendations and instructions.

B. Store form materials and accessories above ground on framework or blocking.

1. Cover with a suitable waterproof covering;

2. Provide adequate air circulation and ventilation.

C. Product Information:

1. Disclose of when:

a. Shelf life has expired.
b. Stored other than per manufacturer's instructions.

2. Container Markings.

3. Include manufacturer's name, product name, batch number, mix ratio by volume, product expiration date, ANSI hazard classification, and appropriate ANSI handling precautions.

**PART 2 - PRODUCTS**

2.01 ADHESIVE.

A. Disposable, self-contained cartridge system capable of dispensing both components in the proper mixing ratio and that fit into manually or pneumatically operated caulking gun.

B. Meet requirements of ASTM C881/C881M.

C. Two-component, insensitive to moisture, designed to be installed in adverse freeze/thaw environments.

D. Cure Temperature, Pot Life, and Workability: Compatible for intended use and anticipated environmental conditions.

E. Mixed Adhesive: Non-sag light paste consistency with ability to remain in a 1 inch diameter overhead drilled hole without run out.

F. Adhesive anchor system used in concrete shall be approved by ICC Evaluation Services Report for short and long-term loads including wind and earthquake, and shall be approved for use with latest edition of IBC.

G. Approved Manufacturers and Products:

1. HILTI, Inc., Tulsa, OK: HIT Doweling Anchor System, HIT HY 200, HIT RE 500 SD.

2. Simpson Strong Tie Co., Inc., Pleasanton, CA: Epoxy-Tie Adhesive ET22, SET-XP Epoxy Adhesive Anchors.

3. Powers Rawl, New Rochelle, NY: Power Fast Epoxy Injection Gel Cartridge System.

H. MIXING NOZZLES

1. Disposable, manufactured in several sizes to accommodate size of reinforcing dowels.

2. Non-removable internal static mixer required to ensure proper blending of components.

I. REINFORCING DOWELS

1. As specified in Section 03210 - Reinforcing Steel.

## PART 3 - EXECUTION

3.01 GENERAL

A. Install in accordance with manufacturer's recommended instructions.

B. Dispense components through specially designed static mixing nozzle that thoroughly mixes components and places mixed adhesive at base of predrilled hole.

3.02 DOWEL SIZING AND INSTALLATION

A. Install per adhesive manufacturer's instructions.

B. Drilling Equipment:

1. Drilling Hammers for Dowel Holes: Electric or pneumatic rotary type with medium or light impact.

2. Hollow drills with flushing air systems are preferred.

3. Where edge distances are less than 2 inches, use lighter impact equipment to prevent micro-cracking and concrete spalling during drilling process.

C. Hole Diameter: Use drill bit diameter meeting ICC Evaluation Services Report requirements and as recommended by the manufacturer.

D. Obstructions in Drill Path:

1. Do not damage when existing reinforcing steel is encountered during drilling and when approved by Engineer, enlarge hole by 1/8 inch, core through existing reinforcing steel at the larger diameter, and resume drilling at original hole diameter; or re-drill hole 1 inch from original location, beginning in same line at surface, redirecting drill to miss reinforcing steel.

2. Place dowels in both the misdrilled hole and the new one.

3. When using epoxy anchors, dowels may be pre-bent prior to installation to 15 degrees to align with other bars. Do not heat dowels to bend.

4. Bent Bar Dowels: Where edge distances are critical, and striking reinforcing steel is likely, drill hole at 10 degree angle or less and use pre-bent reinforcing bars.

3.03 FIELD QUALITY CONTROL.

A. Dowel Testing

1. Test dowels at one per every 20 dowels.
2. Dowels shall be tested to specified yield strength of reinforcing bar.
3. Testing apparatus shall not interfere with development of concrete failure cone at dowel.
4. Testing shall occur only after adhesive has achieved proper cure per manufacturer's requirements.
5. Failure of reinforcing bar or of base concrete will cause dowel to be rejected. For each rejected dowel, additional dowel shall be tested. Rejected dowels shall be reinstalled in sound concrete and retested.
6. If yield strength of reinforcing bar cannot be achieved when tested, manufacturer's representative shall recommend revised installation procedures or adhesive products. Modified installations must be tested at same frequency as specified herein.

B. Inspection

1. Engineer shall be onsite during dowel installation. Provide 24-hour advance written notification to Engineer.
2. Engineer shall observe installation for the following
    a. Drill bit compliance.
    b. Hole depth and cleanliness.
    c. Product Description Product name, rod diameter and length.
    d. Adhesive expiration date.
    e. Verification of dowel installation in accordance with manufacturer's published instructions.

C. Manufacturer's Field Services: Provide manufacturer's representative at Site in accordance with sections 01400 – Quality Control.

END OF SECTION

**SECTION 03251**

**CONCRETE JOINTS AND ACCESSORIES**

PARAGRAPH INDEX

This page intentionally left blank.

# SECTION 03251

# CONCRETE JOINTS AND ACCESSORIES

## PART 1 - GENERAL

### 1.01 DESCRIPTION

A. This Section includes requirements for providing concrete joints and accessories, as modified and supplemented herein, and in accordance with the Contract Documents.

B. See other Sections of Specifications for concrete related work specified elsewhere:

1. Section 03100 – Concrete Formwork;
2. Section 03210 – Reinforcing Steel;
3. Section 03215 – Doweling for Concrete;
4. Section 03300 – Cast in Place Concrete;

### 1.02 REFERENCES

A. The following is a list of standards that may be referenced in this section:

1. ASTM International (ASTM):
   a. A36/A36M – Specification for Carbon Structural Steel.
   b. A615/A615M, Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
   c. B852 – Specification for Zinc Alloys (CGG) for Continuous Hot-Dip Galvanizing of Sheet Steel.
   d. C920 – Specification for Elastomeric Joint Sealants.
   e. D226 – Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
   f. D227 – Specification for Coal-Tar Saturated Organic Felt Used in Roofing and Waterproofing.
   g. D994 – Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
   h. D1056 – Specification for Flexible Cellular Materials—Sponge or Expanded Rubber.
   i. D1171 – Standard Guide for Evaluating Nonwoven Fabrics.
   j. D1751 – Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
   k. D1752 – Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
   l. D2000 – Standard Classification System for Rubber Products in Automotive Applications.
2. Corps of Engineers (COE): CRD C 572 – Corps of Engineers Specifications for Polyvinylchloride Waterstop.

3. American National Standards Institute (ANSI):

a. ANSI/NSF 61 – Drinking Water System Components - Health Effects.

1.03 SUBMITTALS

A. Action Submittals:

1. Shop Drawings:

a. Waterstop: Location during concrete placement.
b. Drawings showing location, types, details of joints and sequence of pours.

B. Informational Submittals:

1. Manufacturer's written instructions for product shipment, storage, handling, installation/application, and repair for:

a. Waterstop.
b. Joint filler and primer.
c. Preformed control joint.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Acceptance at Site: Verify delivered materials are in accordance with Specifications and manufacturer's product data sheets prior to unloading and storing onsite.

B. Storage: Store materials under tarps to protect from oil, dirt, and sunlight.

1.05 QUALITY CONTROL

A. Refer to section 01400 for Contract requirements.

PART 2 - PRODUCTS

2.01 HYDROPHILIC WATERSTOP

A. For use as shown on Drawings.

B. Material shall be a non-bentonite hydrophilic rubber compound.

C. Manufacturers and Products:

1. Greenstreak Plastic Products, St. Louis, MO; Hydrotite CJ 1020 2K with Leakmaster LV 1 adhesive and sealant.

2. Adeka Ultra Seal, JLM Associates, Spearfish, SD; MC 2010M with 3M 2141 adhesive and P 201 sealant.

2.02 BOND BREAKER

A. Tape for Joints: Adhesive-backed glazed butyl or polyethylene tape, same width as joint that will adhere to pre-molded joint material or concrete surface.

B. Use either bond breaker tape or bond prevention material as specified in Section 03300, Cast-in-Place Concrete, except where tape is specifically called for.

2.03 ACCESSORIES

A. Joint Sealant:

1. Polyurethane as specified in Section 07900, Joint Sealants.

2. Gun grade or pourable immersible sealant. Sealant shall be endorsed by the National Sanitation Foundation (NSF) International for use in contact with potable water.

a. Manufacturer and Product Sika Chemical Co.; Sikaflex-1A or 2C.

B. Non-shrink Grout: As specified in Section 03300 - Cast-In-Place Concrete.

C. Reinforcing Steel: As specified in Section 03210, Reinforcing Steel.

D. Nails: Galvanized, as required for securing pre-molded joint filler.

E. Masking Tape: As required to temporarily adhere to concrete at each side of joint to receive filler.

PART 3 - EXECUTION

3.01 GENERAL

A. Commence concrete placement after joint preparation is complete.

B. Time between Concrete Pours: As specified in Section 03300, Cast-in-Place Concrete.

3.02 SURFACE PREPARATION

A. Construction Joints: Prior to placement of abutting concrete, clean contact surface:

1. Remove laitance and spillage from reinforcing steel and dowels.

2. Roughen surface to minimum of 1/4 inch amplitude:

a. Sandblast after concrete has fully cured.
b. Water blast after concrete has partially cured.
c. Green cut fresh concrete with high pressure water and hand tools.

3. Perform cleaning so as not to damage waterstop, if one is present.

B. Construction Joint with Hydrophilic Waterstop:

1. Follow hydrophilic waterstop manufacturer’s written instructions.

2. Clean debris, dirt, dust, and foreign material from concrete surface. Concrete surface must be smooth, clean, and dry. Grind concrete as required.

3.03 INSTALLATION OF WATERSTOPS

A. General:

1. Join waterstop at intersections to provide continuous seal.

2. Repair or replace damaged waterstop.

3. Place concrete and vibrate to obtain impervious concrete in vicinity of joints.

B. Hydrophilic Waterstop:

1. Install in accordance with manufacturer's written instructions.

2. Provide minimum of 2 1/2 inches of concrete cover over waterstop. When structure has two layers of reinforcing steel, locate centered between layers of steel or as shown.

3. Apply adhesive to concrete surface and allow to dry for specified time before applying waterstop strip.

4. Butt ends of waterstop strip together at splices and corners and join with sealant.

5. Verify that waterstop is anchored firmly in place before placing concrete. Do not allow vibrator to come into contact with waterstop.

3.04 CONTRACTION JOINT INSTALLATION

A. Place bond breaker above and below stop.

B. Vibrate concrete thoroughly along the joint form to produce a dense, smooth surface.

END OF SECTION

**SECTION 03300**

**CAST-IN-PLACE CONCRETE**

**CONCRETE FORMWORK**

PARAGRAPH INDEX

# SECTION 03300
# CAST-IN-PLACE CONCRETE

## PART 1 GENERAL

### 1.1 DESCRIPTION

A. This Section includes requirements for providing normal weight cast in place concrete to the sizes and shapes and at the locations indicated, in accordance with ACI 301, as modified and supplemented herein, and in accordance with the Contract Documents.

B. See other Sections of Specifications for concrete used for other than normal weight cast in place concrete and for pipes and precast concrete.

C. See other Sections of Specifications for concrete related work specified elsewhere:

1. Section 03100 – Concrete Formwork;
2. Section 03210 – Reinforcing Steel;
3. Section 03215 – Doweling for Concrete;
4. Section 03251 – Concrete Joints and Accessories;

### 1.2 QUALITY ASSURANCE

Refer to section 01400 - Quality Control for Contract requirements.

A. Field Requirements.

1. Obtain and maintain on site a copy of ACI 301, ACI 347, ACI 350, and appropriate documents referred to therein.
2. Furnish materials and labor;
3. Make cylinders for testing of reinforced concrete. Number of cylinders shall be as follows:
    a. Two at 7 days, lab cured.
    b. Two at 7 days, field cured.
    c. Two at 28 days, lab cured.
    d. Two at 28 days, field cured.
    e. Engineer may request to make cylinders for testing at 14 days.
4. Unless otherwise indicated, concrete testing shall be performed by an independent testing agency hired by the Contractor in accordance with Section 01400.

5. Provide adequate facilities for safe storage and proper curing of concrete test cylinders onsite for first 24 hours, and for additional time as may be required before transporting to test lab. Sample, cure and test concrete in accordance with ASTM C31, ASTM C39, ASTM C143, ASTM C231, and ACI 301-96.

6. Provide visual means of identification of reinforcing steel, size, strength, and specification designation, following CRSI Manual of Standard Practice.

7. Pre-installation Meeting.

   a. Schedule and conduct prior to incorporation of respective products into Project. Notify Engineer at least 5 working days in advance of location and time.

   b. Meet with Engineer, Ready-mix producer, Admixture representative, Testing and Inspection personnel.

   c. Agenda shall include:
      1) Mix designs, tests of mixes, and Submittals.
      2) Admixture types, dosage, performance, and re-dosing at site.
      3) Slump and placement time to maintain slump.
      4) Placement methods, techniques, equipment, consolidation, and form pressures.
      5) Finish, curing, and water retention.
      6) Other specified requirements needing coordination.

1.3 SUBMITTALS

A. Action Submittal: Submit the following documents:

1. Certified concrete mix design for each strength following ACI 301 and ACI 211 for each strength including proposed admixtures.

2. Include minimum dry weights of cement; fine and course aggregates; quantity, type and name of admixture, if any is proposed to be used; and volume of water per cubic yard of concrete that will be used in the mix of each class of concrete for record purposes.

3. Source of fly ash and mix design for flowable fill.

4. Non-shrink grout topping product description, mixing, handling, and placing instructions or recommendations.

5. Bonding compound.

6. Repair mortar.

7. Concrete Sealer and water repellent.

B. Informational Submittal: Submit following:

1. Certified Test Reports:

a. Admixtures.

b. Aggregate.

c. Cement with percentage of alkali (Na20).

d. Copy of ASTM C1260 test with percentage of expansion due to Alkali Silica Reaction (ASR) when alkali content in cement exceeds 0.6 percent.

2. Submit certified delivery tickets for concrete furnished.

a. Name and location of batch plant and name of plant inspector.

b. Ticket number.

c. Load number (batch number).

d. Date and truck number.

e. Destination including name and location of WSSC contract.

f. Concrete type and class (strength) and design mix designation.

g. Actual quantities of all materials including admixtures and amount of concrete in cubic yards.

h. Time at which mixer drum was charged with cement.

i. Amount of free moisture by percentage of permissible mixing water in aggregates, and maximum amount of mixing water that can be added at job site to obtain specified water to cement ratio.

j. Blank space for initials of on site receiving party.

k. Time of arrival of concrete or flowable fill truck on site.

l. Time of concrete or flowable fill placement.

## PART 2 PRODUCTS

2.1 MATERIALS

A. Reinforcing Steel: Requirements are specified in Section 03210, Reinforcing Steel.

B. Fast Setting Repair Mortar:

1. Quick setting non shrink grout and rapid hardening cementitious materials for concrete repairs shall meet requirements of ASTM C928.

2. Approved Products:

   a. Regular Applications.
      1) IPA Systems Inc., Octocrete by IPA Systems Inc.
      2) Blendcrete by Bonsal, Inc.
      3) PermaCrete by Quality Systems, Inc.;
      4) Cempatch by CHESCO Creative Products;
      5) Five Star Structural Concrete by Five Star Products, Inc.;

C. Non-Shrink Grout for dry pack under structured steel and equipment ASTM C1107.

1. Approved Products:

   a. Masterflow 713 grout by BASF Construction.

   b. Five Star Grout by Five Star Products Inc.;

   c. NS Grout by Elucid Chemical Co.;

   d. SureGrout by Kaufman Products Inc.;

   e. Multi purpose grout by Upcon;

   f. Or approved equal.

D. Non-Shrink Grout Topping in Containment Areas

1. Non-shrink grouts shall conform to the requirements of the Corps of Engineers specification CRD-C 588, Type 3.1, b or d. The grout shall have a minimum compressive strength of 5000 psi in 7 days when tested in accordance with AASHTO T 106 except that the cube molds shall remain intact with the top firmly attached throughout the curing period. The non-shrink grout shall have a minimum expansion of 0.0% after 7 days when tested in accordance with AASHTO T 160.

E. Concrete Waterproofing Materials:

1. The concrete waterproofing materials shall be of the cementitious crystalline type that chemically controls fix non-soluble crystalline growth throughout the capillary voids of the concrete.

2. Approved Materials:

   a. Xypex Concentrate and Xypex Modified by Xypex Chemical Corporation;

   b. Or approved equal.

F. Appurtenant Materials:

1. Curing Materials:

    a. Use only non-staining, clear or translucent curing compounds meeting requirements of ASTM C309 over all concrete surfaces to remain permanently exposed. For concrete in contact with potable water, compound shall be NSF approved.

    b. Sheet materials for curing shall meet requirements of ASTM C171.

    c. Burlap cloth made from Jute or Kenaf for curing, shall meet requirements of AASHTO M182, Class 1.

    d. Curing Compound for Concrete Surfaces: ASTM C309 ,

2. Joint Sealer: Requirements are specified in Section 03251, Concrete Joints and Accessories.

3. Waterstops: Requirements are specified in Section 03251, Concrete Joints and Accessories.

4. Epoxy Compound: ASTM C881.

5. Corrosion Protection for Aluminum to be in contact with concrete:

    a. Heavy coast of bituminous paint.

G. Cement shall meet requirements of ASTM C150, Types I and II. Utilize Type III cement only when approved by Engineer.

H. Formwork shall be as specified in Section 03100, Concrete Formwork.

I. Aggregates shall meet requirements of ASTM C33.

J. Water:

1. Water used for mixing and curing concrete shall be clean, fresh and free from injurious substances.

2. If suspected of questionable quality, water shall meet limits of comparison tests with distilled water in accordance with AASHTO T26.

K. Flowable fill (Controlled Low Strength Material): MDOT Standard Specifications for Construction and Material, 902.16, Type A.

L. Fly Ash shall meet requirements of ASTM C618, Class F.

M. Ground Granulated Blast-Furnace (GGBF) Slag: ASTM C-989, Grade 120.

N. Air-Entraining Admixture: ASTM C260.

O. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do 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/C494M, Type A.

2. Retarding Admixture: ASTM C494/C494M, Type B.

3. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.

4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.

5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.

6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.

P. Bonding Compound or Bonding Agent with reinforcement corrosion protection: Sika Armatec-110 EpoCem.

Q. Repair Mortar: Polymer-modified, cementitious repair mortar with corrosion inhibitor; Sikatop-111 plus.

R. Concrete Sealer and Water Repellent: Provide concrete sealer and water repellent for concrete surfaces exposed to weather. Concrete sealer and water repellent must be clear, penetrating, breathable, waterborne silane-siloxane solution.

1. Performance:

a. 40% silane content.

b. Water absorption: 85% reduction per NCHRP 244 Series II.

c. Chloride penetration: 85% reduction per NCHRP 244 Series II.

2. Manufacturer / Products:

a. Euclid Chemical - Baracade Silane 40 WB.

b. Sika - Sikagard 740 W.

c. Dayton Superior - Weather Worker 40% J29.

3. Apply concrete sealer and water repellent in accordance with manufacturer application instructions.

## PART 3 EXECUTION

3.1 DESIGN MIX

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301. Use a

qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.

B. Design, unless otherwise specified, 28 days compressive strength of concrete shall be as follows:

1. Minimum 4,500 psi concrete for structurally reinforced concrete work, concrete ditches, channels, slope protection, exterior work, and flatwork underfoot, including walks, steps, ramps, drives, slabs, and floors.

2. Minimum 3,000 psi for non-reinforced concrete.

3. Minimum 2,000 psi concrete for mud mats, pipe encasement and cradle, filling voids between sewer pipes and casing or tunnel liners, and for under foundations where excavated to excessive depth.

4. Minimum 2,000 psi concrete for grout with maximum size coarse aggregate not exceeding 3/8 inch.

5. Minimum 94 pounds cement per cubic yard and aggregate no larger than 1 1/2 inch for lean mix concrete.

6. 50 to 150 psi for flowable fill for filling voids between sewer pipes and casing or tunnel liners, limited site voids, soil boring voids, manholes and pipes.

C. Mix Proportioning:

1. Mix for 4,500 psi concrete shall produce watertight concrete resistant to naturally occurring or commonly used chemicals, and shall be performed in accordance with ACI 301 and the following:

a. Water to cement ratio: Maximum 0.45.

b. For interior concrete, no air entrainment.

c. For exterior concrete, minimum cement content and air entrainment:

| ASTM C33 Coarse Aggregate No. | Pounds/Cubic Yard | Air Entrainment |
|---|---|---|
| 467 | 517 | 5 ± 1 percent |
| 57 or 67 | 564 | 6 ± 1 percent |

d. Slump: 1 inch minimum, 4 inches maximum.

2. Other concrete: ACI 301.

3. Substitution: GGBF Slag

a. Maximum of 50 percent of weight of cement.

b. Percentage: Establish by
   1) Importance of early strength.
   2) Curing temperature involved.
   3) Properties of other concrete materials.

c. Minimum percentage: Determine by performing ASTM C1260 test if alkali content of cement is higher than 0.6 percent, so expansion of test mortar does not exceed 0.1 percent

d. Minimum cement content and water to cement ratio: Determine on basis of combined weight of cement and GGBF slag.

4. Flowable fill: Cement, fly ash, and water.

   a. Filler, if required: Sand and/or aggregates of 3/8 inch maximum size.

   b. Fly ash: Maximum of 25 percent of weight of cement.

D. Admixtures:

1. Water reducing and retarding admixtures may be used with Engineer's approval. Ensure compatibility of admixtures, and if retarding admixtures are used, follow form removal procedure specified below.

2. Do not use calcium chloride without prior approval.

3. Use admixtures in accordance with manufacturer's written instructions.

4. Use water-reducing high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.

5. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

6. Use water-reducing admixture in pumped concrete and concrete with a w/cm below 0.50.

3.2 FORMWORK DESIGN AND CONSTRUCTION.

A. Formwork requirements for cast in place concrete are specified in Section 03100, Concrete Formwork

B. Design, engineering, construction and removal of formwork shall be the responsibility of the Contractor.

3.3 PLACING REINFORCEMENT

A. Unless otherwise indicated, place reinforcement following ACI 301 and with concrete cover following in ACI 318.

3.4 PLACING CONCRETE

A. Notify Engineer at least 24 hours before placing concrete.

B. Place concrete per ACI 301 and the following:

1. Wet down formwork and reinforcement before placing concrete to prevent leaching of water from concrete, but do not allow free water to stand in forms.

2. Place concrete within 90 minutes after addition of cement, aggregates, water, and admixtures.

3. Discard off-site concrete not placed within these time limits.

4. Do not exceed the concrete free drop of 5 feet without use of adjustable length pipes.

5. Locate joints where shown on Drawings and approved submittals.

6. Seal control joints in exterior slabs.

7. When bonding new concrete to existing, prepare for subsequent placement following ACI 301 with approved bonding compound applied and permitted to cure following manufacturer's recommendations, or as directed by Engineer.

C. Weather Conditions.

1. When air temperature has fallen to, or may be expected to fall below, 40 degrees F. during 7-day period after placement:

a. Protect concrete work from physical damage or reduced strength caused by frost, freezing action, or low temperatures following recommendations of ACI 306 and as specified herein.

b. Provide adequate means to maintain temperature, in area where concrete is being placed, at between 50 and 70 degrees F. for at least 7 days after placement.

c. Uniformly heat water and aggregates before mixing as required to obtain concrete mixture temperature of not less than 55 degrees F. and not more than 85 degrees F. at point of placement.

d. Provide temporary housings or coverings and maintain heat and protection to ensure that ambient temperature does not fall more than 30 degrees F. in 24 hours during 7-day period after placement.

e. Avoid rapid dry out of concrete due to overheating, and avoid thermal shock due to sudden cooling or heating.

f. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

g. Ensure that forms, reinforcing steel, and adjacent concrete surfaces are entirely free of frost, snow, and ice before placing concrete.

h. Do not use chlorides and other materials containing antifreeze agents, or chemical accelerators, or set control admixtures in mix designs, unless approved by Engineer in advance.

2. When Hot Weather Conditions Exist:

a. Place concrete following recommendations of ACI 305 and as specified herein.

b. Cool ingredients before mixing to maintain concrete temperature at time of placement below 80 degrees F. when temperature is rising and below 85 degrees F. when temperature is falling.

c. Cover reinforcing steel with water soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedment in concrete.

d. Do not place concrete when hot weather conditions will cause difficulty from loss of slump, flash set, or cold joints.

e. Do not use set control admixtures in mix designs unless approved by Engineer in advance.

## 3.5 PLACING NON-SHRINK GROUT TOPPING

A. All surfaces to receive the non-shrink grout topping shall be cleaned of oil, grease, dirt, and laitance down to sound concrete to a concrete surface preparation of CSP 5. Rust shall be removed from the underside of all plates and from all bolts or other embedment items by sanding or power brushing.

B. Apply a bonding compound to the surfaces to receive swept-in grout.

C. Grout shall be poured or pumped into position in such a manner as to avoid air pockets and to fill the entire void. When necessary, use rods or other tools to compact the grout and remove all voids.

D. The surface shall be floated and troweled.

E. The grout shall be cured for the time and in the manner recommended by the manufacturer.

## 3.6 CURING AND PROTECTION

A. Method of Curing and Protection: Follow ACI 301 and as required elsewhere in Contract Documents.

B. Protect structural floors left exposed to atmosphere for more than 3 days by polyethylene covering, dampened burlap, straw, or equivalent materials, as required to control hydration.

C. During hot and cold weather, cure and protect concrete as required for placing concrete herein.

D. Cure unreinforced concrete formed with earth, wood, or metal for thrust blocks, joint encasements, pipe encasements, and cradles for at least 2 hours before placing backfill.

3.7 FINISHES

A. Method of Finishing: Follow ACI 301 and as required elsewhere in Contract Documents.

B. Where not shown on Drawings, use following finishes:

1. Curbs and Equipment Bases: Rubbed finish.

2. Exterior Slabs: Broom finish, Class B tolerance.

3. Interior Slabs: Trowel finish, Class A tolerance.

4. Other concrete not exposed to view: rough form finish.

5. Other concrete exposed to view: smooth form finish with voids filled and rubbed smooth.

3.8 CONCRETE WATERPROOFING.

A. Apply to joints and concrete surfaces of the structures as shown on the drawings.

1. General:

a. Application of all waterproofing materials shall be done by or under the direction of a manufacturer's representative.

b. Prior to start of installation of the work of the section, secure a visit to the job site by a representative of the manufacturer of the waterproofing materials used, who shall inspect and shall certify:
1) That the surfaces to which waterproofing were applied were in condition suitable for that application.
2) That the materials installed complied in all respects with the requirements of these specifications.
3) That the materials were installed in complete accordance with the manufacturer's current recommendations.

c. Installation:
1) Concrete surface preparation, as well as waterproofing material mixing, application and curing procedures, shall be in strict accordance with the waterproofing material manufacturer's standard specifications. All such

standard specifications shall be submitted to the engineer at least 30 days prior to waterproofing application.

2) Apply waterproofing agent in rate and strict accordance with the waterproofing material manufacturer's specifications:
   a) Apply on slurry coat of the concentrated waterproofing agent to all joint surfaces as noted on the drawings;
   b) Apply one slurry coat of the concentrated waterproofing agent to all wall and slab surfaces, noted on the drawings;
   c) After first coat has set, but while it is still 'green', apply a second coat of the waterproofing agent, modified as recommended by the manufacturer.

3.9 ACCEPTANCE OF STRUCTURE

A. For sanitary engineering installations as defined by ACI 350, concrete will be considered acceptable if it meets the acceptance criteria of ACI 301 and ACI 350.

B. If the concrete is cored and cores fail to meet specified 28-day strength, the Engineer shall have the right to reject the concrete.

C. For other structures, concrete will be acceptable if it meets acceptance criteria of ACI 301.

D. The Engineer shall be the sole judge to determine if concrete does or does not meet the above requirements.

E. Concrete not meeting the requirements specified above shall be removed, disposed of, and replaced by the Contractor at no cost to the Commission.

F. Make repairs using approved repair procedure in Engineer's presence.

G. In addition to the above acceptance requirements, the containment areas shall be given a leakage test. The following procedure shall be followed:

1. Leakage testing or cleaning of surfaces and grout shall not begin until concrete and have cured and joint sealants have set and cured a minimum of 14 days;

2. Prior to testing, clean exposed surfaces by through hosing and remove surface laitance and loose matter. Remove wash water and debris from the structures by means other than washing through plant piping;

3. Provide piping and equipment to test for leakage;

4. Fill to 1 inch below the containment curb. Repair any running leaks which appear during filling before continuing.

5. After the containment area has been kept full for 48-hours, it will be assumed for the purposes of the test that the absorption of moisture by the concrete in the structure is complete. Then measure the change in water surface each day for a 5-day period;

6. During the test period, examine exposed portions of the structure, and mark visible leaks or damp spots. Repair visible leaks or damp spots after dewatering. If the drop in water surface in the 24-hour period exceeds 1/100 of 1% of the normal volume of liquid contained in the containment area, the leakage shall be considered excessive;

7. The determination of surface moisture evaporation shall be aided with a 24-inch-deep, white-colored, watertight container of not less than 10-square-foot surface area exposure. Position container to experience environmental conditions similar to the structure being tested. Subtract the water loss due to evaporation from the measured water loss in the basin to determine the water loss due to leakage;

8. If the leakage is excessive, drain the area as described in paragraph 1 above, repair leaks and damp spots, and refill the structure and again test for leakage. Continue this process until the drop in water surface in a 24-hour period meets the test requirements;

9. Inspect the piping of the underdrain system for evidence of leaks. If leaking is indicated, locate and repair;

10. Repairs and additional filling and testing shall be made by the Contractor at no additional cost;

11. Repair leaking concrete cracks by cutting out a square edged and uniformly aligned joint 3/8-inch wide by 1-inch deep. Prepare exposed surfaced of the joint, and apply joint sealant;

12. Alternate methods of crack repair may be submitted by the Contractor for review by the Commission.

END OF SECTION

**SECTION 03515**

**LIGHTWEIGHT CEMENTITIOUS DECK**

PARAGRAPH INDEX

## SECTION 03515

## LIGHTWEIGHT CEMENTITIOUS DECK

### 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. Section Includes:

1. Monolithic lightweight cementitious units.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Include details at supports, reinforcement at openings, and attachment to other work.

C. Samples: Show texture, finish, and edge and end configurations of monolithic lightweight cementitious units, 12 inches long by width of unit.

1. Include unit with galvanized-steel edge channel.

D. Welding certificates.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for lightweight cementitious units.

1.04 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Fire-Resistance Ratings: Where indicated, provide cementitious deck identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect cementitious units from moisture.

B. Store units on elevated platforms at Project site in a dry, well-ventilated, covered space and stack according to manufacturer's written recommendations.

C. Handle units to prevent chipping, breaking, cracking, staining, soiling, warping, or other physical damage. Discard damaged units at time of installation.

1.06 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit work to be performed according to manufacturers' written instructions and warranty requirements.

B. Protect cementitious deck from moisture during installation and while exposed to the weather until permanently covered with subsequent construction.

**PART 2 - PRODUCTS**

2.01 MONOLITHIC CEMENTITIOUS UNITS

A. Channel-Reinforced Plank: Manufacturer's standard, tongue-and-groove-edged, cementitious planks with factory-installed, cold-formed, 0.060-inch-thick, galvanized-steel channel set in grooved edge; and as follows:

1. Products: Subject to compliance with requirements, provide the following:

a. Martin Fireproofing, Inc.; Steel Edge Creteplank.

2. Thickness: 2 inches.

3. Size: 18 inches, unless noted otherwise; length to span a minimum of two support spacings.

4. End Configuration: Square.

2.02 ACCESSORIES

A. Portland Cement Grout: Factory-packaged, Portland cement grout formulation recommended by cementitious plank unit manufacturer with a minimum compressive strength of 5,000 psi.

B. Anchor Clips: Manufacturer's standard formed anchor clips of 0.0478-inch- thick minimum, galvanized-steel sheet, of type and configuration required for deck system indicated.

C. Screws: Manufacturer's recommended, corrosion-resistant screw fasteners and washers, self-drilling, self-tapping, of length required for deck and structural framing indicated.

D. Nails: Manufacturer's recommended corrosion-resistant nails of size and length required for deck and structural framing indicated.

E. Adhesive: Manufacturer's recommended construction adhesive complying with APA AFG-01.

## PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine structural support framing for compliance with requirements, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Comply with manufacturer's written instructions for installing cementitious deck.

1. Install fastenings according to manufacturer's written instructions unless otherwise indicated.

B. Deck Interruptions: Provide barrier seals or blocking at overhangs to form wind seals and at partitions and walls to form sound seals unless otherwise indicated.

3.03 ROOF DECK INSTALLATION

A. Plank Roof Deck: Install planks progressively with long dimension perpendicular to supports and with end joints in alternate rows, staggered and centered over supports unless otherwise indicated. Tightly nest tongue-and-groove edges and tightly butt end joints.

1. Cut panels to provide starter units.

2. Continuously support plank edges and ends at perimeter of building and at openings in deck.

3. Mechanically fasten planks to supports and perimeter members.

4. Adhesively and mechanically fasten planks to supports and perimeter members. Apply adhesive to tongue-and-groove edges.

3.04 CLEANING AND PROTECTION

A. Protect top surfaces of deck from damage caused by construction operations.

B. Protect exposed bottom surfaces of deck from soiling and damage during handling and construction.

C. Clean exposed bottom surfaces of completed deck and touch up minor damage to surfaces as approved by Engineer.

D. Provide final protection and maintain conditions in a manner acceptable to manufacturer and Installer that ensures that cementitious deck is without damage or deterioration at time of Substantial Completion.

E. Remove and replace deteriorated and damaged deck units.

**END OF SECTION**

**SECTION 03700**

**CONCRETE REMOVAL AND REPAIR**

PARAGRAPH INDEX

## SECTION 03700

## CONCRETE REMOVAL AND REPAIR

### PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. The Contractor shall furnish all labor, equipment, tools, services, and materials necessary for, or incidental to concrete removals and repairs in conformance with (but not limited to) the following.

B. Removal of existing concrete slabs and wall to the extent shown on the Contract drawings, installing new elements shown on the drawings and pouring new concrete around the new elements as shown on the drawings.

C. Repair of cracks, joints, spalls, and deteriorated concrete conforming to the requirements of the manufacturers, drawings and as specified herein.

D. Removal of deteriorated concrete and repairing with polymer modified cementitious mortars conforming to the requirements of the manufacturer, drawings and as specified herein.

1.02 SUBMITTALS

E. The Contractor shall submit to Engineer, catalog cuts for each material specified and shall state the specific usage for each product submitted. Use of products for procedures not stated is prohibited.

F. 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.

G. The Contractor shall submit to the Engineer, manufacturer's recommended procedures for mixing, application and curing of all repair products.

1.03 QUALITY ASSURANCE

The manufacturer shall clearly mark all containers with the following information:

H. Name of manufacturer

I. Manufacturer's product identification

J. Date of expiration or shelf life

K. Manufacturer's instructions for mixing and application

L. Warning for handling and toxicity

M. Valid MSDS information at the job site for all materials used on the project

N. The manufacturer shall have a knowledgeable technical representative available for on-site assistance to the Contractor during material application procedures

1.04 DELIVERY

All materials shall be delivered in sealed containers with labels legible and intact.

1.05 STORAGE OF MATERIALS

A. The Contractor shall store all materials at temperatures between 40 -90°F unless otherwise recommended by the manufacturer.

B. Storage shall conform to the requirements of ACI 301, 'Specifications for Structural Concrete for Buildings'.

1.06 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.

1.07 EQUIPMENT

A. Oil free compressors shall be used or compressors with an adequate oil trap. The oil trap shall be checked by periodic tests involving spraying cardboard with the air and water spray to check for oil.

B. Chipping hammers shall not exceed a lightweight hand-held 20-pound pneumatic hammer, unless otherwise approved by the Engineer.

**PART 2. MATERIALS**

2.01 POLYMER-MODIFIED CEMENTITIOUS MORTAR

For use in patching: SikaTop 122 Plus, or 123 Plus mortar as manufactured by Sika Corporation or approved equal.

2.02 CONCRETE REPAIR MORTAR

SikaCrete 211 as manufactured by Sika Corporation or approved equal.

2.03 BONDING COMPOUND AND REINFORCING STEEL PROTECTIVE COATING

Sika Armatec 110 bonding compound as manufactured by Sika Corporation, or approved equal.

2.04 REINFORCING STEEL

Reinforcing steel shall conform to ASTM A615, Grade 60.

2.05 HYPALON TYPE STRIP WATERPROOFING

Hypalon type strip waterproofing shall be Sikadur Combiflex as manufactured by Sika Corporation, or approved equal.

## PART 3 CONSTRUCTION

3.01 REPAIRING DETERIORATED CONCRETE WITH POLYMER-MODIFIED CEMENTITIOUS MORTAR

A. Remove all deteriorated concrete, dirt, oil, grease, standing water, and bond inhibiting materials for the surface. Preparation work should be done by chipping, sandblasting and waterblasting. Exposed reinforcing steel shall be cleaned by sandblasting.

B. To ensure removal to sound concrete, chipping shall continue until coarse aggregate is being broken while still held in the existing concrete surface.

C. The edges of repair shall be saw-cut to a minimum depth of 1/2" and as required for repair material. Straight edges shall be formed around repair area.

D. Replace reinforcing bars with 25% or more loss in sectional area by welding the existing bars to new bars with 3" minimum length welds. Welded splices shall be in accordance with AWS D14.4. Temporary shoring shall be used for all structural members requiring reinforcing bars replacement.

E. Air blasting shall be used to remove all dust, etc. before placement of patch material.

F. Install protective coating system to exposed reinforcing steel as specified.

G. Build formwork as required to match original surface.

H. Mix materials mechanically or manually. Mix the two components as recommended by the manufacturer. If manual mixing takes more than 3 minutes, mix smaller quantities.

I. Repair areas shall be filled with a polymer modified cementitious mortar. Type shall be relative to the thickness of the patch and whether it is on a horizontal, vertical or overhead surface.

J. At time of application, surfaces shall be Saturated Surface Dry (SSD) with no glistening water. Mortar must be scrubbed into substrate, filling all pores and voids. Force material against edges of repair, working towards the center. After filling the repair area, allow mortar to set to the desired stiffness, then finish with wood or sponge float for a smooth surface.

K. If the surface is porous, or the mix is stiff and intended for vertical or overhead surfaces, prime surface as recommended by the manufacturer. Mortar must be place while prime is wet. Dried prime coat must be removed by mechanical means and freshly reprimed.

L. Do not use a solvent type curing agent. Cure with water according to manufacturer's specifications.

M. Minimum ambient and surface temperatures must be at least 45 and rising at time of application.

N. See Repair Detail for Repair of Spalled or Deteriorated Concrete on the Drawings.

3.02 CUTTING AND REMOVING EXISTING CONCRETE WALLS AND SLABS FOR INSTALLATION OF NEW ELEMENTS

A. Where shown, install new support members for existing concrete before cutting and removing any existing concrete.

B. Saw cut around the perimeter of the concrete to be removed.

C. Remove the concrete as required or as shown on drawings making sure that any reinforcement noted to remain is not damaged.

D. Cut the reinforcing steel that is to be removed. Clean the reinforcing that is to remain.

E. Place the new elements to be installed in their correct locations, place all new reinforcing required and coat the existing reinforcing steel with bonding compound.

F. Install swelling type waterstops where shown and place new concrete.

G. Install Hypalon type waterproofing where shown according to manufacturer's recommendations.

3.03 REINFORCING STEEL PROTECTIVE COATING

A. Reinforcing steel shall be mechanically cleaned of all bond inhibiting agents.

B. Surface shall be damp but free of standing water at the time of application.

C. Mix coating to manufacturer's specifications.

D. Apply coating with a quality brush, covering all exposed reinforcement with a minimum coating thickness of 40 mils.

E. Allow coating 2-3 hours to dry before applying concrete patching materials.

F. Minimum application temperature to be at least 45 degrees F and rising.

END OF SECTION

**SECTION 04200**

**UNIT MASONRY**

**PARAGRAPH INDEX**

**SECTION 04200**

**UNIT MASONRY**

## PART 1 - GENERAL

1.01 DESCRIPTION

A. The Contractor shall provide all labor, materials, equipment, and services necessary to install all masonry work as shown on the drawings and as specified herein.

1.02 SUMMARY

A. This Section includes the following:

1. Concrete unit masonry.

2. Brick unit masonry.

B. The intent of this Section is to provide Specifications for construction of the new stair house at Pump Station No. 2.

1.03 PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops the following installed compressive strengths (f'm) at 28 days.

1. For Concrete Unit Masonry: As follows, based on net area:

a. f'm = 1500 psi.

2. For Brick Unit Masonry: As follows, based on gross area:

a. f'm = 2000 psi.

1.04 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each different masonry unit, accessory, and other manufactured product specified.

C. Shop drawings for reinforcing detailing fabrication, bending, and placement of unit masonry reinforcing bars. Comply with ACI 315

"Details and Detailing of Concrete Reinforcement" showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of masonry reinforcement.

D. Samples for verification of the following:

1. Full-size units for each different exposed brick unit required showing the full range of exposed colors, textures, and dimensions to be expected in the completed construction.

2. Colored-masonry mortar samples for each color required showing the full range of colors expected in the finished construction.

E. Material certificates for the following, signed by manufacturer and Contractor, certifying that each material complies with requirements.

1. Each different cement product required for mortar and grout, including name of manufacturer, brand, type, and weight slips at time of delivery.

2. Each type and size of joint reinforcement.

3. Each type and size of anchors, ties, and metal accessories.

F. Material test reports from a qualified independent testing agency, employed and paid by Contractor or manufacturer, indicating and interpreting test results relative to compliance of the following proposed masonry materials with requirements indicated:

1. Mortar complying with property requirements of ASTM C 270.

2. Mortar complying with BIA M1.

3. Grout mixes. Include description of type and proportions of grout ingredients.

4. Masonry units.

1.05 QUALITY ASSURANCE

A. Testing Agency Qualifications: To qualify for acceptance, an independent testing agency must demonstrate to Engineer's satisfaction, based on evaluation of agency-submitted criteria conforming to ASTM C 1093, that it has the experience and capability to satisfactorily conduct the testing indicated without delaying the Work.

B. Preconstruction Testing: Employ and pay a qualified independent testing agency to perform the following preconstruction testing to establish compliance of proposed materials and construction with specified requirements:

1. Clay Masonry Unit Test: For each different clay masonry unit indicated, test units per ASTM C 67.

2. Concrete Masonry Unit Test: For each different concrete masonry unit indicated, test units for strength, absorption, and moisture content per ASTM C 140.

3. Test mortar properties per test methods of ASTM C 780.

4. Test grout compressive strength per ASTM C 1019.

C. Single-Source Responsibility for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one source and by a single manufacturer for each different product required.

D. Single-Source Responsibility for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source or producer for each aggregate.

E. Mockup: Prior to installing unit masonry, construct sample wall panels to verify selections made under sample submittals and to demonstrate aesthetic effects as well as other qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for final unit of Work.

1. Site Mock-Up: Construct panel 4 feet-by-4 feet in size, including face and back-up wythes and accessories as shown in drawings and as specified below:

   a. Typical exterior face brick wall.
   b. Locate mockup on site as directed by Owner.

2. Clean exposed faces of mockups with masonry cleaner indicated.

3. Notify Engineer one week in advance of the dates and times when mockups will be constructed.

4. Protect accepted site mockup from the elements with weather-resistant membrane.

5. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

   a. Acceptance of mockup is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Owner in writing.
   b. When directed, demolish and remove mockups from Project site.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver masonry materials to project in undamaged condition.

B. Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store mix in delivery containers on elevated platforms.

C. Store masonry units on elevated platforms, under cover, and in a dry location to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, and other causes. If units become wet, do not install until they are in an air-dried condition.

D. Store cementitious materials on elevated platforms, under cover, and in a dry location.

E. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

F. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.07 PROJECT CONDITIONS

A. Protection of Masonry: During erection, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

   1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.

2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.

B. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and mortar splatter by coverings spread on ground and over wall surface.

2. Protect sills, ledges, and projections from mortar droppings.

3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.

4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt on completed masonry.

C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit masonry damaged by frost or freezing conditions. Comply with the cold weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

D. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg F and above. Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

## PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers: Provide products by one of the listed manufacturers:

1. Concrete Masonry Units:

a. York Building Products
b. Supreme Concrete Block, Inc.

2. Brick:

a. Match brick of existing stairway entrance to Pump Station 2, after brick and mortar have been cleaned as specified in Section 04901, Clay Masonry Restoration and Cleaning.

3. Portland Cement, Mortar Cement, Masonry Cement, and Lime:

a. Lehigh Portland Cement Co.
b. Riverton Corporation (The).

4. Joint Reinforcement, Ties, and Anchors:

a. Dur-O-Wal, Inc.
b. Hohmann & Barnard, Inc.
c. National Wire Products Industries.

2.02 CONCRETE MASONRY UNITS (CMUs)

A. General: Provide shapes indicated and as follows for each form of concrete masonry unit required.

1. Provide special shapes for lintels, corners, jambs, sash, control joints, bond beams, headers, bonding, and other special conditions.

2. Provide bullnose units for outside corners, except is specifically indicated otherwise.

B. Concrete Masonry Units: ASTM C 90 and as follows:

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength indicated below:

a. 1900 psi.
b. Not less than the unit compressive strengths required to produce concrete unit masonry construction of compressive strength indicated.

2. Weight Classification: Light weight.

3. Aggregates: Do not use aggregates made from pumice, scoria, or tuff.

4. Provide Type I, moisture-controlled units, or units made with integral water repellent for all exposed units.

5. Size: Manufactured to the actual dimensions indicated on Drawings within tolerances specified in the applicable referenced ASTM specification.

6. Size: Manufactured to the actual dimensions listed below (within tolerances specified in the applicable referenced ASTM specification) for the corresponding nominal sizes indicated on Drawings:

   a. 8 inches nominal: 7 5/8 inches actual.

7. Exposed Faces: Manufacturer's standard color and texture, unless otherwise indicated.

2.03 BRICK

A. General: Provide shapes indicated and as follows for each form of brick required.

1. Provide units without cores or frogs and with exposed surfaces finished for ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces.

B. Face Brick: ASTM C 216 and as follows:

1. Grade and Unit Compressive Strength: Provide units with grade and minimum average net-area compressive strength indicated below:

   a. Grade: SW.
   b. 8000 psi.

2. Initial Rate of Absorption: Less than 20 g. / 30 sq.in. per minute when tested per ASTM C 67.

3. Type: FBS.

4. Size: Bricks manufactured to the following actual dimensions within tolerances specified in ASTM C 216:

   a. Type 1 Brick: 3 5/8” wide by 2 ¼” high by 7 5/8” long.

5. Bond: Running bond, unless shown otherwise on the drawings.

6. Application

a. Type 1 Brick: Use where brick is exposed, unless otherwise indicated.

7. Products: Subject to compliance with requirements, provide the following:

a. Match brick of existing stairway entrance to Pump Station 2, after brick and mortar have been cleaned as specified in Section 04901, Clay Masonry Restoration and Cleaning.

## 2.04 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

B. Aggregate for Grout: ASTM C 404.

C. Aggregate for Mortar: ASTM C 144; except for joints less than ¼ inch, use aggregate graded with 100 percent passing the No. 16 sieve.

D. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortars.

E. Ready-Mixed Mortar: Cementitious materials, water, and aggregate complying with requirements specified in this Article; combined with set-controlling admixtures to produce a ready-mixed mortar complying with ASTM C 1142.

F. Water: Potable and clean.

G. Hydrated Lime: ASTM C 207, Type S.

H. Products: Subject to compliance with requirements, provide the following or equal:
1. Colored Portland Cement Lime Mix:

a. Flamingo-Brixment Color Masonry Cement; Essroc Corporation.

(1) Color: OC Old Colonial.

**(Color to be approved by the Owner at the time of final brick approval)**

2. Colored Masonry Cement Mix:

a. Lehigh Custom Color Portland Cement; Lehigh Portland Cement Co.
b. Flamingo-Brixment Custom Color Masonry Cement; Essroc Corporation..

(1) Color to match Portland Cement Lime mix color above.

2.05 JOINT REINFORCEMENT

A. General: Provide joint reinforcement formed from the following:

1. Galvanized carbon-steel wire, coating class as follows:

a. ASTM A 153, Class B-2, for both interior and exterior walls.

B. Description: Welded-wire units prefabricated with deformed continuous side rods and plain cross rods into straight lengths of not less than 10 feet, with prefabricated corner and tee units, and complying with requirements indicated below:

1. Wire Diameter for Side Rods: #9 or .148 inch.

2. Wire Diameter for Cross Rods: #9 or .148 inch.

C. For single-wythe masonry, provide type as follows with single pair of side rods:

1. Truss design with continuous diagonal cross rods spaced not more than 16 inches o.c.

D. For multi-wythe masonry, provide type as follows:

1. Truss design with continuous diagonal cross rods spaced not more than 16 inches o.c.

a. Number of Side Rods for Multiwythe Concrete Masonry: One side rod for each face shell of hollow masonry units more than 4 inches in width, plus 1 side rod for each wythe of masonry 4 inches or less in width.

b. Provide integral drips on cross rods at cavity walls.

2. Tab design with single pair of side rods and rectangular box-type cross ties spaced not more than 16 inches o.c., with side rods spaced for embedment within each face shell of back-up wythe and ties extended to engage the outer wythe by at least 1 ½ inches.

3. Adjustable (2-piece) tab design with single pair of side rods and rectangular box-type cross ties spaced not more than 16 inches o.c., with side rods spaced for embedment within each face shell of back-up wythe and with separate adjustable ties engaging the cross ties and extended to engage the outer wythe by at least 1 ½ inches and spaced not more than 16 inches o.c.

a. Use where horizontal joints of facing wythe do not align with those of back-up and where indicated.

2.06 TIES AND ANCHORS, GENERAL

A. General: Provide ties and anchors specified in subsequent articles that comply with requirements for metal and size of this Article, unless otherwise indicated.

B. Wire: As follows:

1. Galvanized Carbon-Steel Wire: ASTM A 82; with ASTM A 153, Class B-2 coating for wire ties and anchors in exterior walls.

2. Wire Diameter: 3/16 inch.

C. Steel Sheet: As follows:

1. Galvanized Steel Sheet: ASTM A 526M, Z 180 (commercial quality), steel sheet zinc coated by hot-dip process on continuous lines prior to fabrication, for sheet-metal ties and anchors in interior walls and in exterior walls when completely embedded in mortar.

2. Galvanized Steel Sheet: ASTM A 366M (commercial quality) cold-rolled, carbon-steel sheet hot-dip galvanized after fabrication to comply with ASTM A 153, Class B-2 or B-3, as applicable, for sheet-metal ties and anchors in exterior walls not completely embedded in mortar and grout.

D. Galvanized Steel Sheet Thickness: For steel sheet hot-dip galvanized by continuous process prior to fabrication:

1. .080 inches.

2.07 MISCELLANEOUS ANCHORS

A. Unit Type Inserts in Concrete: Cast-iron or malleable-iron inserts of type and size indicated.

B. Dovetail Slots: Furnish dovetail slots with filler strips, of slot size indicated, fabricated from 0.0336 inch, galvanized steel sheet at concrete columns.

C. Anchor Bolts: Steel bolts complying with ASTM F 568, Property Class 4.6; with ASTM A 563M hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153, Class C; of diameter and length indicated and in the following configurations:

1. Headed bolts.

2. Nonheaded bolts, straight.

3. Nonheaded bolts, bent in manner indicated.

D. Post-installed Anchors: Anchors as described below, with capability to sustain, without failure, load imposed within factors of safety indicated, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

1. Type: Chemical anchors.

2. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (5 microns) for Class SC 1 service condition (mild).

3. For Postinstalled Anchors in Concrete: Capability to sustain, without failure, a load equal to 4 times the loads imposed by masonry.

2.08 EMBEDDED FLASHING MATERIALS

A. Laminated Flashing: Manufacturer's standard laminated flashing of type indicated below:

1. Copper-Fabric Laminate: Copper sheet of weight indicated below, bonded with asphalt between 2 layers of glass-fiber cloth.

a. Weight: 5 oz./sq. ft..

2. Application: Use where flashing is fully concealed in masonry.

B. Adhesive for Flashings: Of type recommended by manufacturer of flashing material for use indicated.

C. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

1. Copper-Fabric Laminate Flashing:

a. York Copper Fabric Flashing; York Manufacturing, Inc.

## 2.09 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Type 2, Class A, Grade 1; compressible up to 35 percent; of width and thickness indicated; formulated from the following material:

1. Neoprene.

2. Urethane.

B. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

C. Weep Holes: Provide the following:

1. Hohman and Barnard HV Quadro-Vent.

## 2.10 MASONRY CLEANERS

A. Use the Sure Klean or equal product recommended by the brick manufacturer that will ensure a thorough cleaning of the masonry without damage.

1. Available Products: Subject to compliance with requirements, products that may be used to clean unit masonry surfaces include, but are not limited to, the following:

a. Sure Klean No. 600 Detergent; ProSoCo, Inc.

b. Sure Klean No. 101 Lime Solvent; ProSoCo., Inc.
c. Sure Klean Vana Trol; ProSoCo, Inc.

2.11 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.

2. Add cold-weather admixture (if used) at the same rate for all mortar, regardless of weather conditions, in order to ensure that mortar color is consistent.

B. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification, for job-mixed mortar; and ASTM C 1142 for ready-mixed mortar, of types indicated below:

1. For masonry below grade, in contact with earth, and where indicated, use type indicated below:

a. Type: S.

2. For reinforced masonry and where indicated, use type indicated below:

a. Type: N.

3. For exterior, above-grade, load-bearing and nonload-bearing walls and parapet walls; for interior load-bearing walls; for interior nonload-bearing partitions, and for other applications where another type is not indicated, use type indicated below:

a. Type: N.

C. Pigmented Mortar: Select and proportion pigments with other ingredients to produce color required.

1. Limit pigments to the following percentages of cement content by weight:

a. For mineral oxide pigments and portland cement-lime mortar, not more than 10 percent.
b. For mineral oxide pigments and masonry cement mortar, not more than 5 percent.

2. Mix to match mortar existing building as specified.

D. Grout for Unit Masonry: Comply with ASTM C 476. Use grout of consistency indicated or, if not otherwise indicated, of consistency (fine or coarse) at time of placement that will completely fill spaces intended to receive grout.

1. Use fine grout in grout spaces less than 2 inches in horizontal dimension, unless otherwise indicated.

2. Use coarse grout in grout spaces 2 inches or more in least horizontal dimension, unless otherwise indicated.

2.12 REINFORCING MATERIAL

A. Deformed Reinforcing Steel bars, ASTM A615, Grade 60.

2.13 ANTI-GRAFFITI COATING

A. Sure Klean Weather Seal Blok-Guard & Graffiti Control II or equal, as determined by the Engineer.

B. Coating shall be compatible with cleaning solutions specified in Paragraph 2.12 of this specification

**PART 3 - EXECUTION**

3.01 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of unit masonry. Do not proceed with installation until unsatisfactory conditions have been corrected.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of unit masonry.

B. Examine rough-in and built-in construction to verify actual locations of piping connections prior to installation.

3.02 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to the full thickness shown. Build single-wythe walls to the actual thickness of the masonry units, using units of thickness indicated.

B. Build chases and recesses to accommodate items specified in this and other Sections of the Specifications.

C. Leave openings for equipment to be installed before completion of masonry. After installing equipment, complete masonry to match construction immediately adjacent to the opening.

D. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining construction. Use full-size units without cutting, where possible. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Mix units for exposed unit masonry from several pallets or cubes as they are placed to produce uniform blend of colors and textures.

F. Wetting of Brick: Wet brick prior to laying if the initial rate of absorption exceeds 30 grams per 30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb the water so they are damp but not wet at the time of laying.

3.03 CONSTRUCTION TOLERANCES

A. Variation from Plumb: For vertical lines and surfaces of columns, walls, and arrises, do not exceed ¼ inch in 10 feet, nor 3/8 inch in 20 feet, nor ½ inch in 40 feet or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed ¼ inch in 20 feet, nor ½ inch in 40 feet or more. For vertical alignment of head joints, do not exceed plus or minus ¼ inch in 10 feet, nor ½ inch maximum.

B. Variation from Level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines, do not exceed ¼ inch in 20 feet, nor ½ inch in 40 feet or more. For top surface of bearing walls, do not exceed 1/8 inch in 10 feet, nor 1/16 inch within width of a single unit.

C. Variation of Linear Building Line: For position shown in plan and related portion of columns, walls, and partitions, do not exceed ½ inch in 20 feet, nor ¾ inch in 40 feet or more.

D. Variation in Cross-Sectional Dimensions: For columns and thickness of walls, from dimensions shown, do not exceed minus ¼ inch nor plus ½ inch.

E. Variation in Mortar-Joint Thickness: Do not vary from bed-joint thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to ½ inch. Do not vary bed-joint thickness from bed-joint thickness of adjacent course by more than 1/8 inch. Do not vary from head-joint thickness indicated by more than plus or minus 1/8 inch. Do not vary head-joint thickness from adjacent head-joint thickness by more than 1/8 inch. Do not vary from collar-joint thickness indicated by more than minus ¼ inch or plus 3/8 inch.

3.04 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint widths and for accurate locating of openings, movement-type joints, returns, and offsets. Avoid the use of less-than-half-size units at corners, jambs, and where possible at other locations.

B. Lay walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other construction.

C. Bond Pattern for Exposed Masonry: Lay exposed masonry in the following bond pattern; do not use units with less than nominal 4 inch horizontal face dimensions at corners or jambs.

1. Running bond, unless shown otherwise on drawings.

D. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4 inch horizontal face dimensions at corners or jambs.

E. Stopping and Resuming Work: In each course, rack back 2-unit length for one-half running bond or 1/3-unit length for one-third running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly if required, and remove loose masonry units and mortar prior to laying fresh masonry.

F. Built-in Work: As construction progresses, build-in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.

G. Fill space between hollow metal frames and masonry solidly with mortar, unless otherwise indicated.

H. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.

I. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

3.05 MORTAR BEDDING AND JOINTING

A. Lay hollow concrete masonry units as follows:

1. With full mortar coverage on horizontal and vertical face shells.

2. Bed webs in mortar in starting course on footings and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with grout.

3. For starting course on footings where cells are not grouted, spread out full mortar bed, including areas under cells.

4. Maintain joint widths indicated, except for minor variations required to maintain bond alignment. If not indicated, lay walls with 3/8 inch joints.

B. Lay solid brick-size masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not furrow bed joints or slush head joints.

1. At cavity walls, slope beds toward cavity to minimize mortar protrusions into cavity. As work progresses, trowel mortar fins protruding into cavity flat against cavity face of brick.

C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

D. Cut joints flush for masonry walls that are to receive plaster or other direct-applied finishes (other than paint), unless otherwise indicated.

3.06 STRUCTURAL BONDING OF MULTIWYTHE MASONRY

A. Use continuous horizontal-joint reinforcement installed in horizontal mortar joints for bond tie between wythes.

B. Corners: Provide interlocking masonry unit bond in each course at corners, unless otherwise shown.

1. Provide continuity with horizontal-joint reinforcement at corners by using prefabricated "L" units in addition to masonry bonding.

C. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, provide same type of bonding specified for structural bonding between wythes and space as follows:

1. Provide individual metal ties not more than 16 inches o.c.

2. Provide continuity with horizontal-joint reinforcement by using prefabricated "T" units.

3. Provide rigid metal anchors not more than 24 inches o.c. If used with hollow masonry units, embed ends in mortar-filled cores.

## 3.07 HORIZONTAL-JOINT REINFORCEMENT

A. General: Provide continuous horizontal-joint reinforcement as indicated. Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, ½ inch elsewhere. Lap reinforcing a minimum of 6 inches.

1. Space reinforcement not more than 16 inches o.c.

2. Provide reinforcement in mortar joint 1 block course above and below wall openings and extending 12 inches beyond opening.

a. Reinforcement above is in addition to continuous reinforcement.

B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

C. Provide continuity at corners and wall intersections by using prefabricated "L" and "T" sections. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

## 3.08 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joints in unit masonry where indicated. Build-in related items as the masonry progresses. Do not form a continuous span through movement joints unless provisions are made to prevent in-plane restraint of wall or partition movement.

D. Form expansion joints in brick made from clay or shale as follows:

1. Form open joint of width indicated, but not less than ½ inch for installation of sealant and backer rod specified in Division 7 Section "Joint Sealants." Maintain joint free and clear of mortar.

3.09 LINTELS

A. Install steel lintels where indicated.

B. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

3.10 FLASHING, WEEP HOLES, AND VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to the downward flow of water in the wall, and where indicated.

B. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Place through-wall flashing on sloping bed of mortar and cover with mortar. Seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer before covering with mortar.

C. Install flashing as follows:

1. At composite masonry walls, including cavity walls, extend flashing from exterior face of outer wythe of masonry, through the outer wythe, turned up a minimum of 8 inches, and through the inner wythe to within ½ inch of the interior face of the wall in exposed masonry. Where interior surface of inner wythe is concealed by furring, carry flashing completely through the inner wythe and turn up approximately 2 inches, unless otherwise indicated.

2. At lintels and shelf angles, extend flashing a minimum of 4 inches into masonry at each end. At heads and sills, extend flashing 4 inches at ends and turn up not less than 2 inches to form a pan.

3. Cut off flashing flush with face of wall after masonry wall construction is completed.

D. Install weep holes in the head joints in exterior wythes of the first course of masonry immediately above embedded flashing and as follows:

1. Form weep holes with product specified in Part 2 of this Section.

2. Space weep holes at 24 inches o.c. minimum.

3. In cavities, place pea gravel to a height equal to height of first course, but not less than 2 inches, immediately above top of flashing embedded in the wall, as masonry construction progresses, to splatter mortar droppings and to maintain drainage.

4. Place cavity drainage material immediately above flashing in cavities.

5. Cut off exposed end of weep cord flush with face of brick upon completion of masonry work.

## 3.11 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or if units do not match adjoining units. Install new units to match adjoining units; install in fresh mortar or grout, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point-up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for application of sealants.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears prior to tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.

2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.

3. Protect adjacent nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.

4. Wet wall surfaces with water prior to application of cleaners; remove cleaners promptly by rinsing thoroughly with clear water.

5. Clean brick by bucket and brush hand-cleaning method described in BIA Technical Note No. 20 Revised, using the following masonry cleaner:

   a. Job-mixed detergent solution.

6. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2 applicable to type of stain present on exposed surfaces.

E. Protection: Provide final protection and maintain conditions that ensure unit masonry is without damage and deterioration at time of Substantial Completion.

3.11 ANTI-GRAFFITI COATING APPLICATION

A. Coating shall be employed when the temperature is between 40° and 90° F., and will remain in this range for 8 hours after application.

B. Spray-apply from the bottom up. Let this first application penetrate for 2 to 3 minutes. Re-saturate by spray, using less material than the initial application, without creating drips, puddles or run-down.

**END OF SECTION**

**SECTION 04901**

**CLAY MASONRY RESTORATION AND CLEANING**

PARAGRAPH INDEX

**SECTION 04901**

**CLAY MASONRY RESTORATION AND CLEANING**

## 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. Section includes maintenance of unit masonry consisting of brick clay masonry restoration and cleaning as follows:

1. Unused anchor removal.
2. Repairing unit masonry, including replacing units.
3. Painting steel uncovered during the work.
4. Repointing joints.
5. Preliminary cleaning, including removing plant growth.
6. Cleaning exposed unit masonry surfaces.

B. Intent of this Section is to provide Specifications for the restoration and repair of brick masonry on the existing stair house of Pump Station No. 2, and on the existing Pump Station No. 3.

1.03 DEFINITIONS

A. Very Low-Pressure Spray: Under 100 psi.

B. Low-Pressure Spray: 100 to 400 psi; 4 to 6 gpm.

C. Medium-Pressure Spray: 400 to 800 psi; 4 to 6 gpm.

D. High-Pressure Spray: 800 to 1200 psi; 4 to 6 gpm.

E. Saturation Coefficient: Ratio of the weight of water absorbed during immersion in cold water to weight absorbed during immersion in boiling water; used as an indication of resistance of masonry units to freezing and thawing.

1.04 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 Initial Selection: For the following:

1. Pointing Mortar: Submit sets of mortar for pointing in the form of sample mortar strips, 6 inches long by 1/4 inch wide, set in aluminum or plastic channels.

a. Have each set contain a close color range of at least three **s**amples of different mixes of colored sands and cements that produce a mortar matching the cleaned masonry when cured and dry.
b. Submit with precise measurements on ingredients, proportions, gradations, and sources of colored sands from which each Sample was made.

2. Sealant Materials: See Section 07920 "Joint Sealants."
3. Include similar Samples of accessories involving color selection.

C. Samples for Verification: For the following:

1. Each type of masonry unit to be used for replacing existing units. Include sets of Samples as necessary to show the full range of shape, color, and texture to be expected.

a. For each brick type, provide straps or panels containing at least four bricks. Include multiple straps for brick with a wide range.

D. Qualification Data: For chemical-cleaner manufacturer.

E. Cleaning Program.

1.05 QUALITY ASSURANCE

A. Chemical-Cleaner Manufacturer Qualifications: A firm regularly engaged in producing masonry cleaners that have been used for similar applications with successful results, and with factory-trained representatives who are available for consultation and Project-site inspection and assistance at no additional cost.

B. Source Limitations: Obtain each type of material for masonry restoration (face brick, cement, sand, etc.) from one source with resources to provide materials of consistent quality in appearance and physical properties.

C. Cleaning Program: Prepare a written cleaning program that describes cleaning process in detail, including materials, methods, and equipment to be used, protection of surrounding materials, and control of runoff during operations.

1. If materials and methods other than those indicated are proposed for any phase of restoration work, add to the Quality-Control Program a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project and worker's ability to use such materials and methods properly.

D. Cleaning and Repair Appearance Standard: Cleaned and repaired surfaces are to have a uniform appearance as viewed from 50 feet away by Engineer. Perform additional paint and stain removal, general cleaning, and spot cleaning of small areas that are noticeably different, so that surface blends smoothly into surrounding areas.

E. Mockups: Prepare mockups of restoration and cleaning to demonstrate aesthetic effects and set quality standards for materials and execution and for fabrication and installation.

1. Repointing: Rake out joints in 2 separate areas**,** each approximately 36 inches high by 48 inches wide for each type of repointing required and repoint one of the areas.
2. Cleaning: Clean an area approximately 25 sq. ft. for each type of masonry and surface condition.

    a. Test cleaners and methods on samples of adjacent materials for possible adverse reactions. Do not use cleaners and methods known to have deleterious effect.
    b. Allow a waiting period of not less than seven days after completion of sample cleaning to permit a study of sample panels for negative reactions.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Engineer specifically approves such deviations in writing.
4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

F. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to masonry restoration and cleaning including, but not limited to, the following:

    a. Construction schedule. Verify availability of materials, equipment, and facilities needed to make progress and avoid delays.
    b. Materials, material application, sequencing, tolerances, and required clearances.
    c. Acceptable final appearance of masonry.

## 1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver masonry units to Project site strapped together in suitable packs or pallets or in heavy-duty cartons.

B. Deliver other materials to 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 hydrated lime in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.

E. Store sand where grading and other required characteristics can be maintained and contamination avoided.

1.07 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit masonry restoration and cleaning work to be performed according to manufacturers' written instructions and specified requirements.

B. Repair masonry units and repoint mortar joints only when air temperature is between 40 and 90 deg F and is predicted to remain so for at least 7 days after completion of the Work unless otherwise indicated.

C. Cold-Weather Requirements: Comply with the following procedures for masonry repair and mortar-joint pointing unless otherwise indicated:

1. When air temperature is below 40 deg F, heat mortar ingredients, masonry repair materials, and existing masonry walls to produce temperatures between 40 and 120 deg F.
2. When mean daily air temperature is below 40 deg F, provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for 7 days after repair and pointing.

D. Hot-Weather Requirements: Protect masonry repair and mortar-joint pointing when temperature and humidity conditions produce excessive evaporation of water from mortar and repair materials. Provide artificial shade and wind breaks and use cooled materials as required to minimize evaporation. Do not apply mortar to substrates with temperatures of 90 deg F and above unless otherwise indicated.

E. For manufactured repair materials, perform work within the environmental limits set by each manufacturer.

F. Clean masonry surfaces only when air temperature is 40 deg F and above and is predicted to remain so for at least 7 days after completion of cleaning.

1.08 SEQUENCING AND SCHEDULING

A. Order replacement materials at earliest possible date to avoid delaying completion of the Work.

B. Order sand and gray portland cement for pointing mortar immediately after approval of Samples. Take delivery of and store at Project site a sufficient quantity to complete Project.

C. Perform masonry restoration work in the following sequence:

1. Remove plant growth.
2. Inspect for open mortar joints and repair before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
3. Clean masonry surfaces.
4. Rake out mortar from joints surrounding masonry to be replaced and from joints adjacent to masonry repairs along joints.
5. Repair masonry, including replacing existing masonry with new masonry materials.
6. Rake out mortar from joints to be repointed.
7. Point mortar and sealant joints.
8. After repairs and repointing have been completed and cured, perform a final cleaning to remove residues from this work.
9. Inspect for open mortar joints and repair before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
10. Clean masonry surfaces.

D. As scaffolding is removed, patch anchor holes used to attach scaffolding.

**PART 2 - PRODUCTS**

2.01 MASONRY MATERIALS

A. Face Brick: Provide face brick, including specially molded, ground, cut, or sawed shapes where required to complete masonry restoration work.

1. Provide units with colors, color variation within units, surface texture, size, and shape to match existing brickwork.

a. For existing brickwork that exhibits a range of colors or color variation within units, provide brick that proportionally matches that range and variation rather than brick that matches an individual color within that range.

2. Tolerances as Fabricated: Comply with tolerance requirements in ASTM C 216, Type FBS.

2.02 MORTAR MATERIALS

A. Portland Cement: ASTM C 150, Type I or Type II, white or gray or both where required for color matching of exposed mortar.

1. Provide cement containing not more than 0.60 percent total alkali when tested according to ASTM C 114.

B. Hydrated Lime: ASTM C 207, Type S.

C. Factory-Prepared Lime Putty: ASTM C 1489.

D. Quicklime: ASTM C 5, pulverized lime.

E. Mortar Sand: ASTM C 144 unless otherwise indicated.

1. Color: Provide natural sand of color necessary to produce required mortar color.
2. For pointing mortar, provide sand with rounded edges.
3. Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary to achieve suitable match.

F. Water: Potable.

2.03 CLEANING MATERIALS

A. Water: Potable.

B. Hot Water: Water heated to a temperature of 140 to 160 deg F.

C. Acidic Cleaner: Manufacturer's standard acidic masonry cleaner composed of hydrofluoric acid or ammonium bifluoride blended with other acids, detergents, wetting agents, and inhibitors.

1. Products: Subject to compliance with requirements, provide the following:
   a. PROSOCO; Sure Klean Light-Duty Restoration Cleaner.
   b. Diedrich Technologies Inc.: 101G Granite, Terra Cotta and Brick Cleaner.

2.04 ACCESSORY MATERIALS

A. Liquid Strippable Masking Agent: Manufacturer's standard liquid, film-forming, strippable masking material for protecting glass, metal, and polished stone surfaces from damaging effects of acidic and alkaline masonry cleaners.

1. Products: Subject to compliance with requirements, provide the following:
   a. PROSOCO; Sure Klean Strippable Masking.

B. Sealant Materials:

1. Provide manufacturer's standard chemically curing, elastomeric sealant(s) of base polymer and characteristics indicated below that comply with applicable requirements in Section 07920 "Joint Sealants."

2. Colors: Provide colors of exposed sealants to match colors of masonry adjoining installed sealant unless otherwise indicated.

C. Joint-Sealant Backing:

1. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
2. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where acceptable.

D. Setting Buttons: Resilient plastic buttons, nonstaining to masonry, sized to suit joint thicknesses and bed depths of masonry units without intruding into required depths of pointing materials.

E. Masking Tape: Nonstaining, nonabsorbent material, compatible with pointing mortar, joint primers, sealants, and surfaces adjacent to joints; that will easily come off entirely, including adhesive.

F. Antirust Coating: Fast-curing, lead- and chromate-free, self-curing, universal modified-alkyd primer complying with SSPC-Paint 20 or SSPC-Paint 29 zinc-rich coating.

1. Use coating requiring no better than SSPC-SP 3, "Power Tool Cleaning" surface preparation according to manufacturer's literature or certified statement.

G. Miscellaneous Products: Select materials and methods of use based on the following, subject to approval of a mockup:

1. Previous effectiveness in performing the work involved.
2. Little possibility of damaging exposed surfaces.
3. Consistency of each application.
4. Uniformity of the resulting overall appearance.
5. Do not use products or tools that could do the following:

a. Remove, alter, or in any way harm the present condition or future preservation of existing surfaces, including surrounding surfaces not in contract.
b. Leave a residue on surfaces.

## 2.05 MORTAR MIXES

A. Preparing Lime Putty: Slake quicklime and prepare lime putty according to appendix to ASTM C 5 and manufacturer's written instructions.

B. Measurement and Mixing: Measure cementitious materials and sand in a dry condition by volume or equivalent weight. Do not measure by shovel; use known measure. Mix materials in a clean, mechanical batch mixer.

1. 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.

C. Colored Mortar (if required): Produce mortar of color required by using specified ingredients. Do not alter specified proportions without Engineer's approval.

1. Mortar Pigments: Where mortar pigments are indicated, do not exceed a pigment-to-cement ratio of 1:10 by weight.

D. Do not use admixtures in mortar unless otherwise indicated.

E. Mortar Proportions: Mix mortar materials in the following proportions:

1. Pointing Mortar for Brick: 1 part portland cement, 2 parts lime, and 6 parts sand.

a. Add mortar pigments to produce mortar colors required.

2. Rebuilding (Setting) Mortar: Same as pointing mortar.

## 2.06 CHEMICAL CLEANING SOLUTIONS

A. Dilute chemical cleaners with water to produce solutions not exceeding concentration recommended by chemical-cleaner manufacturer.

B. Acidic Cleaner Solution for Brick: Dilute with water to produce hydrofluoric acid content of 3 percent or less, but not greater than that recommended by chemical-cleaner manufacturer.

## PART 3 - EXECUTION

### 3.01 PROTECTION

A. Protect persons, motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm resulting from masonry restoration work.

1. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during course of restoration and cleaning work.

B. Comply with chemical-cleaner manufacturer's written instructions for protecting building and other surfaces against damage from exposure to its products. Prevent chemical-cleaning solutions from coming into contact with people, motor vehicles, landscaping, buildings, and other surfaces that could be harmed by such contact.

1. Cover adjacent surfaces with materials that are proven to resist chemical cleaners used unless chemical cleaners being used will not damage adjacent surfaces. Use materials that contain only waterproof, UV-resistant adhesives. Apply masking agents to comply with manufacturer's written instructions. Do not apply liquid masking agent to painted or porous surfaces. When no longer needed, promptly remove masking to prevent adhesive staining.
2. Keep wall wet below area being cleaned to prevent streaking from runoff.
3. Do not clean masonry during winds of sufficient force to spread cleaning solutions to unprotected surfaces.
4. Neutralize and collect alkaline and acid wastes for disposal off Owner's property.
5. Dispose of runoff from cleaning operations by legal means and in a manner that prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.

C. Prevent mortar from staining face of surrounding masonry and other surfaces.

1. Cover sills, ledges, and projections to protect from mortar droppings.
2. Keep wall area wet below rebuilding and pointing work to discourage mortar from adhering.
3. Immediately remove mortar in contact with exposed masonry and other surfaces.
4. Clean mortar splatters from scaffolding at end of each day.

### 3.02 BRICK REMOVAL AND REPLACEMENT

A. At locations indicated, remove bricks that are damaged, spalled, or deteriorated. Carefully demolish or remove entire units from joint to joint, without damaging surrounding masonry, in a manner that permits replacement with full-size units.

1. When removing single bricks, remove material from center of brick and work toward outside edges.

B. Support and protect remaining masonry that surrounds removal area. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.

C. Remove in an undamaged condition as many whole bricks as possible.

1. Remove mortar, loose particles, and soil from brick by cleaning with hand chisels, brushes, and water.
2. Remove sealants by cutting close to brick with utility knife and cleaning with solvents.
3. Store brick for reuse. Store off ground, on skids, and protected from weather.
4. Deliver cleaned brick not required for reuse to Owner unless otherwise indicated.

D. Clean bricks surrounding removal areas by removing mortar, dust, and loose particles in preparation for replacement.

E. Replace removed damaged brick with new brick matching existing brick, including size. Do not use broken units unless they can be cut to usable size.

F. Install replacement brick into bonding and coursing pattern of existing brick. If cutting is required, use a motor-driven saw designed to cut masonry with clean, sharp, unchipped edges.

1. Maintain joint width for replacement units to match existing joints.
2. Use setting buttons or shims to set units accurately spaced with uniform joints.

G. Lay replacement brick 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 C 67 initial rates of absorption (suction) of more than 30 g/30 sq. in. per min. Use wetting methods that ensure that units are nearly saturated but surface is dry when laid.

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 same time as repointing of surrounding area.
3. When mortar is sufficiently hard to support units, remove shims and other devices interfering with pointing of joints.

## 3.03 PAINTING STEEL UNCOVERED DURING THE WORK

A. Inspect steel exposed during masonry removal. Where steel piece cannot be totally removed, prepare and paint it as follows:

1. Remove paint, rust, and other contaminants according SSPC-SP 3, "Power Tool Cleaning", as applicable to meet paint manufacturer's recommended preparation.
2. Immediately paint exposed steel with two coats of antirust coating, following coating manufacturer's written instructions and without exceeding manufacturer's recommended rate of application (dry film thickness per coat).

3.04 CLEANING MASONRY, GENERAL

A. Proceed with cleaning in an orderly manner; work from bottom to top of each scaffold width and from one end of each elevation to the other. Ensure that dirty residues and rinse water will not wash over cleaned, dry surfaces.

B. Use only those cleaning methods indicated for each masonry material and location.

1. Do not use wire brushes or brushes that are not resistant to chemical cleaner being used. Do not use plastic-bristle brushes if natural-fiber brushes will resist chemical cleaner being used.
2. Use spray equipment that provides controlled application at volume and pressure indicated, measured at spray tip. Adjust pressure and volume to ensure that cleaning methods do not damage masonry.

    a. Equip units with pressure gages.

3. For chemical-cleaner spray application, use low-pressure tank or chemical pump suitable for chemical cleaner indicated, equipped with cone-shaped spray tip.
4. For water-spray application, use fan-shaped spray tip that disperses water at an angle of 25 to 50 degrees.
5. For high-pressure water-spray application, use fan-shaped spray tip that disperses water at an angle of at least 40 degrees.
6. For heated water-spray application, use equipment capable of maintaining temperature between 140 and 160 deg F at flow rates indicated.
7. For steam application, use steam generator capable of delivering live steam at nozzle.

C. Perform each cleaning method indicated in a manner that results in uniform coverage of all surfaces, including corners, moldings, and interstices, and that produces an even effect without streaking or damaging masonry surfaces.

D. Water Application Methods:
1. Water-Spray Applications: Unless otherwise indicated, hold spray nozzle at least 6 inches from surface of masonry and apply water in horizontal back and forth sweeping motion, overlapping previous strokes to produce uniform coverage.

E. Chemical-Cleaner Application Methods: Apply chemical cleaners to masonry surfaces to comply with chemical-cleaner manufacturer's written instructions; use brush application. Do not spray apply at pressures exceeding 50 psi. Do not allow chemicals

to remain on surface for periods longer than those indicated or recommended by manufacturer.

F. Rinse off chemical residue and soil by working upward from bottom to top of each treated area at each stage or scaffold setting. Periodically during each rinse, test pH of rinse water running off of cleaned area to determine that chemical cleaner is completely removed.

1. Apply neutralizing agent and repeat rinse if necessary to produce tested pH of between 6.7 and 7.5.

G. After cleaning is complete, remove protection no longer required. Remove tape and adhesive marks.

## 3.05 PRELIMINARY CLEANING

A. Removing Plant Growth: Completely remove visible plant, moss, and shrub growth from masonry surfaces. Carefully remove plants, creepers, and vegetation by cutting at roots and allowing to dry as long as possible before removal. Remove loose soil and debris from open masonry joints to whatever depth they occur.

B. Preliminary Cleaning: Before beginning general cleaning, remove extraneous substances that are resistant to cleaning methods being used. Extraneous substances include paint, calking, asphalt, and tar.

1. Carefully remove heavy accumulations of material from surface of masonry with a sharp chisel. Do not scratch or chip masonry surface.
2. Remove paint and calking with alkaline paint remover.
    a. Repeat application up to two times if needed.

3. Remove asphalt and tar with solvent-type paint remover.
    a. Apply paint remover only to asphalt and tar by brush without prewetting.
    b. Allow paint remover to remain on surface for 10 to 30 minutes.
    c. Repeat application if needed.

## 3.06 CLEANING BRICKWORK

A. Hot-Water Wash: Use hot water applied by low-pressure spray.

B. Acidic Chemical Cleaning:

1. Wet masonry with cold water applied by low-pressure spray.
2. Apply cleaner to masonry by brush or low-pressure spray. Let cleaner remain on surface for period indicated below:
    a. As recommended by chemical-cleaner manufacturer.
3. Brush surface with application brush while cleaner remains on surface.

4. Rinse with cold water applied by low-pressure spray to remove chemicals and soil.
5. Repeat cleaning procedure above where required to produce cleaning effect established by mockup.

## 3.07 REPOINTING MASONRY

A. Rake out and repoint joints to the following extent:

1. All joints in areas indicated.
2. Joints where mortar is missing or where they contain holes.
3. Cracked joints where cracks can be penetrated at least 1/4 inch by a knife blade 0.027 inch thick.
4. Cracked joints where cracks are 1/16 inch or more in width and of any depth.
5. Joints where they sound hollow when tapped by metal object.
6. Joints where they are worn back 1/4 inch or more from surface.
7. Joints where they are deteriorated to point that mortar can be easily removed by hand, without tools.
8. Joints where they have been filled with substances other than mortar.
9. Joints indicated as sealant-filled joints.

B. Do not rake out and repoint joints where not required.

C. Rake out joints as follows, according to procedures demonstrated in approved mockup:

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 raked-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 Engineer.

    a. Cut out mortar by hand with chisel and resilient mallet. Do not use power-operated grinders without Engineer's written approval based on approved quality-control program.
    b. Cut out center of mortar bed joints using angle grinders with diamond-impregnated metal blades. Remove remaining mortar by hand with chisel and resilient mallet. Strictly adhere to approved quality-control program.

D. Notify Engineer of unforeseen detrimental conditions including voids in mortar joints, cracks, loose masonry units, rotted wood, rusted metal, and other deteriorated items.

E. Pointing with Mortar:

1. Rinse joint surfaces with water to remove dust and mortar particles. Time rinsing application so, at time of pointing, joint surfaces are damp but free of standing water. If rinse water dries, dampen joint surfaces before pointing.
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 it 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 and allow to become thumbprint hard before applying next layer. Where existing masonry units 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 beyond joint edges onto exposed masonry surfaces or to featheredge the mortar.
4. When mortar is thumbprint hard, tool joints to match original appearance of joints as demonstrated in approved mockup. Remove excess mortar from edge of joint by brushing.
5. Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours including weekends and holidays.

    a. 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.
    b. Adjust curing methods to ensure that pointing mortar is damp throughout its depth without eroding surface mortar.

6. Hairline cracking within the mortar or mortar separation at edge of a joint is unacceptable. Completely remove such mortar and repoint.

## 3.08 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.

1. Do not use metal scrapers or brushes.
2. Do not use acidic or alkaline cleaners.

B. Wash adjacent woodwork and other nonmasonry surfaces. Use detergent and soft brushes or cloths.

C. Clean mortar and debris from roof and site. Rinse off roof and flush all concrete structures.

D. Sweep and rake adjacent pavement and grounds to remove mortar and debris. Where necessary, pressure wash pavement surfaces to remove mortar, dust, dirt, and stains.

END OF SECTION

**SECTION 05500**

**METAL FABRICATIONS**

PARAGRAPH INDEX

# SECTION 05500
# METAL FABRICATIONS

## PART 1 GENERAL

### 1.01 DESCRIPTION

A. Section Includes: Requirements for providing metal fabricated items for the steel roof framing and other miscellaneous metal fabrications.

### 1.02 SUBMITTALS

A. Submit following:

1. Shop Drawings: Show sizes, finishes, locations, required hardware and accessories, and details for all fabricated metal work, threaded fasteners and welds.

   a. Indicate welds, both shop and field, by symbols conforming to AWS Standards.

   b. Shop drawings for continually furnished items will be waived provided Contractor submits a letter naming manufacturer to furnish these items who has on file with Engineer a certified standard drawing containing approved required information.

   c. Indicate existing members to be reused/relocated.

2. Setting diagrams, erection plans, templates, and directions for installation of backing plates, anchors, and other items.

3. Catalog descriptions of manufacturers' items.

4. Working Drawings and calculations for Contractor designed hatches and gratings.

B. Submit following Section 01400 – Quality Control.

1. Certificate of Compliance for Railings.

2. Manufacturers' test results of identical railings tested by manufacturer.

### 1.03 QUALITY ASSURANCE

A. Stairs, landing platforms, fixed industrial ladders, guardrails, handrails, and other walking-working surfaces shall conform with OSHA 29 CFR 1910 Subpart D - Walking/Working Surfaces.

### 1.04 DELIVERY, HANDLING, AND STORAGE

A. Identify and match mark, if applicable, all materials, items, and fabrications for installation or field assembly.

B. Wherever practicable, deliver items to Contract site as complete units, ready for installation with all anchors, hangers, fasteners, and miscellaneous metal items.

C. Provide storage facilities at Contract site for protection and storage of delivered materials.

1. Handle and store so as not to damage factory finishes.

2. Repair damaged finishes, at no cost to the Commission.

## PART 2 PRODUCTS

2.01 MATERIALS

A. Shapes and Bars:

1. W-flange: ASTM A992.

2. HSS tubes: ASTM A500.

3. Mild Steel: ASTM A36, unless otherwise shown on Drawings.

4. Atmosphere Corrosion Resistant Steel: ASTM A242.

5. Aluminum:

a. ASTM B221 with alloy and temper of 6061-T6.

b. Aluminum Structural Members rolled or extruded: ASTM B308 with alloy and temper of 6061-T6.

c. Handrail that is standard manufacturer's product may be alloy 6061 or 6063 temper, as furnished by manufacturer.

B. Plate, Sheet, and Strip:

1. Mild Steel: ASTM A36.

2. High Strength Steel: ASTM A242.

3. Atmosphere Corrosion Resistant Steel: ASTM A242.

4. Stainless Steel: ASTM A264 and ASTM A240, type 316.

5. Aluminum: ASTM B209 with alloy and temper of 6061-T6.

C. Mild Steel Forgings: ASTM A668, Class F.

D. Castings:

1. Gray Iron: ASTM A48, grade 25 for all castings except valve and curb boxes, and minimum class 20 for valves and curb boxes.

2. Malleable Iron: ASTM A47, grade 35018.

3. Ductile Iron: ASTM A536, grade 60 40 18.

4. Steel: ASTM A27, grade 65 35.

5. Aluminum: ASTM B108 with alloy and temper of 356.0, T6.

E. Pipe and Tube:

1. Mild Steel:

a. For Welding:
1) ASTM A53, type S, Grade B, schedule 40, black.

b. For Screwed Connections:
1) ASTM A53, type E or S, grade B, schedule 40.

2. Stainless: ASTM A312, grade TP 316L.

3. Aluminum:

a. ASTM B221 with alloy and temper of 6061-T6.

b. Wall Thickness: Schedule 80, following ANSI H35.2, unless otherwise shown on Drawings.

c. Guardrail Posts and Railings: Schedule 40. ASTM B221 or ASTM B249 with alloy and temper of 6105-T5.

F. Steel Bolts, Nuts, Washers:

1. General

a. Galvanized for use with galvanized material.

b. Stainless for use with stainless and aluminum materials.

c. Cadmium plated for use with other materials.

2. Stainless:

a. Bolts: ASTM A193, grade B8M.

b. Nuts: ASTM A194, grade 8M.

c. Washers: ANSI B18.22.1 and of same material as bolts and nuts.

3. Expansion/Adhesive Anchors:

a. Manufacturer’s Shear and Tensile Strength Tests: ASTM E488.

b. Fastener Assemblies Working Strength: See manufacturer’s recommendations.

4. Headed Steel Anchors: Fabricated from cold finished carbon steel meeting requirements of ASTM A108 and fabricated following Drawings.

G. Safety Treads: FS RR T 650, type C.

H. Grating:

1. Aluminum: ASTM B221 with alloy and temper of 6063-T6, mechanically locked, with fluted non-skid surface.

2. Match style and thickness of existing grating.

I. Fabrication:

1. General: Fabricate items following Contract Documents and approved Contractor's submittals.

a. Straighten work bent by shearing or punching.

b. Press exposed edges and ends of metal smooth, with no sharp edges and with corners slightly rounded.

c. Construct connections and joints exposed to weather to exclude water.

d. Sufficient quantity and size of anchors for proper fastening of work.

2. Fabricated Products:

a. Pipe Sleeves in Concrete Construction: Standard weight, black steel pipe, with anchors welded to exterior, and size to accommodate passage of conduits, pipes, ducts, and similar items.

b. Gratings: Unless otherwise shown on Drawings, removable with locking legs and means of bolting in place.
   1) Bearing bars not less than 3/16 inch thick of flat stock or equivalent I bars with center to center spacing of not more than 1 3/16 inches.
   2) Structural supports for gratings, of shapes indicated, fastened to structure with anchors.
   3) Cross supports: Allowable maximum deflection is span length, in inches, divided by 360 or 1/4 inch whichever is smaller.
   4) Non-skid Surface: Serrated edges on top of grating bars, or other equivalent means.
   5) Perimeter banding: Solid.
   6) Aluminum grating: Mechanically locked at intersections of all bars.

3. Connections: Weld shop connections in weldable materials not designed for service removal.

    a. Welding: AWS Dl.1 requirements.
        1) Weld behind finished surfaces whenever possible.
        2) Grind all exposed welds smooth.
        3) Remove weld, brazing, and solder spatter, flux, slag, and oxides from finished surfaces.

    b. Use sheet metal lock seams only when indicated on Drawings or approved shop and working drawings.

    c. Complete provisions for bolted field connections in shop unless otherwise shown on Drawings.

    d. Match exposed work to produce continuity of line and design.
        1) Fabricate and fasten metal work so that work will not be distorted, finish impaired, nor fasteners overstressed from expansion and contraction of metal.
        2) Conceal fastenings whenever practicable.
        3) Use fastenings exposed to public view of same color and appearance as surrounding metal.

4. Castings and Forgings: Fabricate.

    a. Castings and Forgings:
        1) Uniform quality, true to pattern, strong, tough, of even grain, sound, smooth, without cold sheets, scabs, blisters, and sand holes, cracks, or other defects.
        2) Plugs, filled holes, and welding will not be allowed.

    b. Castings: Thicknesses and configurations following Standard Details.
        1) Sand blast to remove scale and sand to achieve uniform smooth clean surface.
        2) Markings: Raised letters where indicated.

    c. Valve Boxes:
        1) Round head, sliding type consisting of snug-fitting top, bottom section and sliding type extension.
        2) Lid: Removable only by lifting straight up from shaft shoulder.

5. Galvanizing:

    a. Galvanize following reference standards set forth herein.

    b. Items fabricated entirely from galvanized shapes, hardware, and sheet, without welding will not require galvanizing after fabrication.

J. Painting and Coatings:

1. Painting Metal Fabrications:

   a. Shop paint following Drawings, or if not shown, use metal fabricator's standard shop paint.

   b. Shop prime and field paint connecting ends after installation.

2. Metal Coatings:

   a. Galvanized Sheet: ASTM A653.

   b. Other Galvanizing: ASTM A123, ASTM A153, and ASTM A385.

   c. Cadmium: ASTM B766, type NS.

3. Repair of Damaged Coatings:

   a. Repair Damaged Areas: ASTM A780.

   b. Minimum Thickness Requirements for Repair: ASTM A123.

   c. Maximum Area to Be Repaired:
      1) ASTM A123.
      2) If damaged area exceeds maximum defined, re-galvanize item as stated herein.

4. Corrosion Protection for Contact Surfaces of Different Type Metals:

   a. Carboline Bitumastic 300M.

   b. Or equal.

5. Corrosion Protection for Aluminum to Be Embedded in Concrete: See Section 03300.

K. Source Quality Control:

1. Test Metal Railings.

   a. ASTM E935 – Standard Test Methods for performance of permanent metal railing systems and rails for buildings.

   b. ASTM E894 – Standard Testing Method for anchorage of permanent metal railing systems and rails for buildings.

## PART 3 EXECUTION

3.01 INSTALLATION

A. Standards:

1. AISC Specification for Design, Fabrication, and Erection of Structural Steel for Buildings.

2. ISC Code of Standard Practice for Steel Buildings and Bridges, where applicable.

B. Add shims, washers, anchors, and corrective work to ensure that installation is firm, tight, anchored, in true alignment with neat fits, without distortions, unsightly fastenings, raw edges, or protrusions.

C. Touch Up:

1. Damaged painted areas and field coat at connecting ends using compatible paint system.

2. Galvanized Items: ASTM A780.

END OF SECTION

**SECTION 05510**

**ACCESS HATCHES**

PARGRAPH INDEX

## SECTION 05510

## ACCESS HATCHES

### PART 1 - GENERAL

1.01 SUMMARY

A. Work included: Furnishing and installing factory fabricated access hatches.

1.02 SUBMITTALS

A. Product Data: Provide manufacturer's product data for all materials in this specification.

B. Shop Drawings: Show profiles, accessories, location, and dimensions.

C. Contract Closeout: Access door manufacturer shall provide the manufacturer's Warranty prior to the contract closeout.

1.03 PRODUCT HANDLING

A. All materials shall be delivered in manufacturer's original packaging.

B. Store materials in a dry, protected, well-vented 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.

1.04 SUBSTITUTIONS

A. Proposals for substitution products shall be accepted only from bidding contractors and not less than (10) working days before bid due date. Contractor guarantees that proposed substitution shall meet the performance and quality standards of this specification.

1.05 JOB CONDITIONS

A. Verify that other trades with related work are complete before installing access hatches.

B. Mounting surfaces shall be straight and secure; substrates shall be of proper width. Refer to the construction documents, shop drawings, and manufacturer's installation instructions.

C. Observe all appropriate OSHA safety guidelines for this work.

1.06 WARRANTY/GUARANTEE

A. Manufacturer's standard warranty: Materials shall be free of defects in material and workmanship for a period of (25) twenty-five years from the date of purchase. Should a part fail to function in normal use within this period, manufacturer shall furnish a new part at no charge. Electrical motors, special finishes, and other special equipment (if applicable) shall be warranted separately by the manufacturers of those products.

**PART 2 - PRODUCTS**

2.01 MANUFACTURER

A. The BILCO Company, P.O. Box 1203, New Haven, CT 06505; 1-203-934-6363, Fax: 1-203-933-8478, Web: www.bilco.com, or approved equal.

B. Halliday Products, 6401 Edgewater Drive, Orlando, FL 32810; 1-800-298-1027, Fax: 1-407-298-4534, Web: www.hallidayproducts.com, or approved equal for tri-leaf hatch.

C. USF Fabrication Inc., 3200 West 84$^{th}$ Street, Hialeah, Florida 33018; 1-800-258-6873, Fax: 305-882-1577, Web: www.usafab.com. Or approved equal watertight hatches.

2.02 ACCESS HATCHES

A. Furnish and install, where indicated on plans, access hatches Type J-Al and Type JD-Al, sizes as shown on the drawings, or approved equal. The access hatches shall be single or double leaf, as shown on plans. The access hatches shall be designed to be cast into new concrete flush with the surface and pre-assembled from the manufacturer.

B. Performance characteristics:

1. Covers: Shall be reinforced to support a minimum live load of 300 psf (1464 kg/m$^2$) with a maximum deflection of 1/150th of the span.

2. Operation of the covers shall be smooth and easy with controlled operation throughout the entire arc of opening and closing.

3. Operation of the cover shall not be affected by temperature.

4. Entire hatch, including all hardware components, shall be corrosion resistant. Please consult the manufacturer when doors are to be installed in unusually harsh environments or extremely corrosive conditions.

C. Covers: Shall be 1/4" (6.3 mm) aluminum diamond pattern.

D. Frame: Channel frame shall be 1/4" (6.3mm) extruded aluminum with bend down anchor tabs around the perimeter. A continuous EPDM gasket shall be mechanically attached to the aluminum frame to create a barrier around the entire perimeter of the cover and significantly reduce the amount of dirt and debris that may enter the channel frame.

E. Hinges: Shall be specifically designed for horizontal installation and shall be through bolted to the cover with tamperproof Type 316 stainless steel lock bolts and shall be through bolted to the frame with Type 316 stainless steel bolts and locknuts

F. Drain Coupling: Provide a 1-1/2" (38mm) drain coupling located in the right front corner of the channel frame.

G. Lifting mechanisms: Manufacturer shall provide the required number and size of compression spring operators enclosed in telescopic tubes 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. The upper tube shall be the outer tube to prevent accumulation of moisture, grit, and debris inside the lower tube assembly. The lower tube shall interlock with a flanged support shoe fastened to a formed 1/4" gusset support plate.

H. Locking: Provide flush-type Lev-L-Lok, as manufactured by Lovatt & Radcliff, Patterson, New Jersey, with removable handle, on all exterior hatches.

I. A removable exterior turn/lift handle with a spring loaded ball detent shall be provided to open the cover and the latch release shall be protected by a flush, gasketed, removable screw plug.

J. Hardware:

1. Hinges: Heavy forged aluminum hinges, each having a minimum 1/4" (6.3 mm) diameter Type 316 stainless steel pin, shall be provided and shall pivot so the cover does not protrude into the channel frame.

2. Covers shall be equipped with a hold open arm, which automatically locks the cover in the open position.

3. Covers shall be fitted with the required number and size of compression spring operators. Springs and spring tubes shall be Type 316 stainless steel.

4. A Type 316 stainless steel snap lock with fixed handle shall be mounted on the underside of the cover.

5. Hardware: Shall be anticorrosion throughout. All hardware to be Type 316 stainless steel unless otherwise noted.

K. Finishes: Factory finish shall be mill finish aluminum with bituminous coating applied to the portions of the exterior of the frame to be in contact with concrete.

L. Drain Piping: Provide 1 ½ inch schedule 80 PVC drain piping to drain water from the channel frame away from structure, as shown in drawings.

## PART 3 - EXECUTION

3.01 INSPECTION

A. Verify that the access hatch installation will not disrupt other trades. Verify that the substrate is dry, clean, and free of foreign matter. Report and correct defects prior to any installation.

3.02 INSTALLATION

A. Submit product design drawings for review and approval to the architect or specifier before fabrication.

B. The installer shall check as-built conditions and verify the manufacturer's vault access door details for accuracy to fit the application prior to fabrication. The installer shall comply with the vault access door manufacturer's installation instructions.

C. The installer shall furnish mechanical fasteners consistent with the vault access door manufacturer's instructions.

D. For hatches with channel frames, the installer shall install drain piping from drain connection as shown in drawings.

END OF SECTION

**SECTION 05521**

**PIPE AND TUBE RAILING**

PARAGRAPH INDEX

## SECTION 05521

## PIPE AND TUBE RAILING

## 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 the following:

1. Aluminum pipe and tube handrails and railings.

1.03 PERFORMANCE REQUIREMENTS

A. General: 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. Aluminum Design Manual (2010).

B. Structural Performance of Handrails and Railings: Provide handrails and railings complying with requirements of ASTM E 985 for structural performance, based on testing performed according to ASTM E 894 and ASTM E 935.

C. Structural Performance of Handrails and Railings: Provide handrails and railings capable of withstanding the following structural loads without exceeding allowable design working stresses of materials for handrails, railings, anchors, and connections:

1. Top Rail of Guards or Handrails at stairs: Capable of withstanding the following loads applied as indicated:

a. Concentrated load of 200 lbs applied at any point and in any direction.

b. Uniform load of 50 lbs/ft. applied horizontally and concurrently with uniform load of 100 lbs/ft applied vertically downward.

c. Concentrated and uniform loads above need not be assumed to act concurrently.

2. Handrails Not Serving As Top Rails: Capable of withstanding the following loads applied as indicated:

   a. Concentrated load of 200 lb applied at any point and in any direction.

   b. Uniform load of 50 lbs/ft. applied in any direction.

   c. Concentrated and uniform loads above need not be assumed to act concurrently.

3. Infill Area of Guards: Capable of withstanding a horizontal concentrated load of 200 lb applied to 1 sq. ft. at any point in system, including panels, intermediate rails, balusters, or other elements composing infill area.

   a. Load above need not be assumed to act concurrently with loads on top rails in determining stress on guard.

D. 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 nighttime-sky heat loss.

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

E. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

F. Minimum Railing Dimensions

1. The guard rail system shall be two-rail system. The top rail shall be 42” high, measured vertically above adjacent walking surfaces or the line connecting the leading edges of stair treads. The center rail shall be at mid-height. The top rail shall have the minimum horizontal dimension (grip) of 1 ½”.

2. Where located along a stair, a handrail shall be located 34” vertically above the line connecting the leading edges of stair treads. The handrail shall be offset horizontally from the plane of the guard rail system and provide a clearance of 1 ½” between handrail and wall or other structure. The handrail shall have the minimum horizontal dimension (grip) of 1 ½”.

3. Maximum post spacing: 8’-0"

4. Toe Boards: 4” above walking surfaces, at all walking surfaces located 10’-0” above lower levels.

1.04 SUBMITTALS

A. Product Data: For the following:

1. Manufacturer's product lines of mechanically connected handrails and railings.

2. Grout, anchoring cement, and paint products.

B. 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 responsible for their preparation.

C. Product Test Reports: From a qualified testing agency indicating handrails and railings comply with ASTM E 985, based on comprehensive testing of current products.

1.05 QUALITY ASSURANCE

A. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice 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.

B. Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

C. Source Limitations: Obtain each type of handrail and railing through one source from a single manufacturer.

1.06 STORAGE

A. Store handrails and railings in a dry, well-ventilated, weathertight place.

1.07 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.

1.08 COORDINATION

A. Coordinate installation of anchorages for handrails and railings. 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. Deliver such items to Project site in time for installation.

1.09 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 METALS

A. General: Provide metal free from pitting, seam marks, roller marks, stains, discolorations, and other imperfections where exposed to view on finished units.

B. Aluminum: 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.

1. Extruded Bar and Tube: ASTM B 221, alloy 6063-T5/T52.

2. Extruded Structural Pipe and Tube: ASTM B 429, alloy 6063-T6.

3. Drawn Seamless Tube: ASTM B 210, alloy 6063-T832.

4. Plate and Sheet: ASTM B 209, alloy 6061-T6.

5. Die and Hand Forgings: ASTM B 247, alloy 6061-T6.

6. Castings: ASTM B 26/B 26M, alloy A356-T6.

C. Brackets, Flanges, and Anchors: Same type of material and finish as supported rails, unless otherwise indicated.

2.02 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: Select fasteners of type, grade, and class required to produce connections suitable for anchoring handrails and railings to other types of construction indicated and capable of withstanding design loads.

1. For aluminum handrails and railings, use fasteners fabricated from Type 316 stainless steel.

C. Fasteners for Interconnecting Handrail and Railing Components: Use fasteners fabricated from same basic metal as fastened metal, unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined.

1. Provide concealed fasteners for interconnecting handrail and railing components and for attaching them to other work, unless otherwise indicated.

D. 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. Adhesive anchors.

2.03 GROUT AND ANCHORING CEMENT

A. Nonshrink, Nonmetallic Grout: See specification section titled ‘Cast-in-Place Concrete’.

## 2.04 FABRICATION

A. General: 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.

C. Form changes in direction of railing members as follows:

1. By flush radius bends. By inserting prefabricated flush-elbow fittings.

2. By any method indicated above, applicable to change in direction involved.

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 tee and cross intersections, notch ends of intersecting members to fit contour of pipe to which end is joined and weld all around.

5. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

F. Non-welded Connections: Fabricate handrails and railings by connecting members with concealed mechanical fasteners and fittings, unless otherwise indicated. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

1. Fabricate splice joints for field connection using an epoxy structural adhesive where this is manufacturer's standard splicing method.

G. Welded Connections for Aluminum Pipe: Fabricate pipe handrails and railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.

H. 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.

I. 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.

J. For railing posts set in concrete, provide preset sleeves of 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.

1. Provide chain with eye, snap hook, and staple across gaps formed by removable railing sections at locations indicated. Fabricate from same metal as railings.

L. Shear and punch metals cleanly and accurately. Remove burrs from exposed cut edges.

M. 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.

N. Cut, reinforce, drill, and tap components, as indicated, to receive finish hardware, screws, and similar items.

O. 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.

P. Fabricate joints that will be exposed to weather in a watertight manner.

Q. Close exposed ends of handrail and railing members with prefabricated end fittings.

R. 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.

S. Toe Boards: Provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

T. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, 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.

2.05 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in the same piece are not acceptable.

2.06 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with system established by the Aluminum Association for designating aluminum finishes.

B. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: non-specular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 607.1.

## PART 3. EXECUTION

### 3. 01 EXAMINATION

Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as sleeves, concrete inserts, anchor bolts, and miscellaneous items. Coordinate delivery of such items to project site.

### 3. 02 INSTALLATION, GENERAL

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. Non-welded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of handrails and railings.

B. 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.

C. 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. Anchorage of posts to concrete shall be surface mount type. Design mounting base plates and other hardware to carry the specified loads. The edge distance for anchoring bolts shall not be less than 4 inches.

B. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:

1. For aluminum pipe railings, attach posts as indicated using fittings designed and engineered for this purpose.

C. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

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 non-welded connections.

2. Bolt flanges to metal surfaces.

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. For wood stud partitions, use hanger or lag bolts set into wood backing between studs. Coordinate with carpentry work to locate backing members.

4. For steel-framed gypsum board assemblies, use hanger or lag bolts set into wood backing between studs. Coordinate with stud installation to locate backing members.

5. Use type of bracket with flange tapped for concealed anchorage to threaded hangar bolt.

6. Use type of bracket with predrilled hole for exposed anchorage.

3. 07 CLEANING

A. Clean aluminum and stainless steel 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

**SECTION 06100**

**ROUGH CARPENTRY**

PARAGRAPH INDEX

**SECTION 06100**

**ROUGH CARPENTRY**

## PART 1 - GENERAL

1.01 DESCRIPTION

A. The Contractor shall provide all labor, materials, equipment, and services necessary to install all rough carpentry as shown on the drawings and as specified herein.

1.02 SUMMARY

A. This Section includes the following:

1. Blocking

2. Wood furring, nailers, and blocking.

3. Plywood backing panels.

1.03 DEFINITIONS

A. Rough Carpentry: Carpentry work not specified in other Sections and not exposed, unless otherwise specified.

1.04 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for the following products:

1. Construction adhesives.

C. Material certificates for dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the American Lumber Standards Committee's (ALSC) Board of Review.

D. Wood treatment data as follows, including chemical treatment manufacturer's instructions for handling, storing, installing, and finishing treated materials:

1. For each type of preservative-treated wood product, include certification by treating plant stating type of preservative solution and pressure process used,

net amount of preservative retained, and compliance with applicable standards.

2. For waterborne-treated products, include statement that moisture content of treated materials was reduced to levels indicated before shipment to Project site.

3. For fire-retardant-treated wood products, include certification by treating plant that treated materials comply with specified standard and other requirements as well as data relative to bending strength, stiffness, and fastener-holding capacities of treated materials.

E. Material test reports from a qualified independent testing agency indicating and interpreting test results relative to compliance of fire-retardant-treated wood products with requirements indicated.

F. Warranty of chemical treatment manufacturer for each type of treatment.

G. Research or evaluation reports of the model code organization acceptable to authorities having jurisdiction that evidence the following products' compliance with building code in effect for Project.

1. Power-driven fasteners.

2. Fire-retardant-treated wood.

1.05 QUALITY ASSURANCE

A. Single-Source Responsibility for Fire-Retardant-Treated Wood: Obtain each type of fire-retardant-treated wood product from one source and by a single producer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Keep materials under cover and dry. Protect from weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels. Provide for air circulation within and around stacks and under temporary coverings.

1. For lumber and plywood pressure treated with waterborne chemicals, place spacers between each bundle to provide air circulation.

**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:

1. Wood-Preservative-Treated Materials:

    a. Baxter: J. H. Baxter Co.
    b. Chemical Specialties, Inc.
    c. Continental Wood Preservers, Inc.
    d. Hickson Corp.
    e. Hoover Treated Wood Products, Inc.
    f. Osmose Wood Preserving, Inc.

2. Metal Framing Anchors:

    a. Cleveland Steel Specialty Co.
    b. Harlen Metal Products, Inc.
    c. Silver Metal Products, Inc.
    d. Simpson Strong-Tie Company, Inc.
    e. Southeastern Metals Manufacturing Co., Inc.

2.02 LUMBER, GENERAL

A. Lumber Standards: Comply with DOC PS 20, "American Softwood Lumber Standard," and with applicable grading rules of inspection agencies certified by ALSC's Board of Review.

B. Inspection Agencies: Inspection agencies, and the abbreviations used to reference them, include the following:

1. NELMA - Northeastern Lumber Manufacturers Association.

2. SPIB - Southern Pine Inspection Bureau.

C. Grade Stamps: Provide lumber with each piece factory marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.

D. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.

1. Provide dressed lumber, S4S, unless otherwise indicated.

2. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 38 mm (1 ½ inches) actual thickness or less, unless otherwise indicated.

2.03 WOOD-PRESERVATIVE-TREATED MATERIALS

A. General: Where lumber or plywood is indicated as preservative treated or is specified to be treated, comply with applicable requirements of AWPA C2 (lumber) and AWPA C9 (plywood). Mark each treated item with the Quality Mark Requirements of an inspection agency approved by ALSC's Board of Review.

B. Pressure treat aboveground items with waterborne preservatives to a minimum retention of 4.0 kg/cu. M (.25 lbs per cubic foot). After treatment, kiln-dry lumber and plywood to a maximum moisture content of 19 and 15 percent, respectively. Treat indicated items and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, and similar members in connection with roofing and flashing.

2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.

C. Complete fabrication of treated items before treatment, where possible. If cut after treatment, apply field treatment complying with AWPA M4 to cut surfaces. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.

## 2.04 MISCELLANEOUS LUMBER

A. General: Provide lumber for support or attachment of other construction, including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, furring, stripping, and similar members.

B. Fabricate miscellaneous lumber from dimension lumber of sizes indicated and into shapes shown.

C. Moisture Content: 19 percent maximum for lumber items not specified to receive wood preservative treatment.

D. Grade: For dimension lumber sizes, provide No. 3 or Standard grade lumber per ALSC's NGRs of any species. For board-size lumber, provide No. 3 Common grade per NELMA, NLGA, or WWPA; No. 2 grade per SPIB; or Standard grade per NLGA, WCLIB or WWPA of any species.

## 2.05 STRUCTURAL-USE PANELS FOR BACKING

A. Plywood Backing Panels: For mounting electrical or telephone equipment, provide fire-retardant-treated plywood panels with grade, C-D Plugged Exposure 1, in thickness indicated or, if not otherwise indicated, not less than 11.9 mm thick (15/32 inch).

## 2.06 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, in the roof, or in area of high relative humidity, provide fasteners with a hot-dip zinc coating per ASTM A 153 or of Type 304 stainless steel.

B. Nails, Wire, Brads, and Staples: FS FF-N-105.

C. Power-Driven Fasteners: CABO NER-272.

D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.3.8M.

F. Bolts: Steel bolts complying with ASTM F 568, Property Class 4.6; with ASTM A 563M hex nuts and, where indicated, flat washers.

2.07 MISCELLANEOUS MATERIALS

A. Adhesives for Field Gluing Panels to Framing: Formulation complying with APA AFG-01 that is approved for use with type of construction panel indicated by both adhesive and panel manufacturers.

B. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbonate (IPBC) as its active ingredient.

**PART 3 - EXECUTION**

3.01 INSTALLATION, GENERAL

A. Discard units of material with defects that impair quality of rough carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.

B. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted.

C. Fit rough carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, and similar supports to allow attachment of other construction.

D. Apply field treatment complying with AWPA M4 to cut surfaces of preservative-treated lumber and plywood.

E. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. CABO NER-272 for power-driven staples, P-nails, and allied fasteners.

2. Table 2304.9.1 - Fastening Schedule of the 2009 International Building Code.

F. Use common wire nails, unless otherwise indicated. Use finishing nails for finish work. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; predrill as required.

G. Use hot-dip galvanized or stainless-steel nails where rough carpentry is exposed to weather, in ground contact, in roof construction, or in area of high relative humidity.

H. Countersink nail heads on exposed carpentry work and fill holes with wood filler.

3.02 WOOD GROUNDS, NAILERS, BLOCKING, AND SLEEPERS

A. Install wood nailers, blocking, and sleepers where shown and where required for attaching other work. Form to shapes shown and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

3.03 WOOD FRAMING, GENERAL

A. Framing Standard: Comply with AFPA's "Manual for Wood Frame Construction," unless otherwise indicated.

B. Install framing members of size and at spacing indicated.

**END OF SECTION**

**SECTION 07115**

**BITUMINOUS DAMPPROOFING**

PARAGRAPH INDEX

## SECTION 07115

## BITUMINOUS DAMPPROOFING

### PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:

1. Cold-applied, emulsified-asphalt dampproofing.

1.02 SUBMITTALS

A. Product Data: For each type of product indicated.

1.03 PROJECT CONDITIONS

A. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until dampproofing has cured.

### PART 2 - PRODUCTS

2.01 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Degussa Building Systems; Sonneborn Brand Products.

2. Henry Company.

3. Karnak Corporation.

4. Koppers Inc.

B. Trowel Coats: ASTM D 1227, Type II, Class 1.

C. Fibered Brush and Spray Coats: ASTM D 1227, Type II, Class 1.

D. Brush and Spray Coats: ASTM D 1227, Type III, Class 1.

E. VOC Content: Zero.

2.02 MISCELLANEOUS MATERIALS

A. Cut-Back Asphalt Primer: ASTM D 41.

B. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended by manufacturer.

C. Asphalt-Coated Glass Fabric: ASTM D 1668, Type I.

**PART 3 - EXECUTION**

3.01 PREPARATION

A. Clean substrates of projections and substances detrimental to work; fill voids, seal joints, and apply bond breakers if any, as recommended by prime material manufacturer.

3.02 APPLICATION, GENERAL

A. Comply with manufacturer's written recommendations unless more stringent requirements are indicated or required by Project conditions to ensure satisfactory performance of dampproofing.

B. Apply dampproofing to provide continuous plane of protection on exterior face of inner wythe of exterior masonry cavity walls.

3.03 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

A. On Exterior Face of Inner Wythe of Cavity Walls: Apply primer and 1 brush or spray coat at not less than 4 to 6 gal./100 sq. ft..

**END OF SECTION**

**SECTION 07131**

**SELF-ADHERING SHEET WATERPROOFING**

PARAGRAPH INDEX

## SECTION 07131

## SELF-ADHERING SHEET WATERPROOFING

### 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 the following:

1. Modified bituminous sheet waterproofing.

2. Asphalt impregnated protection board.

1.03 SUBMITTALS

A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing.

B. Shop Drawings: Show locations and extent of waterproofing. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.

C. Samples: For the following products:

1. 12-by-12-inch square of waterproofing sheet.

2. 4-by-4-inch square of protection board.

D. Installer Certificates: Signed by manufacturers certifying that installers comply with requirements.

E. Qualification Data: For Installer.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for waterproofing.

G. Warranties: Special warranties specified in this Section.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: A firm that is approved or licensed by waterproofing manufacturer for installation of waterproofing required for this Project.

B. Source Limitations: Obtain waterproofing materials**,** protection course, and molded-sheet drainage panels through one source from a single manufacturer.

1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

C. Preinstallation Conference: Conduct conference at Project site.

1. Review waterproofing requirements including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver liquid materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by waterproofing manufacturer.

C. Remove and replace liquid materials that cannot be applied within their stated shelf life.

D. Store rolls according to manufacturer's written instructions.

E. Protect stored materials from direct sunlight.

1.06 PROJECT CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.

1. Do not apply waterproofing in snow, rain, fog, or mist.

B. Maintain adequate ventilation during preparation and application of waterproofing materials.

1.07 WARRANTY

A. Special Manufacturer's Warranty: Manufacturer's standard form in which manufacturer agrees to replace waterproofing material that does not comply with requirements or that fails to remain watertight within specified warranty period.

1. Warranty does not include failure of waterproofing due to failure of substrate prepared and treated according to requirements or formation of new joints and cracks in substrate exceeding 1/16 inch in width.

2. Warranty Period: Two years from date of Substantial Completion.

**PART 2 - PRODUCTS**

2.01 MODIFIED BITUMINOUS SHEET WATERPROOFING

A. Modified Bituminous Sheet: Not less than 60-mil-thick, self-adhering sheet consisting of 56 mils of rubberized asphalt laminated to a 4-mil-thick, polyethylene film with release liner on adhesive side and formulated for application with primer or surface conditioner that complies with VOC limits of authorities having jurisdiction.

1. Products: Subject to compliance with requirements, provide one of the following:

a. American Hydrotech, Inc.; VM 75.
b. Grace, W. R. & Co.; Bituthene 4000.
c. Henry Company; Blueskin WP 200.
d. Meadows, W. R., Inc.; SealTight Mel-Rol.

2. Physical Properties:

a. Tensile Strength: 250 psi minimum; ASTM D 412, Die C, modified.
b. Ultimate Elongation: 300 percent minimum; ASTM D 412, Die C, modified.
c. Low-Temperature Flexibility: Pass at minus 20 deg F; ASTM D 1970.
d. Crack Cycling: Unaffected after 100 cycles of 1/8-inch movement; ASTM C 836.

e. Puncture Resistance: 40 lbf minimum; ASTM E 154.
f. Hydrostatic-Head Resistance: 150 feet minimum; ASTM D 5385.
g. Water Absorption: 0.15 percent weight-gain maximum after 48-hour immersion at 70 deg F; ASTM D 570.
h. Vapor Permeance: 0.05 perms; ASTM E 96, Water Method.

2.02 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.

1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.

B. Primer: Liquid waterborne primer recommended for substrate by manufacturer of sheet waterproofing material.

C. Substrate Patching Membrane: Low-viscosity, two-component, asphalt-modified coating.

D. Sheet Strips: Self-adhering, rubberized-asphalt sheet strips of same material and thickness as sheet waterproofing.

E. Mastic, Adhesives, and Tape: Liquid mastic and adhesives, and adhesive tapes recommended by waterproofing manufacturer.

1. Detail Tape: Two-sided, pressure-sensitive, self-adhering reinforced tape, 4-1/2 inches wide, with a tack-free protective adhesive coating on one side and release film on self-adhering side.

2. Detail Strips: 62.5-mil-thick, felt-reinforced self-adhesive strip, 9 inches wide, with release film on adhesive side.

F. Metal Termination Bars: Aluminum bars, approximately 1 by 1/8 inch thick, predrilled at 9-inch centers.

2.03 PROTECTION BOARD

A. Protection Board: ASTM D 6506, semi-rigid sheets of mineral reinforced asphaltic core, pressure laminated between two asphalt-saturated fibrous liners and as follows:

1. Thickness: 1/8 inch nominal, for vertical applications; ¼ inch nominal, horizontal applications and elsewhere.

2. Adhesive: Rubber-based solvent type recommended by waterproofing membrane manufacturer for protection course material.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.

1. Verify that concrete has cured and aged for minimum time period recommended by waterproofing manufacturer.

2. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.

3. Verify that compacted subgrade is dry, smooth, and sound; and ready to receive adhesive-coated HDPE sheet.

4. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 SURFACE PREPARATION

A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.

E. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.

1. Install sheet strips and center over treated construction and contraction joints and cracks exceeding a width of 1/16 inch.

F. Bridge and cover discontinuous deck-to-wall and deck-to-deck joints with overlapping sheet strips.

1. Invert and loosely lay first sheet strip over center of joint. Firmly adhere second sheet strip to first and overlap to substrate.

G. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.

1. Install membrane strips centered over vertical inside corners. Install 3/4-inch fillets of liquid membrane on horizontal inside corners and as follows:

a. At footing-to-wall intersections, extend liquid membrane each direction from corner or install membrane strip centered over corner.
b. At plaza deck-to-wall intersections, extend liquid membrane or sheet strips onto deck waterproofing and to finished height of sheet flashing.

H. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to ASTM D 6135.

3.03 MODIFIED BITUMINOUS SHEET WATERPROOFING APPLICATION

A. Install modified bituminous sheets according to waterproofing manufacturer's written instructions and according to recommendations in ASTM D 6135.

B. Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by sheet waterproofing in same day. Reprime areas exposed for more than 24 hours.

C. Apply and firmly adhere sheets over area to receive waterproofing. Accurately align sheets and maintain uniform 2-1/2-inch-minimum lap widths and end laps. Overlap and seal seams and stagger end laps to ensure watertight installation.

1. When ambient and substrate temperatures range between 25 and 40 deg F, install self-adhering, modified bituminous sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F.

D. Apply continuous sheets over sheet strips bridging substrate cracks, construction, and contraction joints.

E. Seal exposed edges of sheets at terminations not concealed by metal counterflashings or ending in reglets with mastic.

F. Install sheet waterproofing and auxiliary materials to tie into adjacent waterproofing.

G. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheet waterproofing extending 6 inches beyond repaired areas in all directions.

H. Install protection course with butted joints over waterproofing membrane immediately.

1. Molded-sheet drainage panels may be used in place of a separate protection course to vertical applications when approved by waterproofing manufacturer and installed immediately.

I. Correct deficiencies in or remove sheet waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

3.04 PROTECTION BOARD INSTALLATION

A. Place and secure asphalt impregnated protection board according to manufacturer's written instructions. Use adhesives or mechanical fasteners that do not penetrate waterproofing. Protect installed panels during subsequent construction and backfilling operations.

3.05 FIELD QUALITY CONTROL

A. Engage a full-time site representative qualified by waterproofing membrane manufacturer to inspect substrate conditions; surface preparation; membrane application, flashings, protection, and drainage components; and to furnish daily reports to Engineer.

3.06 PROTECTION AND CLEANING

A. Do not permit foot or vehicular traffic on unprotected membrane.

B. Protect waterproofing from damage and wear during remainder of construction period.

C. Protect installed board insulation and insulation drainage panels from damage due to UV light, harmful weather exposures, physical abuse, and other causes.

Provide temporary coverings where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

D. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

**END OF SECTION**

**SECTION 07210**

**BUILDING INSULATION**

PARAGRAPH INDEX

## SECTION 07210

## BUILDING INSULATION

### 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. Section Includes:

1. Foam-plastic board insulation.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

1.04 QUALITY ASSURANCE

A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect foam-plastic board insulation as follows:

1. Do not expose to sunlight except to necessary extent for period of installation and concealment.

2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site before installation time.
3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

## PART 2 - PRODUCTS

### 2.01 FOAM-PLASTIC BOARD INSULATION

A. Extruded-Polystyrene Board Insulation: ASTM C 578, of type and minimum compressive strength indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Dow Chemical Company (The).
    b. Owens Corning.

2. Type IV, 25 psi.

3. Location: Building roof.

B. Foil-Faced, Polyisocyanurate Board Insulation: ASTM C 1289, Type I, Class 2, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Atlas Roofing Corporation.
    b. Dow Chemical Company (The).
    c. Rmax, Inc.

2. Location: Cavity Wall.

C. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

### 2.02 INSULATION FASTENERS

A. General: Provide fasteners of the size and type indicated that comply with requirements specified in this article for material and manufacture.

B. Wood Screws: ASME B18.6.1.

C. Power-Driven Fasteners: NES NER-272.

D. Insulation Adhesive: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation, fasteners, and substrates.

1. Products: Subject to compliance with requirements, provide one of the following:

a. AGM Industries, Inc.; TACTOO Adhesive.
b. Gemco; Tuff Bond Hanger Adhesive.

## PART 3 - EXECUTION

### 3.01 PREPARATION

A. Clean substrates of substances that are harmful to insulation or that interfere with insulation attachment.

### 3.02 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

### 3.03 INSTALLATION OF CAVITY-WALL INSULATION

A. Foam-Plastic Board Insulation: Install pads of adhesive spaced approximately 24 inches o.c. both ways on inside face, and as recommended by manufacturer. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions. Press units firmly against inside substrates.

## 3.04 INSTALLATION OF INSULATION FOR CONCRETE ROOF SUBSTRATES

A. Install board insulation on concrete roof substrates by adhesively attaching boards as follows:

1. Fasten insulation to concrete substrates with insulation adhesive according to manufacturer's written instructions. Trowel adhesive onto roof plank with toothed trowel.

2. After adhesive has dried per manufacturer’s recommendation, install board insulation by pressing insulation into position.

3. Apply roof sheathing over insulation. Fasten sheathing with wood screws or power-driven fasteners through insulation and into precast roof plank, taking care not to over-drive the fastener. Fasteners shall end within the precast roof plank.

4. If fasteners are driven through the pre-cast roof plank, remove fastener and set two fasteners on either side of original location.

## 3.05 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

## 3.06 INSULATION SCHEDULE

A. Insulation Type - Roof: Type IV extruded-polystyrene board insulation.

B. Insulation Type – Cavity Wall: Foil-faced, polyisocyanurate board insulation.

END OF SECTION 07210

**SECTION 07315**

**SLATE SHINGLES**

PARAGRAPH INDEX

## SECTION 07315

## SLATE SHINGLES

## 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. Section Includes:

1. Slate shingles.
2. Underlayment.
3. Snow guards.

1.03 DEFINITIONS

A. Roofing Terminology: See ASTM D 1079 and glossary in NRCA's "The NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: Of each color, size, texture, and shape.

1. Include similar Samples of trim and accessories involving color selection.

C. Samples for Verification: For the following products, of sizes indicated, to verify color selected:

1. Slate Shingle: Full size, of each color, size, texture, and shape.
2. Fasteners: Three fasteners of each type, length, and finish.
3. Snow Guard: Base, bracket, and 12-inch- long rail.

D. Material Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each slate variety.

E. Warranty: Sample of special warranty.

F. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Slate Shingles: 100 sq. ft. of each type and color, in unbroken bundles.

1.05 QUALITY ASSURANCE

A. Source Limitations: Obtain each color of slate shingle from single quarry capable of producing slate of consistent quality in appearance and physical properties.

B. Preinstallation Conference: Conduct conference at Project site.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store underlayment rolls on end, on pallets or other raised surfaces. Do not double stack rolls.

1. Handle, store, and place roofing materials in a manner to avoid significant or permanent damage to roof deck or structural supporting members.

B. Protect unused underlayment from weather, sunlight, and moisture when left overnight or when roofing work is not in progress.

1.07 PROJECT CONDITIONS

A. Environmental Limitations: Proceed with installation of self-adhering sheet underlayment only within the range of ambient and substrate temperatures recommended by manufacturer.

1.08 WARRANTY

A. Special Warranty: Standard form in which roofing Installer agrees to repair or replace slate roofing that fails in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.01 SLATE SHINGLES

A. Slate Shingles: ASTM C 406, Grade S1 Standard Slate; hard, dense, and sound; chamfered edges, with nail holes machine punched or drilled and countersunk. No broken or cracked slates, no broken exposed corners, and no broken corners on covered ends that could sacrifice nailing strength or laying of a watertight roof.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Buckingham-Virginia Slate Corp.
    b. Greenstone Slate Company, Inc.
    c. Virginia Slate Company (The).

2. Thickness: Nominal 3/16 to 1/4 inch.
3. Surface Texture: Rough – match existing slates used on existing Pump Stations.
4. Size: 18 inches long by random widths, but not less than one-half-length wide – match existing slates used on existing Pump Stations.
5. Nail Holes: Two per shingle.
6. Butt Shape: Standard square cut.
7. Color: Gray Blend to match existing slates used on existing Pump Stations.
8. Weather-Exposure Color Change: Unfading.

B. Starter Slate: Slate shingles with chamfered nail holes front-side punched.

1. Length: Exposure of slate shingle plus head lap.

C. Ridge Slate: Slate shingles fabricated with vertical grain orientation.

### 2.02 UNDERLAYMENT MATERIALS

A. Felt Underlayment: ASTM D 226, Type I, asphalt-saturated organic felt, unperforated.

B. Self-Adhering Sheet Underlayment, Polyethylene Faced: ASTM D 1970, minimum of 60-mil- thick, slip-resisting, polyethylene-film-reinforced top surface laminated to SBS-modified asphalt adhesive, with release paper backing; cold applied. Provide primer for adjoining concrete or masonry surfaces to receive underlayment.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Carlisle Coatings & Waterproofing, Inc.
    b. Grace, W. R. & Co. - Conn.

c. Henry Company.
d. Johns Manville.

2.03 SNOW GUARDS

A. Snow-Guard Pads: Fabricated cast-bronze units, designed to be installed without penetrating slate shingles, and complete with predrilled holes or hooks for anchoring.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Alpine Snow Guards, a division of Vermont Slate & Copper Services, Inc.
b. Berger Building Products.

2.04 ACCESSORIES

A. Asphalt Roofing Cement: ASTM D 4586, Type II, asbestos free.

B. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in slate-shingle roofing and remain watertight.

C. Slating Nails: ASTM F 1667, stainless-steel, smooth shanked, wire nails; 0.135-inch minimum thickness; sharp pointed; with 3/8-inch-minimum diameter flat head; of sufficient length to penetrate a minimum of 3/4 inch into sheathing.

1. Where nails are in contact with metal flashing, use nails made from same metal as flashing.

D. Felt Underlayment Nails: Stainless-steel or hot-dip galvanized-steel wire nails with low-profile capped heads or disc caps, 1-inch minimum diameter.

E. Wood Nailer Strips and Eave Cants: Comply with requirements in Section 06100 "Rough Carpentry."

2.05 METAL FLASHING AND TRIM

A. General: Comply with requirements in Section 07620 "Sheet Metal Flashing and Trim."

1. Sheet Metal: Copper.

B. Fabricate sheet metal flashing and trim to comply with recommendations that apply to design, dimensions, metal, and other characteristics of the item in SMACNA's "Architectural Sheet Metal Manual."

1. Apron Flashings: Fabricate with lower flange extending a minimum of 4 inches over and 4 inches beyond each side of downslope slate shingles and 6 inches up the vertical surface.
2. Step Flashings: Fabricate with a head lap of 3 inches and a minimum extension of 4 inches both horizontally and vertically.
3. Drip Edges: Fabricate in lengths not exceeding 10 feet with 2-inch roof-deck flange and 1-1/2-inch fascia flange with 3/8-inch drip at lower edge.

C. Vent-Pipe Flashings: ASTM B 749, Type L51121, at least 1/16 inch thick. Provide lead sleeve sized to slip over and turn down into pipe, soldered to skirt at slope of roof and extending at least 4 inches from pipe onto roof.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Examine roof sheathing to verify that sheathing joints are supported by framing and blocking or metal clips and that installation is within flatness tolerances.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored and that provision has been made for flashings and penetrations through roofing.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 UNDERLAYMENT INSTALLATION

A. General: Comply with underlayment manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.

B. Double-Layer Felt Underlayment: Install on roof deck parallel with and starting at the eaves. Install a 19-inch-wide starter course at eaves and completely cover with full-width second course. Install succeeding courses lapping previous courses 19 inches in

shingle fashion. Lap ends a minimum of 6 inches. Stagger end laps between succeeding courses at least 72 inches. Fasten with felt underlayment nails.

1. Install felt underlayment on roof sheathing not covered by self-adhering sheet underlayment. Lap edges over self-adhering sheet underlayment not less than 3 inches in direction to shed water.
2. Terminate felt underlayment extended up not less than 4 inches against sidewalls, curbs, chimneys, and other roof projections.

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. Lap ends not less than 6 inches, staggered 24 inches between courses. Roll laps with roller. Cover underlayment within seven days.

1. Prime concrete and masonry surfaces to receive self-adhering sheet underlayment.
2. Eaves: Extend from edges of eaves 36 inches beyond interior face of exterior wall.
3. Rakes: Extend from edges of rakes 24 inches beyond interior face of exterior wall.
4. Ridges: Extend 36 inches on each side.
5. Sidewalls: Extend 18 inches beyond sidewalls and return vertically against sidewalls not less than 4 inches.

## 3.03 METAL FLASHING INSTALLATION

A. General: Install metal flashings and other sheet metal to comply with requirements in Section 07620 "Sheet Metal Flashing and Trim."

1. Install metal flashings according to recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."

B. Apron Flashings: Extend lower flange over and beyond each side of downslope slate shingles and up the vertical surface.

C. Step Flashings: Install with a head lap of 3 inches and extend both horizontally and vertically. Install with lower edge of flashing just upslope of, and concealed by, butt of overlying slate shingle. Fasten to roof deck only.

D. Rake Drip Edges: Install over underlayment and fasten to roof deck.

E. Eave Drip Edges: Install beneath underlayment and fasten to roof deck.

F. Pipe Flashings: Form flashing around pipe penetrations and slate shingles. Fasten and seal to slate shingles.

3.04 SLATE-SHINGLE INSTALLATION

A. General: Beginning at eaves, install slate shingles according to manufacturer's written instructions and to details and recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."

1. Install wood nailer strip cant at eave edges.
2. Install shingle starter course chamfered face down.

B. Install first and succeeding shingle courses with chamfered face up. Install full-width first course at rake edge.

1. Offset joints of uniform-width slate shingles by half the shingle width in succeeding courses.
2. Offset joints of random-width slate shingles a minimum of 3 inches in succeeding courses.

C. Maintain a 4-inch-minimum head lap between succeeding shingle courses.

D. Maintain uniform exposure of shingle courses between eaves and ridge.

E. Extend shingle starter course and first course 1 inch over fasciae at eaves.

F. Extend shingle starter course and succeeding courses 1 inch over fasciae at rakes.

G. Cut and fit slate neatly around roof vents, pipes, ventilators, and other projections through roof.

H. Hang slate with two slating nails for each shingle with nail heads lightly touching slate. Do not drive nails home drawing slates downward or leave nail head protruding enough to interfere with overlapping shingle above.

I. Ridges: Install ridge slate in saddle configuration.

1. Install and anchor wood nailer strips of thicknesses to match abutting courses of slate shingles, terminating nailer strip 3 to 4 inches from the eave. Cover with felt underlayment strip, extending to underlying slate but concealed by ridge slate.
2. Lay ridge slate in bed of asphalt roofing cement.
3. Anchor ridge slate to supporting wood nailer strip with two nails for each slate shingle without nails penetrating underlying slate.
4. Extend combing slate over leeward ridge slate by 1/8 to 1/4 inch. Seal ridge joint with elastomeric sealant.
5. Cover heads of exposed nails at final ridge shingle with asphalt roofing cement.

3.05 SNOW-GUARD INSTALLATION

A. Snow-Guard Pads: Install two rows of snow-guard pads at locations indicated according to manufacturer's written installation instructions. Space rows 20 inches apart horizontally, beginning 12 inches from gutter. Space snow guards 24 inches apart in each row, offsetting by half this dimension between succeeding rows.

3.06 ADJUSTING AND CLEANING

A. Remove and replace damaged or broken slate shingles.

B. Remove excess slate and debris from Project site.

3.07 SAMPLE ROOFING INSTALLER'S WARRANTY

A. WHEREAS <**Insert name**> of <**Insert address**>, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:

1. Owner: <**Insert name of Owner**>.
2. Address: <**Insert address**>.
3. Building Name/Type: <**Insert information**>.
4. Address: <**Insert address**>.
5. Area of Work: <**Insert information**>.
6. Acceptance Date: <**Insert date**>.
7. Warranty Period: <**Insert time**>.
8. Expiration Date: <**Insert date**>.

B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,

C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.

D. This Warranty is made subject to the following terms and conditions:

1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:

a. Lightning;
b. Peak gust wind speed exceeding 90 mph;
c. Fire;

d. Failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
e. Faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
f. Vapor condensation on bottom of roofing; and
g. Activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.

2. When work has been damaged by any of the foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this <**Insert day**> day of <**Insert month**>, <**Insert year**>.

1. Authorized Signature: <**Insert signature**>.
2. Name: <**Insert name**>.
3. Title: <**Insert title**>.

END OF SECTION

**SECTION 07620**

**SHEET METAL FLASHING AND TRIM**

PARAGRAPH INDEX

**SECTION 07620**

**SHEET METAL FLASHING AND TRIM**

## 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. Section Includes:

1. Manufactured reglets with counterflashing.
2. Formed roof-drainage sheet metal fabrications.
3. Formed steep-slope roof sheet metal fabrications.

### 1.03 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

### 1.04 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
3. Review sheet metal flashing observation and repair procedures after flashing installation.

### 1.05 SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

B. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.
3. Include identification of material, thickness, weight, and finish for each item and location in Project.
4. Include details for forming, including profiles, shapes, seams, and dimensions.
5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
6. Include details of roof-penetration flashing.
7. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
8. Include details of special conditions.
9. Include details of connections to adjoining work.
10. Detail formed flashing and trim at scale of not less than 1-1/2 inches per 12 inches.

C. Samples for Initial Selection: For each type of sheet metal and accessory indicated with factory-applied finishes.

D. Qualification Data: For fabricator.

E. Product Test Reports: For each product, for tests performed by a qualified testing agency.

F. Sample Warranty: For special warranty.

G. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

## 1.06 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Build mockup of typical roof eave, including gutter, fascia trim and apron flashing, approximately 8 feet long, including supporting construction cleats, seams, attachments, underlayment, and accessories.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Engineer specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.08 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

**PART 2 - PRODUCTS**

2.01 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

## 2.02 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.

1. Exposed Coil-Coated Finish:

a. Two-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

2. Color: Stone White.

3. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.

## 2.03 UNDERLAYMENT MATERIALS

A. Felt: ASTM D 226/D 226M, Type II (No. 30), asphalt-saturated organic felt; nonperforated.

B. Self-Adhering, High-Temperature Sheet: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Grace Construction Products, a unit of W. R. Grace & Co.-Conn.; Grace Ice and Water Shield HT.
   b. Henry Company; Blueskin PE200 HT.
   c. Polyguard Products, Inc.; Deck Guard HT.

2. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F or higher.
3. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F or lower.

C. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. minimum.

## 2.04 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal **or** manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

   a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
   b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
   c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.

2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.

C. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

D. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane or silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

E. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

F. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.

G. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

## 2.05 MANUFACTURED SHEET METAL FLASHING AND TRIM

A. Reglets: Units of type, material, and profile required, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with interlocking counterflashing on exterior face, of same metal as reglet.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Fry Reglet Corporation.
   b. Hohmann & Barnard, Inc.
   c. Keystone Flashing Company, Inc.

2. Material: Stainless steel, 0.019 inch thick.
3. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
4. Concrete Type: Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.
5. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.
6. Accessories:

   a. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.

7. Finish: No. 4.

## 2.06 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.

1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
2. Obtain field measurements for accurate fit before shop fabrication.

3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints where necessary for strength.

G. Do not use graphite pencils to mark metal surfaces.

## 2.07 ROOF-DRAINAGE SHEET METAL FABRICATIONS

A. Hanging Gutters: Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch-long sections. Furnish flat-stock gutter brackets and flat-stock gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard but with thickness not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, gutter bead reinforcing bars, and gutter accessories from same metal as gutters. Shop fabricate interior and exterior corners.

1. Gutter Profile: Style D according to cited sheet metal standard.
2. Expansion Joints: Lap type.
3. Accessories: Continuous, removable leaf screen with sheet metal frame and hardware cloth screen.
4. Gutters with Girth up to 15 Inches: Fabricate from the following materials:
   a. Aluminum: 0.032 inch thick.

5. Gutters with Girth 16 to 20 Inches: Fabricate from the following materials:

a. Aluminum: 0.040 inch thick.

B. Downspouts: Fabricate rectangular downspouts to dimensions indicated, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors.

1. Fabricated Hanger Style: Fig 1-35C according to SMACNA's "Architectural Sheet Metal Manual."

2. Fabricate from the following materials:
a. Aluminum: 0.024 inch thick.

2.08 STEEP-SLOPE ROOF SHEET METAL FABRICATIONS

A. Apron, Step, Cricket, and Backer Flashing: Fabricate from the following materials:
1. Aluminum: 0.032 inch thick.

B. Drip Edges: Fabricate from the following materials:
1. Aluminum: 0.032 inch thick.

C. Eave and Rake Flashing: Fabricate from the following materials:
1. Aluminum: 0.032 inch thick.

D. Counterflashing: Fabricate from the following materials:
1. Aluminum: 0.032 inch thick.

E. Flashing Receivers: Fabricate from the following materials:
1. Stainless Steel: 0.016 inch thick.

F. Roof-Penetration Flashing: Fabricate from the following materials:
1. Stainless Steel: 0.019 inch thick.

2.09 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Equipment Support Flashing: Fabricate from the following materials:
1. Stainless Steel: 0.019 inch thick.

**PART 3 - EXECUTION**

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.

1. Verify compliance with requirements for installation tolerances of substrates.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.02 UNDERLAYMENT INSTALLATION

A. Felt Underlayment: Install felt underlayment, wrinkle free, using adhesive to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.

B. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller. Cover underlayment within 14 days.

C. Apply slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.

## 3.03 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to provide a complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
5. Torch cutting of sheet metal flashing and trim is not permitted.
6. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or

corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Coat concealed side of uncoated-aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.

E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as required for watertight construction.

1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
2. Prepare joints and apply sealants to comply with requirements in Section 07920 "Joint Sealants."

G. Rivets: Rivet joints in uncoated aluminum where necessary for strength.

## 3.04 ROOF-DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.

B. Hanging Gutters: Join sections with joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchor them in position. Provide end closures and seal watertight with sealant. Slope to downspouts.

1. Fasten gutter spacers to front and back of gutter.
2. Anchor and loosely lock back edge of gutter to continuous cleat.
3. Anchor gutter with gutter brackets spaced not more than 24 inches apart to roof deck, unless otherwise indicated, and loosely lock to front gutter bead.
4. Install gutter with expansion joints at locations indicated, but not exceeding, 50 feet apart. Install expansion-joint caps.
5. Install continuous gutter screens on gutters with noncorrosive fasteners, removable for cleaning gutters.

C. Downspouts: Join sections with 1-1/2-inch telescoping joints.

1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches o.c.
2. Provide elbows at base of downspout to direct water away from building.
3. Connect downspouts to underground drainage system.

## 3.05 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch centers.

C. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.

D. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints minimum of 4 inches. Secure in waterproof manner by means of snap-in installation and sealant or lead wedges and sealant unless otherwise indicated.

E. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

## 3.06 MISCELLANEOUS FLASHING INSTALLATION

A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

## 3.07 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

## 3.08 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.

E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

**SECTION 07920**

**JOINT SEALANTS**

PARAGRAPH INDEX

## SECTION 07920

## JOINT SEALANTS

### 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. Section Includes:
   1. Urethane joint sealants.
   2. Solvent-release-curing joint sealants.

1.03 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Joint-Sealant Schedule: Include the following information:

   1. Joint-sealant application, joint location, and designation.
   2. Joint-sealant manufacturer and product name.
   3. Joint-sealant formulation.
   4. Joint-sealant color.

1.04 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.

C. Sealant, Waterproofing, and Restoration Institute (SWRI) Validation Certificate: For each sealant specified to be validated by SWRI's Sealant Validation Program.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

E. Preconstruction Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

F. Preconstruction Field-Adhesion Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.

G. Field-Adhesion Test Reports: For each sealant application tested.

H. Warranties: Sample of special warranties.

## 1.05 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

C. Preinstallation Conference: Conduct conference at Project site.

## 1.06 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

## 1.07 WARRANTY

A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from natural causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

## PART 2 - PRODUCTS

### 2.01 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

C. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

D. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

E. Colors of Exposed Joint Sealants: As selected by Engineer from manufacturer's full range.

## 2.02 URETHANE JOINT SEALANTS

A. Single-Component, Nonsag, Urethane Joint Sealant (JS-1): ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:

a. BASF Building Systems; Sonolastic Ultra.
b. Bostik, Inc.; Chem-Calk 900.
c. Pecora Corporation; Dynatrol I-XL.
d. Sika Corporation, Construction Products Division; Sikaflex - 1a.

B. Single-Component, Nonsag, Traffic-Grade, Urethane Joint Sealant (JS-2): ASTM C 920. Type S, Grade NS, Class 25, for Use T.

1. Products: Subject to compliance with requirements, provide one of the following:

a. BASF Building Systems; Sonolastic Ultra.
b. Pecora Corporation; Urexpan NR-201
c. Sika Corporation, Construction Products Division; Sikaflex - 1a.

## 2.03 JOINT SEALANT BACKING

A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

## 2.04 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

    a. Concrete.
    b. Masonry.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

    a. Metal.
    b. Glass.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written

instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

## 3.03 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet the joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
4. Provide flush joint profile where indicated per Figure 8B in ASTM C 1193.

5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C 1193.

    a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

## 3.04 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

## 3.05 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

## 3.06 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application (JS-2): Exterior joints in horizontal traffic surfaces.

1. Joint Locations:

    a. Isolation and contraction joints in cast-in-place concrete slabs.
    b. Joints between plant-precast architectural concrete paving units.
    c. Joints between different materials listed above.
    d. Other joints as indicated.

2. Urethane Joint Sealant: Single component, nonsag, traffic grade.
3. Joint-Sealant Color: Limestone grey.

B. Joint-Sealant Application (JS-1): Exterior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

    a. Construction joints in cast-in-place concrete.
    b. Control and expansion joints in unit masonry.
    c. Joints in dimension stone cladding.
    d. Joints between different materials listed above.

e. Perimeter joints between materials listed above and frames of doors and louvers.
f. Control and expansion joints in ceilings and other overhead surfaces.
g. Other joints as indicated.

2. Urethane Joint Sealant: Single component, nonsag, Class 25.
3. Joint-Sealant Color: Match materials being sealed.

C. Joint-Sealant Application (JS-2): Interior joints in horizontal traffic surfaces.

1. Joint Locations:

a. Isolation joints in cast-in-place concrete slabs.
b. Other joints as indicated.

2. Urethane Joint Sealant: Single component, traffic grade Class 25.
3. Joint-Sealant Color: Limestone grey.

D. Joint-Sealant Application (JS-1): Interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

a. Control and expansion joints on exposed interior surfaces of exterior walls.
b. Perimeter joints of exterior openings where indicated.
c. Vertical joints on exposed surfaces of interior unit masonry or concrete walls and partitions.
d. Perimeter joints between interior wall surfaces and frames of interior doors.
e. Other joints as indicated.

2. Joint Sealant: Urethane single component, nonsag, Class 25.
3. Joint-Sealant Color: Match color of materials receiving sealant.

END OF SECTION

**SECTION 08110**

**STEEL DOORS AND FRAMES**

PARAGRAPH INDEX

## SECTION 08110

## STEEL DOORS AND FRAMES

### 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. Section includes hollow-metal work.

1.03 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.04 COORDINATION

A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.05 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1.06 SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, core descriptions, and finishes.

B. Shop Drawings: Include the following:

1. Elevations of each door type.

2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of moldings, removable stops, and glazing.
9. Details of conduit and preparations for power, signal, and control systems.

C. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

D. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.

E. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.

1. Provide additional protection to prevent damage to factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch-high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

**PART 2 - PRODUCTS**

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ceco Door Products; an Assa Abloy Group company.
2. Republic Doors and Frames.

3. Steelcraft; an Ingersoll-Rand company.

B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

## 2.02 REGULATORY REQUIREMENTS

A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

## 2.03 INTERIOR DOORS AND FRAMES

A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Extra-Heavy-Duty Doors and Frames: SDI A250.8, Level 3.

1. Physical Performance: Level A according to SDI A250.4.

2. Doors:

a. Type: As indicated in the Door and Frame Schedule.
b. Thickness: 1-3/4 inches.
c. Face: Metallic-coated, cold-rolled steel sheet, minimum thickness of 0.053 inch.
d. Edge Construction: Model 1, Full Flush.
e. Core: Vertical steel stiffener.

3. Frames:

a. Materials: Metallic-coated, steel sheet, minimum thickness of 0.053 inch.
b. Construction: Full profile welded.

4. Exposed Finish: Prime.

## 2.04 EXTERIOR HOLLOW-METAL DOORS AND FRAMES

A. Construct exterior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Extra-Heavy-Duty Doors and Frames: SDI A250.8, Level 3.

1. Physical Performance: Level A according to SDI A250.4.

2. Doors:

   a. Type: As indicated in the Door and Frame Schedule.
   b. Thickness: 1-3/4 inches.
   c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A40 coating.
   d. Edge Construction: Model 1, Full Flush.
   e. Core: Vertical steel stiffener.

      1) Thermal-Rated Doors: Provide doors fabricated with thermal-resistance value (R-value) of not less than 2.38 deg F x h x sq. ft./Btu when tested according to ASTM C 1363.

3. Frames:

   a. Materials: Metallic-coated steel sheet, minimum thickness of 0.067 inch, with minimum A40 coating.
   b. Construction: Full profile welded.

4. Exposed Finish: Prime.

## 2.05 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
2. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

## 2.06 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.

D. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

F. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

G. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.

H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

I. Glazing: Comply with requirements in Section 08800 "Glazing."

J. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

## 2.07 FABRICATION

A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Hollow-Metal Doors:

1. Steel-Stiffened Door Cores: Provide minimum thickness 0.026 inch, steel vertical stiffeners of same material as face sheets extending full-door height, with vertical webs spaced not more than 6 inches apart. Spot weld to face sheets no more than 5 inches o.c. Fill spaces between stiffeners with glass- or mineral-fiber insulation.
2. Fire Door Cores: As required to provide fire-protection ratings indicated.
3. Vertical Edges for Single-Acting Doors: Bevel edges 1/8 inch in 2 inches.
4. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets.

5. Bottom Edge Closures: Close bottom edges of doors with inverted channels of same material as face sheets.
6. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
7. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.

C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
4. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Masonry Type: Locate anchors not more than 16 inches from top and bottom of frame. Space anchors not more than 32 inches o.c., to match coursing, and as follows:

        1) Two anchors per jamb up to 60 inches high.
        2) Three anchors per jamb from 60 to 90 inches high.
        3) Four anchors per jamb from 90 to 120 inches high.
        4) Four anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.

    b. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
5. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.

    a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.

E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.

1. Reinforce doors and frames to receive non-templated, mortised, and surface-mounted door hardware.
2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.

2.08 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

2.09 ACCESSORIES

A. Louvers: Provide louvers for interior doors, where indicated, which comply with SDI 111C, with blades or baffles formed of 0.020-inch-thick, cold-rolled steel sheet set into 0.032-inch-thick steel frame.

1. Sightproof Louver: Stationary louvers constructed with inverted-V or inverted-Y blades.

B. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

C. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

**PART 3 - EXECUTION**

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.02 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

## 3.03 INSTALLATION

A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.

B. Hollow-Metal Frames: Install hollow-metal frames of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

    a. At fire-rated openings, install frames according to NFPA 80.
    b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    c. Install frames with removable stops located on secure side of opening.
    d. Install door silencers in frames before grouting.
    e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
    g. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.
2. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
3. Concrete Walls: Solidly fill space between frames and concrete with mineral-fiber insulation.

4. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
5. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

    a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
    c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Steel Doors:

    a. Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch.
    b. Between Edges of Pairs of Doors: 1/8 inch to 1/4 inch plus or minus 1/32 inch.
    c. At Bottom of Door: 3/4 inch plus or minus 1/32 inch.
    d. Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
3. Smoke-Control Doors: Install doors and gaskets according to NFPA 105.

D. Glazing: Comply with installation requirements in Section 08800 "Glazing" and with hollow-metal manufacturer's written instructions.

1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

## 3.04 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow-metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

E. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION

**SECTION 08520**

**ALUMINUM WINDOWS**

PARAGRAPH INDEX

**SECTION 08520**

**ALUMINUM WINDOWS**

## 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. Section includes aluminum windows for exterior locations.

### 1.03 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review and discuss the finishing of aluminum windows that is required to be coordinated with the finishing of other aluminum work for color and finish matching.
3. Review, discuss, and coordinate the interrelationship of aluminum windows with other exterior wall components. Include provisions for anchorage, flashing, sealing perimeters, and protecting finishes.
4. Review and discuss the sequence of work required to construct a watertight and weather-tight exterior building envelope.
5. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

### 1.04 SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for aluminum windows.

B. Shop Drawings: Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.

C. Samples: For each exposed product and for each color specified, 2 by 4 inches in size.

D. Product Schedule: For aluminum windows. Use same designations indicated on Drawings.

E. Qualification Data: For manufacturer and Installer.

F. Product Test Reports: For each type of aluminum window, for tests performed by a qualified testing agency.

G. Field quality-control reports.

H. Sample Warranties: For manufacturer's warranties.

## 1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer capable of fabricating aluminum windows that meet or exceed performance requirements indicated and of documenting this performance by test reports, and calculations.

B. Installer Qualifications: An installer acceptable to aluminum window manufacturer for installation of units required for this Project.

## 1.06 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

    a. Failure to meet performance requirements.
    b. Structural failures including excessive deflection, water leakage, condensation, and air infiltration.
    c. Faulty operation of movable sash and hardware.
    d. Deterioration of materials and finishes beyond normal weathering.
    e. Failure of insulating glass.

2. Warranty Period:

    a. Window: 10 years from date of Substantial Completion.
    b. Glazing Units: Five years from date of Substantial Completion.
    c. Aluminum Finish: 10 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Graham Series 6700 Thermally Broken Operable Aluminum Windows or comparable product by one of the following:

1. EFCO Corporation; a Pella company.
2. Graham Architectural Products Corp.
3. Quaker Windows Products Co.Thermal Windows, Inc.
4. TRACO.
5. Wausau Window and Wall Systems.
6. YKK AP America Inc.

B. Source Limitations: Obtain aluminum windows from single source from single manufacturer.

### 2.02 WINDOW PERFORMANCE REQUIREMENTS

A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.

1. Window Certification: AMMA certified with label attached to each window.

B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:

1. Minimum Performance Class for Projected Window: CW.
2. Minimum Performance Grade for Projected Window: 100.

C. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.46 Btu/sq. ft. x h x deg F. using clear/low-E insulating glass.

D. Condensation-Resistance Factor (CRF): Provide aluminum windows tested for thermal performance according to AAMA 1503, showing a CRF of 31.

E. Thermal Movements: Provide aluminum windows, including anchorage, 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 joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F, ambient; 180 deg F material surfaces.

F. Sound Transmission Class (STC): Rated for not less than 33-35 STC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 413.

## 2.03 ALUMINUM WINDOWS

A. Operating Types: Provide the following operating types in locations indicated on Drawings:

1. Awning: Project out.
2. Fixed.

B. Frames and Sashes: Aluminum extrusions complying with AAMA/WDMA/CSA 101/I.S.2/A440.

1. Thermally Improved Construction: Fabricate frames, sashes, and muntins with an integral, concealed, low-conductance thermal barrier located between exterior materials and window members exposed on interior side in a manner that eliminates direct metal-to-metal contact.

C. Insulating-Glass Units: ASTM E 2190.

1. Glass: ASTM C 1036, Type 1, Class 1, q3.

a. Tint: Clear.
b. Kind: Laminated exterior pane; Fully tempered interior pane.

2. Lites: Two.
3. Filling: Fill space between glass lites with air.
4. Low-E Coating: Pyrolytic on second surface.

D. Hardware, General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with adjacent materials; designed to smoothly operate, tightly close, and securely lock windows, and sized to accommodate sash weight and dimensions.

1. Exposed Hardware Color and Finish: Match window frame and mullions.

E. Projected Window Hardware:

1. Gear-Type Rotary Operators: Complying with AAMA 901 when tested according to ASTM E 405, Method A. Provide operators that function without requiring the removal of interior screens or using screen wickets.

a. Type and Style: Aluminum, clear anodized.

2. Hinges: 4-bar, stainless steel hinges.
3. Lock: Lever handle and cam-action lock with keeper.
4. Limit Devices: Concealed support arms with adjustable, limited, hold-open limit devices designed to restrict sash opening.

F. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.

G. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.

1. Exposed Fasteners: Do not use exposed fasteners to the greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

## 2.04 ACCESSORIES

A. Subsills: Thermally broken, extruded-aluminum subsills in configurations indicated on Drawings.

B. Interior Trim: Extruded-aluminum profiles in sizes and configurations indicated on Drawings.

## 2.05 INSECT SCREENS

A. General: Fabricate insect screens to integrate with window frame. Provide screen for each operable exterior sash. Screen wickets are not permitted.

1. Type and Location: Full, inside for project-out sashes.

B. Aluminum Frames: Manufacturer's standard aluminum alloy complying with SMA 1004 or SMA 1201. Fabricate frames with mitered or coped joints or corner extrusions, concealed fasteners, and removable PVC spline/anchor concealing edge of frame.

1. Tubular Framing Sections and Cross Braces: Roll formed from aluminum sheet.

C. Stainless Steel Wire Fabric: 18-by-16 mesh of 0.009-inch-diameter, stainless steel wire.

1. Wire-Fabric Finish: Natural bright.

## 2.06 FABRICATION

A. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.

B. Glaze aluminum windows in the factory.

C. Weather strip each operable sash to provide weathertight installation.

D. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.

E. Provide water-shed members above side-hinged sashes and similar lines of natural water penetration.

F. Mullions: Provide mullions and cover plates, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections, as indicated. Provide mullions and cover plates capable of withstanding design wind loads of window units.

G. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation.

## 2.07 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## 2.08 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.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.

C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight window installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 INSTALLATION

A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E 2112.

B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weather-tight construction.

C. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.

D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

### 3.03 ADJUSTING, CLEANING, AND PROTECTION

A. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weather-tight closure.

B. Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

1. Keep protective films and coverings in place until final cleaning.

C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

D. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written instructions.

END OF SECTION

**SECTION 08710**

**DOOR HARDWARE**

PARAGRAPH INDEX

**SECTION 08710**

**DOOR HARDWARE**

## PART 1 - GENERAL

1.01 DESCRIPTION

A. The Contractor shall provide all labor, materials, equipment, and services necessary to install all door hardware as shown on the drawings and as specified herein.

1.02 SUMMARY

A. This Section includes items known commercially as finish or door hardware that are required for swing, sliding, and folding doors, except special types of unique hardware specified in the same sections as the doors and door frames on which they are installed.

B. This Section includes the following:

1. Hinges.

2. Lock cylinders and keys.

3. Lock and latch sets.

4. Bolts.

5. Closers.

6. Protection plates.

7. Weatherstripping for exterior doors.

8. Thresholds.

9. Stops

C. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 8 Section “Steel Doors and Frames”.

1.03 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification sections.

B. Product data including manufacturers' technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.

C. Final hardware schedule coordinated with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Final Hardware Schedule Content: Based on hardware indicated, organize schedule into "hardware sets" indicating complete designations of every item required for each door or opening. Include the following information:

a. Type, style, function, size, and finish of each hardware item.
b. Name and manufacturer of each item.
c. Fastenings and other pertinent information.
d. Location of each hardware set cross referenced to indications on Drawings both on floor plans and in door and frame schedule.
e. Explanation of all abbreviations, symbols, and codes contained in schedule.
f. Mounting locations for hardware.
g. Door and frame sizes and materials.
h. Keying information.

2. Keying Schedule: Submit separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks has been fulfilled.

D. Templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

1.04 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from a single manufacturer.

B. Supplier Qualifications: A recognized architectural door hardware supplier, with warehousing facilities in the Project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that employs an experienced architectural hardware consultant (AHC) who is available to Owner, Engineer, and Contractor, at reasonable times during the course of the Work, for consultation.

1. Require supplier to meet with Owner to finalize keying requirements and to obtain final instructions in writing.

C. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by UL, Warnock Hersey, FM, or other testing and inspecting organization acceptable to authorities having jurisdiction for use on types and sizes of doors indicated in compliance with requirements of fire-rated door and door frame labels.

1.05 PRODUCT HANDLING

A. Tag each item or package separately with identification related to final hardware schedule, and include basic installation instructions with each item or package.

B. Packaging of door hardware is responsibility of supplier. As material is received by hardware supplier from various manufacturers, sort and repackage in containers clearly marked with appropriate hardware set number to match set numbers of approved hardware schedule. Two or more identical sets may be packed in same container.

C. Inventory door hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.

D. Deliver individually packaged door hardware items promptly to place of installation (shop or Project site). General Contractor to coordinate delivery of necessary hardware pieces and sets to door manufacturer.

E. Provide secure lock-up for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable so that completion of the Work will not be delayed by hardware losses both before and after installation.

1.06 MAINTENANCE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

## PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

1. Butts and Hinges:

a. Hager Hinge Co.
b. McKinney Products Co.
c. Stanley Hardware, Div. Stanley Works.

2. Cylinders and Locks:

a. Corbin-Russwin.

3. Bolts:

a. Hager Hinge Co.
b. H. B. Ives, A Harrow Company.
c. Stanley Hardware, Div. Stanley Works.

4. Overhead Closers:

a. Corbin & Russwin Architectural Hardware, Div. Black & Decker Corp.
b. LCN, Div. Ingersoll-Rand Door Hardware Group.
c. Norton Door Controls, Div. Yale Security Inc.

5. Kick, Mop, and Armor Plates:

a. Baldwin Hardware Corp.
b. H. B. Ives, A Harrow Company.

6. Door Stripping and Seals:

a. Reese Enterprises, Inc.
b. Zero International, Inc.

7. Thresholds:

a. Reese Enterprises, Inc.
b. Zero International, Inc.

2.02 SCHEDULED HARDWARE

A. Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of finish hardware are indicated in the "Hardware Schedule" at the end of this Section. Products are identified by using hardware designation numbers of the following:

1. Manufacturer's Product Designations: The product designation and name of one manufacturer are listed for each hardware type required for the purpose of establishing minimum requirements. Provide either the product designated or, where more than one manufacturer is specified under the Article

"Manufacturers" in Part 2 for each hardware type, the comparable product of one of the other manufacturers that complies with requirements.

## 2.03 MATERIALS AND FABRICATION

A. Manufacturer's Name Plate: Do not use manufacturers' products that have manufacturer's name or trade name displayed in a visible location (omit removable nameplates) except in conjunction with required fire-rated labels and as otherwise acceptable to Engineer.

1. Manufacturer's identification will be permitted on rim of lock cylinders only.

B. Base Metals: Produce hardware units of basic metal and forming method indicated using manufacturer's standard metal alloy, composition, temper, and hardness, but in no case of lesser (commercially recognized) quality than specified for applicable hardware units for finish designations indicated.

C. Fasteners: Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. Do not provide hardware that has been prepared for self-tapping sheet metal screws, except as specifically indicated.

D. Furnish screws for installation with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including "prepared for paint" surfaces to receive painted finish.

E. Provide concealed fasteners for hardware units that are exposed when door is closed except to the extent no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless their use is the only means of reinforcing the work adequately to fasten the hardware securely. Where thru-bolts are used as a means of reinforcing the work, provide sleeves for each thru-bolt or use sex screw fasteners.

## 2.04 HINGES, BUTTS, AND PIVOTS

A. Templates: Provide only template-produced units.

B. Screws: Provide Phillips flat-head screws complying with the following requirements:

1. For fiberglass doors and frames install machine screws into drilled and tapped holes.

2. For fire-rated fiberglass doors install #12 x 32-mm, threaded-to-the-head steel wood screws.

3. Finish screw heads to match surface of hinges or pivots.

C. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:

1. Out-Swing Exterior Doors: Nonremovable pins.

2. Interior Doors: Nonrising pins.

3. Tips: Flat button and matching plug, finished to match leaves, except where hospital tip (HT) indicated.

D. Number of Hinges: Provide number of hinges indicated but not less than 3 hinges per door leaf for doors 7' – 4" or less in height and one additional hinge for each 30 inches of additional height.

1. Fire-Rated Doors: Not less than 3 hinges per door leaf for doors 7' 0" or less in height with same rule for additional hinges.

2.05 LOCK CYLINDERS AND KEYING

A. Review the keying system with the Owner and provide the type required (master, grandmaster or great-grandmaster), integrated with Owner's existing system.

B. Equip locks with cylinders for interchangeable-core pin tumbler inserts. Furnish only temporary inserts for the construction period, and remove these when directed.

1. Furnish final cores and keys as directed by Owner.

C. Metals: Construct lock cylinder parts from brass or bronze, stainless steel, or nickel silver.

D. Comply with Owner's instructions for masterkeying and, except as otherwise indicated, provide individual change key for each lock that is not designated to be keyed alike with a group of related locks.

1. Permanently inscribe each key with number of lock that identifies cylinder manufacturer's key symbol, and notation, "DO NOT DUPLICATE."

E. Key Material: Provide keys of nickel silver only.

F. Key Quantity: Furnish 3 change keys for each lock.

1. Furnish one extra blank for each lock.

2. Deliver keys to Owner.

2.06 LOCKS, LATCHES, AND BOLTS

A. Strikes: Provide manufacturer's standard wrought box strike for each latch or lock bolt, with curved lip extended to protect frame, finished to match hardware set, unless otherwise indicated.

B. Lock Throw: Provide 16-mm (5/8 inch) minimum throw of latch on pairs of doors. Comply with UL requirements for throw of bolts and latch bolts on rated fire openings.

1. Provide 13-mm (1/2 inch ) minimum throw of latch for other bored and preassembled types of locks and 19-mm (3/4 inch) minimum throw of latch for mortise locks. Provide 25-mm (1 inch) minimum throw for all dead bolts.

C. Flush Bolt Heads: Minimum of 13-mm (1/2 inch)-diameter rods of brass, bronze, or stainless steel with minimum 300-mm(12 inch) long rod for doors up to 2100 mm (7 feet) in height. Provide longer rods as necessary for doors exceeding 2100 mm (7 feet) in height.

D. Exit Device Dogging: Except on fire-rated doors where closers are provided on doors equipped with exit devices, equip the units with keyed dogging device to keep the latch bolt retracted, when engaged.

2.07 PUSH/PULL UNITS

A. Exposed Fasteners: Provide manufacturer's standard exposed fasteners for installation, thru-bolted for matched pairs but not for single units.

2.08 CLOSERS AND DOOR CONTROL DEVICES

A. Size of Units: Except as otherwise specifically indicated, comply with the manufacturer's recommendations for size of door control unit depending on size of door, exposure to weather, and anticipated frequency of use.

1. Where parallel arms are indicated for closers, provide closer unit one size larger than recommended for use with standard arms.

2. Provide parallel arms for all overhead closers, except as otherwise indicated.

2.09 WEATHERSTRIPPING AND SEALS

A. General: Provide continuous weatherstripping on exterior doors and smoke, light, or sound seals on interior doors where indicated or scheduled. Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

B. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strip is easily replaceable and readily available from stocks maintained by manufacturer.

C. Weatherstripping at Jambs and Heads: Provide bumper-type resilient insert and metal retainer strips, surface applied unless shown as mortised or semimortised, and of following metal, finish, and resilient bumper material:

1. Extruded aluminum with color anodized finish as selected from manufacturer's standard color range, 1.6-mm (1.8 inch) minimum thickness of main walls and flanges.

2. Solid neoprene conforming to MIL R 6855, Class II, Grade 40.

a. Flexible, hollow bulb or loop insert.

2.10 THRESHOLDS

A. General: Except as otherwise indicated, provide standard metal threshold unit of type, size, and profile as shown or scheduled.

1. For out-swinging doors provide rabbeted type units with replaceable weatherstrip insert in stop.

2.11 HARDWARE FINISHES

B. Match items to the manufacturer's standard color and texture finish for the latch and lock sets (or push-pull units if no latch or lock sets).

C. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.

D. Provide protective lacquer coating on all exposed hardware finishes of brass, bronze, and aluminum, except as otherwise indicated. The suffix "-NL" is used with standard finish designations to indicate "no lacquer."

E. The designations used in schedules and elsewhere to indicate hardware finishes are the industry-recognized standard commercial finishes, except as otherwise noted.

1. Rust-Resistant Finish: For iron and steel base metal required for exterior work provide 0.005-mm-thick copper coating on base metal before applying brass, bronze, nickel, or chromium plated finishes.

**PART 3 - EXECUTION**

3.01 INSTALLATION

A. Mount hardware units at heights indicated in following applicable publications, except as specifically indicated or required to comply with governing regulations and except as otherwise directed by Engineer.

1. "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute.

2. NWWDA Industry Standard I.S.1.7, "Hardware Locations for Wood Flush Doors."

B. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Where cutting and fitting is required to install hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation or application of surface protection with finishing work specified in the Division 9 Sections. Do not install surface-mounted items until finishes have been completed on the substrates involved.

C. Set units level, plumb, and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

D. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

E. Set thresholds for exterior doors in full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements specified in Division 7 Section "Joint Sealants."

F. Weatherstripping and Seals: Comply with manufacturer's instructions and recommendations to the extent installation requirements are not otherwise indicated.

3.02 ADJUSTING, CLEANING, AND DEMONSTRATING

A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate freely and smoothly or as intended for the application made.

1. Where door hardware is installed more than one month prior to acceptance or occupancy of a space or area, return to the installation during the week prior to acceptance or occupancy and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

B. Clean adjacent surfaces soiled by hardware installation.

C. Instruct Owner's personnel in the proper adjustment and maintenance of door hardware and hardware finishes.

D. Six-Month Adjustment: Approximately six months after the date of Substantial Completion, the Installer, accompanied by representatives of the manufacturers of

latchsets and locksets and of door control devices, and of other major hardware suppliers, shall return to the Project to perform the following work:

1. Examine and re-adjust each item of door hardware as necessary to restore function of doors and hardware to comply with specified requirements.

2. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures.

3. Replace hardware items that have deteriorated or failed due to faulty design, materials, or installation of hardware units.

4. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware.

3.03 HARDWARE SCHEDULE

A. General: Provide hardware for each door to comply with requirements of Section "Door Hardware," hardware set numbers indicated in door schedule, and in the following schedule of hardware sets.

1. Hardware sets indicate quantity, item, manufacturer and product designation, size, and finish or color, as applicable.

HW-1 Doors 2-101, 2-102,

| | | |
|---|---|---|
| 1 ½ pair | Butt Hinges | Stanley FBB 199, 4 ½" x 4 ½", NRP, US32D |
| 1 each | Exit Device | Corbin Russwin ED 5200 Panic, US32D |
| 1 each | Cylinder | 6 pin cylinder |
| 1 set | Weatherstripping | Reese DS78C |
| 1 each | Kickplate | 8" x 32" x US32D |
| 1 each | Door Bottom Sweep | Reese DB591AU |
| 1 each | Threshold | Reese FBR 555 |
| 1 each | Overhd. Stop/Holder | Glyn-Johnson 81-4-H-US32D |

HW-2 Doors 3-101

| | | |
|---|---|---|
| 1 each | Exit Device | Corbin Russwin ED5600 Mortise Type, US32D |
| 1 each | Trim with Cylinder | Corbin Russwin Newport N9 Lever, US32D |
| 1 each | Closer | LCN 4040, US32D |
| 1 each | Overhd. Stop/Holder | Glynn-Johnson 81-4-H-US32D |
| 1 set | Surface Bolts | Ives SB453, US 26D |

HW-3 Doors 3-102

| | | |
|---|---|---|
| 1 ½ pair | Butt Hinges | Stanley FBB 199, 4 ½" x 4 ½", NRP, US32D |
| 1 each | Mortise Lock | Corbin Russwin ML2051 HS, US32D |
| 1 each | Cylinder | 6 pin cylinder |
| 1 each | Kickplate | 8" x 32" x US32D |
| 1 each | Wall Stop & Holder | Ives WS 245 x US26D |

HW-4 Doors 3-103

| | | |
|---|---|---|
| 1 ½ pair | Butt Hinges | Stanley FBB 199, 4 ½" x 4 ½", NRP, US32D |
| 1 each | Cylinder Lock | Corbin Russwin CL3320 w. Newport Lever, US32D |
| 1 each | Kickplate | 8" x 32" x US32D |
| 1 each | Wall Stop & Holder | Ives WS 245 x US26D |

| | | |
|---|---|---|
| HW-5 | Doors 3-104 | |
| 1 each | Exit Device | Corbin Russwin ED5200, US32D |
| 1 each | Trim with Cylinder | Corbin Russwin Newport N9, US32D |

**END OF SECTION**

**SECTION 08800**

**GLAZING**

PARAGRAPH INDEX

# SECTION 08800

# GLAZING

## 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. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Windows.
2. Doors.

### 1.03 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. Interspace: Space between lites of an insulating-glass unit.

### 1.04 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

### 1.05 SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.

1. Insulating glass.

C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

D. Qualification Data: For installers.

E. Product Certificates: For glass and glazing products, from manufacturer.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for insulating glass and glazing sealants.

1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.

G. Warranties: Sample of special warranties.

## 1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved by coated-glass manufacturer.

B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

E. Source Limitations for Glass: Obtain insulating glass from single source from single manufacturer for each glass type.

F. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

G. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: GANA's "Laminated Glazing Reference Manual" and GANA's "Glazing Manual."
2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

H. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or the manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

I. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

J. Preinstallation Conference: Conduct conference at Project site.

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review temporary protection requirements for glazing during and after installation.

## 1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with insulating-glass manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

## 1.08 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F.

1.09 WARRANTY

A. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form in which laminated-glass manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: Five years from date of Substantial Completion.

B. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: Ten years from date of Substantial Completion.

**PART 2 - PRODUCTS**

2.01 GLASS PRODUCTS, GENERAL

A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.

1. Minimum Glass Thickness for Exterior Lites: Not less than ¼ inch.
2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.

B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass as needed. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass as needed. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.

C. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites ¼ inch thick.

2. For laminated-glass lites, properties are based on products of construction indicated.
3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

## 2.02 GLASS PRODUCTS

A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.

B. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
2. For uncoated glass, comply with requirements for Condition A.
3. For coated vision glass, comply with requirements for Condition C (other coated glass).

C. Uncoated Tinted Float Glass: Class 2, complying with other requirements specified.

1. Products: Subject to compliance with requirements, provide the following:

   a. Pilkington Optifloat Grey Tint as outer pane in insulated glass.

2. Tint Color: Gray.
3. Visible Light Transmittance: 44 percent minimum for single pane.

## 2.03 LAMINATED GLASS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Pilkington.
2. PPG

B. Laminated Glass: ASTM C 1172, and complying with testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.

1. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written recommendations.
2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
3. Interlayer Color: Clear unless otherwise indicated.

C. Glass: Comply with applicable requirements in "Glass Products" Article as indicated by designations in "Laminated-Glass Types" Article.

## 2.04 INSULATING GLASS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Pilkington
2. PPG

B. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified.

1. Sealing System: Dual seal, with manufacturer's standard primary and secondary.
2. Spacer: Manufacturer's standard spacer material and construction.
3. Desiccant: Molecular sieve or silica gel, or blend of both.

C. Glass: Comply with applicable requirements in "Glass Products" Article and in "Laminated Glass" Article as indicated by designations in "Insulating-Glass Types" Article[ and in "Insulating-Laminated-Glass Types" Article.

## 2.05 GLAZING GASKETS

A. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned neoprene or thermoplastic polyolefin rubber gaskets complying with ASTM C 509, Type II, black; of profile and hardness required to maintain watertight seal.

1. Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.

## 2.06 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

G. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

## 2.07 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

C. Grind smooth and polish exposed glass edges and corners.

## 2.08 LAMINATED-GLASS TYPES

A. Glass Type: Clear laminated glass with two plies of float glass.

1. Thickness of Each Glass Ply: 1/8 inch.
2. Interlayer Thickness: 0.030 inches.
3. Provide safety glazing labeling.

## 2.09 INSULATING-LAMINATED-GLASS TYPES

A. Glass Type: Low-e-coated, tinted, insulating laminated glass.

1. Overall Unit Thickness: 1 inch (25 mm).
2. Outdoor Lite: Tinted laminated glass with two plies of float glass.

a. Thickness of Each Glass Ply: 1/8 inch.
b. Interlayer Thickness: 0.030 inches.

3. Interspace Content: Air.
4. Indoor Lite: Tinted fully tempered float glass.
5. Low-E Coating: Pyrolytic or sputtered on third surface.
6. Visible Light Transmittance: 36 percent minimum.
7. Winter Nighttime U-Factor: 0.33 maximum.
8. Summer Daytime U-Factor: 0.33 maximum.
9. Solar Heat Gain Coefficient: 0.40 maximum.
10. Provide safety glazing labeling.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep systems.
3. Minimum required face and edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

### 3.03 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches.

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

K. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

L. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

## 3.04 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Install gaskets so they protrude past face of glazing stops.

## 3.05 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION

**SECTION 09900**

**PAINTING**

PARAGRAPH INDEX

**SECTION 09900**

**PAINTING**

## PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General Requirements and Supplementary Conditions, apply to this section.

1.02 SUMMARY

A. The Contractor shall provide all labor materials and equipment necessary to furnish a coating system as indicated in drawings and specified herein.

B. Painting shall include the following; surface preparation, primary, 1st coat, 2nd coat, final coat, field and shop coating, curing, and touch up on new and existing materials. Surface preparation and coating shall be according to Steel Structures Painting Council (SSPC).

C. Finished surfaces not to be painted include:

1. Anodized aluminum unless in contact with concrete or grout.

2. Stainless Steel unless in contact with concrete or grout.

3. Chromium Plate unless in contact with concrete or grout.

4. Bronze unless in contact with concrete or grout.

5. Brass unless in contact with concrete or grout.

6. Copper.

7. Similarly Finished Materials.

8. Rubber Materials

9. All aluminum surfaces shall not be coated except when in contact with concrete.

D. Operating parts not to be painted include moving parts of operating equipment such as the following:

1. Valve and damper operators.

2. Linkages.

3. Sensing devices.

4. Motor and fan shafts.

5. Equipment Manufacturer's Labels

E. Unless otherwise indicated, painting is not required on surfaces in concealed areas and inaccessible areas such as foundation space, furred spaces, utility tunnels, pipe space and duct shafts.

F. Labels: Do not paint over Underwriter's Laboratories, Factory Mutual or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

G. Dry well/Pump room floor and equipment bases: Floor and bases receive floor sealant or hardener in accordance with finish schedule at end of Section 09900.

1.03 DEFINITIONS

A. "Paint" includes coating systems materials, primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate, or finish coats.

1.04 QUALITY ASSURANCE

A. Inspection: The Engineer will inspect all materials prior to and following application to ensure compliance with Contract Documents. The Contractor's coating equipment will be inspected by Engineer to verify adequate application of coating on a designated surface.

B. Coatings shall be delivered to site and stored in original containers. The container shall indicate manufacturer's name and coating identification number and shall have unbroken seals.

C. Provide primers and undercoat paint produced by the same manufacturer as the finish coats.

D. Review other sections in which primers are provided to ensure compatibility of the total systems for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers. Notify the Engineer of problems anticipated using the materials specified.

E. Provide the manufacturer's best quality paint material of the various coating types specified. Paint material containers not displaying manufacturer's product identification will not be acceptable.

F. Proprietary names used to designate colors or materials are not intended to imply that products named are required or to exclude equal products of other manufacturers.

G. The use of paint containing lead is prohibited.

H. The color shall be as indicated on Finish Paint Schedule Table 1-1.

I. Paint equipment not furnished with a factory finish, or not finished with an acceptable factory finish, the same color as adjacent surface.

J. The Engineer shall select colors where not indicated or specified with no extra compensation allowed the Contractor for such.

K. Do not place painted items into service until paints and coatings are fully cured (dry-hard).

1.05 SUBMITTALS

Provide the following information in accordance with the General Requirements of the Special Provisions.

A. Shop drawings shall include manufacturer product technical description, catalog number, label analysis, storage and handling, safety data, application instructions, curing instructions, and color chart.

B. Certificate of Compliance shall be submitted for all coatings and primers that the materials furnished meet the requirements of this specification.

C. Submit color swatches for materials to be coated. Such samples shall be standards for finished color on all coatings on the project.

D. Furnish documentation to certify that specific prime coats are recommended by the manufacturer for application with specific intermediate and final coats.

E. Manufacturer shall supply instruction material for repairing surface damage and scratches to coatings.

F. Furnish name, address, and telephone number of manufacturer and local distributor.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the job site in the manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:

1. Product name or title of material.

2. Product description (generic classification or binder type).

3. Federal specification number, if applicable.

4. Manufacturer's stock number and data of manufacture.

5. Contents by volume, for pigment and vehicle constituents.

6. Thinning instructions.

7. Application instructions

8. Color name and number.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain containers used in storage in a clean condition, free of foreign materials and residue.

C. Protect coating from freezing. Ensure measures are taken to protect people and materials from fire and health hazards resulting from handling and application of coatings. Enforce MOSHA requirements.

1.07 JOB CONDITIONS

A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 deg F (10 deg C) and 90 deg F (32 deg C).

B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 deg F (7 deg C) and 95 deg F (35 deg C).

C. Do not apply paint in snow, rain, fog, or mist, or when the relative humidity exceeds 85 percent, or to damp or wet surfaces.

D. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by the manufacturer during application and drying periods.

E. 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 manufactures 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.

F. Painting Factory Finished Items: 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 finished coatings in addition to the prime coating) shall not require repainting in the field unless:

1. Factory finish is unacceptable to the Engineer, that is, not having generic type of paint or proper mil thickness to withstand corrosive atmosphere of a Water Pump Station.

2. Factory finish is damaged.

G. On factory-finished items requiring repainting, first sand existing paint to a dull finish and then repaint in scheduled finish system for the installed location of such factory-finished items.

H. Environmental Requirements:

1. Adhere to manufacturer's data on air and surface temperature limits and relative humidity during application and curing of coatings.

2. Schedule coating work to avoid dust and airborne contaminants.

3. Apply exterior finishes during daylight hours only.

4. When painting must be done in confined spaces, or because of unfavorable ambient conditions, longer drying times will be necessary.

5. Provide supplementary ventilation such as fans and blowers in confined or enclosed areas to carry off solvents during the evaporation stage.

6. Do not spray-apply paint when the wind velocity is above 15 mph.

I. Protection:

1. Protect paint materials before, during and after application.

2. Lay drop cloths in all areas where painting is being done. All adjacent surfaces not being painted shall be carefully protected. Where it becomes necessary to remove previously erected temporary covering placed by other trades, these shall be replaced in a proper manner. In case these coverings cannot be replaced, the work shall be protected in some other satisfactory manner.

3. Concrete floors shall be left in perfect conditions and covered with clean building paper, which shall be kept in place until the entire work has been completed and accepted.

4. Hardware, hardware accessories, plates, lighting fixture, and similar items in place shall be removed prior to painting, or otherwise protected during painting operations, and shall be repositioned upon completion of each space.

5. Clean up or otherwise remedy without additional costs, damage by paint and coatings to public or private property.

6. Provide in-place protection for fully factory finished general construction products, appliances and panels.

**PART 2 - PRODUCTS**

2.01 MANUFACTURERS

Available Manufacturers: Refer to Finish Paint Schedule Table 1.1.

## PART 3 - EXECUTION

3.01 SURFACE PREPARATION

A. Miscellaneous Ferrous Metals:

1. Shop Primed

a. Immediately before paint application, clean 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. Unless directed by the Engineer in writing, all ferrous metals shall be factory primed.

a. Solvent clean in accordance with SSPC SP-1.

b. Before sandblasting, remove weld splatter and grind smooth to a rounded contour sharp edges and welds.

c. Except for insides of pipes, sandblast in accordance with SSPC SP-1O or pickle in accordance with SSPC SP-8.

d. After sandblasting, remove dust and spent sand from surface by brushing or vacuum cleaning.

e. Apply prime coat to prepared metal before surface starts to rust.

3. Not Shop Primed and Non-Submerged. Unless directed by the Engineer in writing, all ferrous metals shall be factory primed.

a. Solvent clean in accordance with SSPC SP-1.

b. Before sandblasting, remove weld splatter and grind smooth to a rounded contour sharp edges and welds.

c. Sandblast in accordance with SSPC SP-6.

d. After sandblasting, remove dust and spent sand from surface by brushing or vacuum cleaning.

e. Apply prime coat to prepared metal before surface starts to rust.

B. Galvanized Metal Including Pipe and Conduits:

1. Solvent Clean in accordance with SSPC SP-1.

2. Remove white rust by hand or power tool cleaning in accordance with SSPC-SP-2 or SP-3. Pretreat with Tnemec 21-1210, Tnemec Grip, or equal.

3. Allow to dry before application of paint.

C. Polyvinyl chloride pipe shall be lightly sanded to remove sheen and clean.

D. Masonry:

1. Allow mortar to cure for 30 days.

2. Clean out cracks and loose mortar, and patch with mortar.

3. Perform work only on cured, dry, and dust-free masonry surfaces.

E. Pipe Insulation:

1. Clean pipe insulation of dirt, dust, or other foreign matter.

F. Mechanical & Electrical Systems:

1. Provide cleaning to remove dirt, dust, or other foreign matter.

2. Solvent clean or otherwise degrease surfaces and exercise care not to damage surfaces.

3. Do not paint light fixtures.

G. Concrete:

1. Remove oil, grease, and dirt by steam cleaning or scrubbing with a strong commercial type of detergent and flushing with water.

2. Neutralize and adequately flush chemical cleaning contaminates.

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.

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 the manufacturer's recommendations nor shall the coverage per gallon exceed the 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 rate 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: 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.

3.03 DRY FILM THICKNESS TESTING

A. Dry-Film thickness measurements shall be taken to ensure specified coating thickness. Provide Dry-Film thickness gages/device manufactured by Mikrotest or ELcometer.

B. Measurements for Testing

Make five separate spot measurements spaced evenly over each 100 sq ft. of area to be measured. The average of the spot measurements shall not be less than the specified thickness. No single spot measurement in any 100 sq ft. area shall be less than 80% of the specified thickness.

C. The Contractor shall give the Engineer a minimum of 5 days written notice for specified dry-film thickness testing and inspection. Contractor shall provide sketch and table indicating number of thickness tests and location.

3.04 FINISH SCHEDULE

A. The paint systems specified in Table 1.1 are acceptable options. The following paint systems are intended to include items to be painted at the job site. Any item not specifically named in Table 1.1, but obviously required to be painted, shall be painted in accordance with the system selected by the Engineer, or otherwise painted as directed by the Engineer.

B. Refer to the Finish Paint Schedule Table, Table 1.1, following this Section: 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 Engineer.

**END OF SECTION**

| FINISH PAINT SCHEDULE TABLE 1.1 | | | | |
|---|---|---|---|---|
| **Item** | **Items to be Painted** | **TNEMEC** | **CARBOLINE** | **Finish Color (Remarks)** |
| 1 | Misc. Interior Ferrous Metals: Vents, drain pipes, structural steel, roof supports, metal piping, etc. | One coat Series 394 Perimeprime @ 2.5 - 3.5 mils DFT.. Two coats Series V-69 Hi-Build Epoxoline II @ 4-6 mils DFT per coat. | One coat Carbozinc 859 @ 3-5 mils DFT. Two coats Carboguard 691 @ 8 – 10 mils DFT per coat. | To be selected by Owner. |
| 2 | Valve handwheels, valve extension shafts, pump shafting | One coat Series 394 Periimeprime @ 2.5 - 3.5 mils DFT.. Two coats Series V-69 Hi-Build Epoxoline II @ 4-6 mils DFT per coat. | One coat Carbozinc 859 @ 3-5 mils DFT. Two coats Carboguard 691 @ 8 – 10 mils DFT per coat. | O.S.H.A. Safety Red |
| 3 | Electrical Conduit | One coat Series 394 Perimeprime @ 2.5 – 3 mils DFT. Two coats Series 1029 Enduratone @ 2 -3 mils DFT per coat. | One coat Carbocrylic 3356 @ 3 mils DFT. Two coats Carbocrylic 3359 @ 2 mils DFT per coat. | Black |
| 4 | Water Pipes | One coat Series 394 Perimeprime @ 2.5 – 3.5 mils DFT. Two coats Series L-140 Pota-Pox Plus @ 4 – 6 mils DFT per coat. | One coat Carbozinc 859 @ 3-5 mils DFT. Two coats Carboguard 691 @ 8 – 10 mils DFT per coat. | Light Blue |
| 5 | Concrete Masonry Unit (Interior only) | One coat Series 130 Enviro-Fill at 70-80 sq. ft. per gal. Two coats Series 113 Hi-Build Tneme Tuf-Coat at 4-6 mils DFT per coat. | One coat Sanitile 100 Filler @ 12 mils DFT. Two coats Sanitile 155 @ 2 – 3 mils DFT per coat. | White |
| 6 | Concrete Surfaces: Walls, ceilings and floors, wet wells, sumps, etc. | Two coats Series 617 WB Conformal Stain @ 125 - 200 sq. ft. per gallon per coat | Note 1 | White (Floors and Equipment bases shall be gray). |
| 7 | Concrete Storage Boxes | Two coats Series 113 Hi-Build Tneme Tuf-Coat at 4-6 mils DFT per coat. | Two coats Sanitile 155 @ 2 – 3 mils DFT per coat. | White |
| 8 | Pumps, Motors, Ventilation Fans, Heaters, etc. (ferrous metals only) | One coat Series 394 Perimeprime @ 2.5 - 3.5 mils DFT.. Two coats Series V-69 Hi-Build Epoxoline II @ 6-8 mils DFT per coat. | One coat Carbozinc 859 @ 3-5 mils DFT. Two coats Carboguard 691 @ 8 – 10 mils DFT per coat | Gray |
| 9 | Exterior Ferrous Metals | One coat Series 394 Perimeprime @ 2.5 - 3.5 mils DFT. One coat Series V-69 Hi-Build Epoxoline II @ 6-8 mils DFT per coat. One coat 1029 Enduratone @ 2-3 mils DFT. | One coat Carbozinc 859 @ 3-5 mils DFT. One coat Carboguard 691 @ 8 – 10 mils DFT per coat. One coat Carbocrylic 3359 @ 2 mils DFT. | To be selected by Owner. |

Note 1: Two coats Sherwin Williams H & C Shield-Plus - Ultra Acrylic Concrete Stain @ 150 – 250 sq. ft. per gallon per coat may be used for this item.

**SECTION 10200**

**LOUVERS AND VENTS**

PARAGRAPH INDEX

**SECTION 10200**

**LOUVERS AND VENTS**

## PART 1 - GENERAL

1.01 DESCRIPTION

A. The Contractor shall provide all labor, materials, equipment, and services necessary to install all louvers and vents as shown on the drawings and as specified herein.

1.02 SUMMARY

A. This Section includes the following:

1. Fixed louvers.

1.03 DEFINITIONS

A. Louver Terminology: Refer to Air Movement and Control Association (AMCA) 501 for definitions of terms for metal louvers not otherwise defined in this Section or in referenced standards.

1.04 PERFORMANCE REQUIREMENTS

A. Structural Performance: Engineer, fabricate, and install exterior metal wall louvers to withstand the effects of loads and stresses from wind and normal thermal movement without evidencing permanent deformation of louver components including blades, frames, and supports; noise or metal fatigue caused by louver blade rattle or flutter; or permanent damage to fasteners and anchors.

1. Wind Load: Uniform pressure (velocity pressure) of 20 psf , acting inwards or outwards.

2. Normal thermal movement is defined as that resulting from the following maximum change (range) in ambient temperature. Base design calculations on actual surface temperatures of metals due to both solar heat gain and nighttime sky heat loss.

B. Temperature Change (Range): 133 deg F.

C. Air-Performance, Water-Penetration, and Air-Leakage Ratings: Provide louvers complying with performance requirements indicated as demonstrated by testing manufacturer's stock units of height and width indicated. Test units according to AMCA 500.

1. Perform water-penetration testing on louvers without screens.

2. Equivalent Air-Performance Ratings: Louvers having less free area than that specified or having a lower free area velocity at the static pressure loss specified may be considered for the Work provided their total air performance is equivalent to that specified. The burden of proof of equivalency is on the Contractor. For louvers to be considered equivalent, the product of their free area, for the size specified, and their free area velocity at the static pressure loss specified must be at least equal to the product of the specified free area and velocity.

1.05 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each type of product specified.

C. Shop drawings of louver units and accessories. Include plans, elevations, sections, and details showing profiles, angles, and spacing of louver blades; unit dimensions related to wall openings and construction; free areas for each size indicated; profiles of frames at jambs, heads, and sills; and anchorage details and locations.

D. Samples for initial selection in the form of manufacturer's color charts showing the full range of colors available for units with factory-applied color finishes.

E. Product test reports evidencing compliance of units with performance requirements indicated.

F. Product certificates signed by louver manufacturers certifying that their products comply with the specified requirements and are licensed to bear the AMCA seal based on tests made according to AMCA 500 and complying with the AMCA Certified Ratings Program.

G. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience.

1.06 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain louvers and vents from one source and by a single manufacturer where alike in one or more respects regarding type, design, and factory-applied color finish.

B. Welding Standards: Comply with applicable provisions of D1.2 "Structural Welding Code--Aluminum," and D1.3 "Structural Welding Code--Sheet Steel."

C. SMACNA Standard: Comply with SMACNA "Architectural Sheet Metal Manual" recommendations for fabrication, construction details, and installation procedures.

1.07 PROJECT CONDITIONS

A. Field Measurements: Check actual louver openings by accurate field measurements before fabrication, and show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Coordinate construction to ensure that actual opening dimensions correspond to established dimensions.

**PART 2 - PRODUCTS**

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

1. Fixed Louvers:

a. American Warming and Ventilating, Inc.
b. Construction Specialties, Inc.
c. Greenheck Fan Corporation.

2.02 MATERIALS

A. Aluminum Extrusions: ASTM B 221M, Alloy 6063-T5 or T-52.

B. Aluminum Sheet: ASTM B 209M, Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer to produce required finish.

C. Fasteners: Of same basic metal and alloy as fastened metal or 300 series stainless steel, unless otherwise indicated. Do not use metals that are corrosive or incompatible with joined materials.

1. Use types and sizes to suit unit installation conditions.

2. Use Phillips flat-head screws for exposed fasteners, unless otherwise indicated.

D. Anchors and Inserts: Of type, size, and material required for type of loading and installation indicated. Use nonferrous metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or expansion bolt devices for drilled-in-place anchors.

E. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12 except containing no asbestos fibers (complying with ASTM D1187).

2.03 FABRICATION

A. General: Fabricate louvers and vents to comply with requirements indicated for design, dimensions, materials, joinery, and performance.

B. Assemble louvers in shop to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

C. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.

D. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances of louvers, adjoining construction, and perimeter sealant joints.

E. Include supports, anchorages, and accessories required for complete assembly.

F. Provide vertical mullions of type and at spacings indicated but not more than recommended by manufacturer, or 6 ft. o.c., whichever is less. At horizontal joints between louver units, provide horizontal mullions except where continuous vertical assemblies are indicated.

G. Provide sill extensions and loose sills made of same material as louvers where indicated or required for drainage to exterior and to prevent water penetrating to interior.

H. Join frame members to one another and to fixed louver blades as follows, unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary:

1. With fillet welds, concealed from view; or mechanical fasteners; or a combination of these methods; as standard with louver manufacturer.

2.04 FIXED, EXTRUDED ALUMINUM LOUVERS

A. Horizontal, Drainable-Blade Louver

1. Basis-of-Design Product: Subject to compliance with requirements, provide Greenheck Model ESD-603 or comparable product by one of the following:

a. Airolite Company, LLC (The).
b. American Warming and Ventilating, Inc.; a Mestek company.

c. Construction Specialties, Inc.

2. Louver Depth: 6 inches.

3. Frame and Blade Nominal Thickness: Not less than 0.080 inch (2.03 mm).

4. Mullion Type: Exposed.

5. Louver Performance Ratings:

a. Free Area: Not less than 8.30 sq. ft. for 48-inch-wide by 48-inch-high louver.
b. Point of Beginning Water Penetration: Not more than 1027 fpm.
c. Air Performance: Not more than 0.15-inch wg static pressure drop at 1000 FPM free-area velocity.

6. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

7. Calculations are based on Greenheck Model ESD-603.

2.05 LOUVER SCREENS

A. General: Provide each exterior louver with louver screens complying with the following requirements:

1. Screen Location for Fixed Louvers: Interior face, unless otherwise indicated.

2. Screening Type: Insect screening, unless otherwise indicated.

B. Secure screens to louver frames with stainless-steel machine screws, spaced 6 inches maximum from each corner and at 12 inches o.c. between.

C. Louver Screen Frames: Fabricate screen frames with mitered corners to louver sizes indicated and to comply with the following requirements:

1. Metal: Same kind and form of metal as indicated for louver frames to which screens are attached.

a. Reinforce extruded-aluminum screen frames at corners with clips.

2. Finish: Mill finish, unless otherwise indicated.

3. Type: Rewireable frames with a driven spline or insert for securing screen mesh.

D. Louver Screening for Aluminum Louvers: Fit aluminum louver screen frames with screening covering louver openings and complying with the following requirements:

1. Insect Screening: 1.4 mm x 1.6 mm (18-inch x 16-inch) mesh, 0.30 mm (0.012-inch) diameter aluminum wire.

2.06 FINISHES, GENERAL

A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designating finishes.

B. Finish louvers after assembly.

2.07 ALUMINUM FINISHES

A. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.

B. High-Performance Organic Coating Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's instructions.

1. Fluoropolymer 2-Coat Coating System: Manufacturer's standard 2-coat, thermocured system composed of specially formulated inhibitive primer, fluoropolymer color coat, with color coat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605.

2. Color and Gloss: As selected by Owner’s Representative from manufacturer’s full range.

**PART 3 - EXECUTION**

3.01 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.02 INSTALLATION

A. Locate and place louver units plumb, level, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Repair finishes damaged by cutting, welding, soldering, and grinding operations required for fitting and jointing. Restore finishes so there is no evidence of corrective work. Return items that cannot be refinished in the field to the shop, make required alterations, and refinish entire unit, or provide new units.

F. Protect galvanized- and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.

G. Install concealed gaskets, flashings, joint fillers, and insulation, as louver installation progresses, where required to make louver joints weathertight. Comply with Division 7 Section "Joint Sealants" for sealants applied during installation of louver.

3.03 ADJUSTING AND PROTECTION

A. Protect louvers and vents from damage of any kind during construction period including use of temporary protective coverings where needed and approved by louver manufacturer. Remove protective covering at time of Substantial Completion.

B. Restore louvers and vents damaged during installation and construction period, so that no evidence remains of correction work. If results of restoration are unsuccessful, as judged by Engineer, remove damaged units and replace with new units.

1. Clean and touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

C. Test operation of adjustable wall louvers and adjust as needed to produce fully functioning units that comply with requirements.

3.04 CLEANING

A. Periodically clean exposed surfaces of louvers and vents that are not protected by temporary covering to remove fingerprints and soil during construction period. Do not let soil accumulate until final cleaning.

B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Rinse surfaces thoroughly and dry.

C. Restore louvers damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, remove damaged units and replace with new units.

1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

**END OF SECTION**

**SECTION 10425**

**SIGNS**

PARAGRAPH INDEX

**SECTION 10425**

**SIGNS**

## 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 the following types of signs:

1. Panel signs.

2. Safety Signs.

1.03 SUBMITTALS

A. General: Submit the following according to the General Requirements and the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each type of sign specified, including details of construction relative to materials, dimensions of individual components, profiles, and finishes.

C. Shop drawings showing fabrication and erection of signs. Include plans, elevations, and large-scale sections of typical members and other components. Show layout, accessories, and installation details.

1. Provide message list for each sign required, including large-scale details of wording and lettering layout.

2. For signs supported by or anchored to permanent construction, provide setting drawings, templates, and directions for installation of anchor bolts and other anchors to be installed as a unit of Work in other Sections.

D. Samples: Provide the following samples of each sign component for initial selection of color, pattern and surface texture as required and for verification of compliance with requirements indicated.

1. Samples for verification of color, pattern, and texture selected and compliance with requirements indicated:

a. Cast Acrylic Sheet and Plastic Laminate: Provide a sample panel not less than 8-1/2 inches by 11 inches for each material, color, texture, and pattern required. On each panel include a representative sample of the graphic image process required, showing graphic style, and colors and finishes of letters, numbers, and other graphic devices.

b. Aluminum: Samples of each finish type and color, on 6-inch-long sections of extrusions and not less than 4-inch squares of sheet or plate. Where finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.

1.04 QUALITY ASSURANCE

A. Sign Fabricator Qualifications: Firm experienced in producing signs similar to those indicated for this Project, with a record of successful in-service performance, and sufficient production capacity to produce sign units required without causing delay in the Work.

B. Single-Source Responsibility: For each separate sign type required, obtain signs from one source of a single manufacturer.

C. Design Concept: The Drawings indicate sizes, profiles, and dimensional requirements of signs and are based on the specific types.

**PART 2 - PRODUCTS**

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Manufacturers of Panel Signs:

a. ABC Architectural Signing System.
b. APCO Graphics, Inc.
c. ASI Sign Systems, Inc.
d. Mohawk Sign Systems.
e. Or equal.

2.02 MATERIALS

A. Aluminum Extrusions: Provide aluminum extrusions of alloy and temper recommended by the sign manufacturer for the type of use and finish indicated, and with not less than the strength and durability properties specified in ASTM B 221 for 6063-T5.

B. Fasteners: Use concealed fasteners for mounting on Gypsum Wallboard fabricated from metals that are not corrosive to the sign material and mounting surface. Block-wall mounted signs shall utilize 3M double sided black tape (or equivalent)

C. Anchors and Inserts: Use nonferrous metal or hot-dipped galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.03 PANEL SIGNS

A. Panel Signs: Comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.

1. Produce smooth, even, level sign panel surfaces, constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally.

B. Engraved Copy: Machine-engrave letters, numbers, symbols, and other graphic devices into sign panel on the face indicated to produce precisely formed copy, incised to uniform depth. Use high-speed cutters mechanically linked to master templates in a pantographic system or equivalent process capable of producing characters of the style indicated with sharply formed edges.

C. Schedule:

| Location | Text | Pictogram |
|---|---|---|
| 104 | Entrance | - |
| 102 | Office | - |
| 101 | Pump Room | - |
| 103 | Rest Room | Man/Woman |
| | | |

2.04 SAFETY SIGNS

A. Provide signs of fiberglass or plastic.

B. Provide the following safety sign types:

| Text | Location |
|---|---|
| N0N-POTABLE WATER - NOT SUITABLE FOR DRINKING | At all Hose Bibbs. Wall mount or chain to bibb as appropriate |
| FIRE EXTINGUISHER | At each fire extinguisher |

2.05 FINISHES

A. Colors and Surface Textures: For exposed sign material that requires selection of materials with integral or applied colors, surface textures or other characteristics related to appearance, provide color matches indicated, or if not indicated, as selected by the Owner from the manufacturer's standards.

**PART 3 - EXECUTION**

3.01 INSTALLATION

A. General: Locate sign units and accessories where indicated, using mounting methods of the type described and in compliance with the owners instructions. See Section 10425, 2.03 and 2.04.

1. Install signs level, plumb, and at the height indicated, with sign surfaces free from distortion or other defects in appearance.

B. Wall-Mounted Signs: Attach panel signs to wall surfaces using the methods indicated below:

1. Vinyl-Tape Mounting: Use 3M double-sided black tape #4432 or equivalent along entire sign perimeter to mount signs to CMU surfaces.

3.02 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to the manufacturer's instructions. Protect units from damage until acceptance by the Owner.

**END OF SECTION**

**SECTION 10800**

**TOILET AND BATH ACCESSORIES**

PARAGRAPH INDEX

**SECTION 10800**

**TOILET AND BATH ACCESSORIES**

## PART 1 - GENERAL

1.01 DESCRIPTION

A. The Contractor shall provide all labor, materials, equipment and services necessary to install all toilet accessories as shown on the drawings and as specified herein.

1.02 SUMMARY

A. This Section includes toilet and bath accessory items as scheduled.

1.03 SUBMITTALS

A. General: Submit the following according to Conditions of Contract and Division 1 Specifications Sections.

B. Product data for each toilet accessory item specified, including construction details relative to materials, dimensions, gages, profiles, mounting method, specified options, and finishes.

C. Schedule indicating types, quantities, sizes, and installation locations (by room) for each toilet accessory item to be provided for project.

D. Setting drawings where cutouts are required in other work, including templates, substrate preparation instructions, and directions for preparing cutouts and installing anchorage devices.

E. Maintenance instructions including replaceable parts and service recommendations.

1.04 QUALITY ASSURANCE

A. Inserts and Anchorages: Furnish accessory manufacturers' standard inserts and anchoring devices that must be set in concrete or built into masonry. Coordinate delivery with other work to avoid delay.

B. Single-Source Responsibility: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise acceptable to Engineer.

1.05 PROJECT CONDITIONS

A. Coordination: Coordinate accessory locations, installation, and sequencing with other work to avoid interference with and ensure proper installation, operation, adjustment, cleaning, and servicing of toilet accessory items.

1.06 WARRANTY

A. Warranty: Submit a written warranty executed by mirror manufacturer, agreeing to replace any mirrors that develop visible silver spoilage defects within warranty period.

B. Warranty Period: 15 years from date of Substantial Completion.

C. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

**PART 2 - PRODUCTS**

2.01 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering toilet accessories that may be incorporated in the Work include, but are not limited to, the following:

1. Bobrick Washroom Equipment, Inc.

2. American Specialties, Inc.

3. Bradley Corporation.

2.02 MATERIALS, GENERAL

A. Stainless Steel: AISI Type 302/304, with polished No. 4 finish, 0.9 mm (1/32 inch) minimum thickness.

B. Mirror Glass: Nominal 6.0 mm thick, conforming to ASTM C 1036, Type I, Class 1, Quality q2, and with silvering, electro- plated copper coating, and protective organic coating.

C. Galvanized Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.

D. Fasteners: Screws, bolts, and other devices of same material as accessory unit, or of galvanized steel where concealed.

2.03 PAPER TOWEL DISPENSER

A. Surface-Mounted Paper Towel Dispenser: Surface Mounted, Stainless steel with all-welded construction; exposed surfaces shall have satin finish. Door shall be secured to cabinet with a full-length stainless steel piano-hinge and equipped with a tumbler lock keyed like other washroom accessories.

B. Capacity: Unit shall be capable of dispensing 400 C-fold or 525 multifold paper towels, minimum.

2.04 SOAP DISPENSERS

A. Liquid Soap Dispenser, Vertical-Tank Type: Surface-mounted type, minimum 40-oz. (1182.9-ml) capacity tank with stainless-steel piston, springs, and internal parts designed to dispense soap in measured quantity by pump action; and stainless-steel cover with unbreakable window-type refill indicator.

2.05 TOILET TISSUE DISPENSER

A. Double-roll Dispenser, Heavy-duty cast aluminum frame, surface mounted; equip with cycolac ABS spindles and vandal-resistant self-locking mechanisms, and able to accommodate two standard-core tissue rolls up to 4-1/2 inch diameter.

2.06 MIRROR UNITS

A. Stainless Steel Framed Mirror Units: Fabricate frame with channel shapes not less than 1.3 mm (0.05 inch), with square corners mitered, welded, and ground smooth. Provide in No. 4 satin polished finish.

2.07 WASTE RECEPTACLE

A. Waste Receptacle: Stainless steel, 22-gauge, exposed surfaces shall have satin finish.

B. Capacity: 13 gal.

D. Accessory: Vinyl liner, mfr standard for unit specified.

2.08 FABRICATION

A. General: Only a maximum 38 mm (1 ½ inch) diameter, unobtrusive stamped manufacturer logo, as approved by Engineer, is permitted on exposed face of toilet or bath accessory units. On either interior surface not exposed to view or back surface, provide additional identification by either a printed, waterproof label or a stamped nameplate, indicating manufacturer's name and product model number.

B. Surface-Mounted Toilet Accessories, General: Except where otherwise indicated, fabricate units with tight seams and joints, exposed edges rolled. Hang doors or

access panels with continuous stainless steel piano hinge. Provide concealed anchorage wherever possible.

C. Toilet Accessories, General: Except where otherwise indicated, fabricate units of all-welded construction, without mitered corners.

D. Framed Mirror Units, General: Fabricate frames for glass mirror units to accommodate wood, felt, plastic, or other glass edge protection material. Provide mirror backing and support system that will permit rigid, tamperproof glass installation and prevent moisture accumulation, as follows:

1. Provide galvanized-steel backing sheet, not less than 1/32 inch and full mirror size, with nonabsorptive filler material. Corrugated cardboard is not an acceptable filler material.

E. Mirror Unit Hangers: Provide system for mounting mirror units that will permit rigid, tamperproof, and theftproof installation, as follows:

1. One-piece, galvanized-steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.

2. Heavy-duty wall brackets of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.

F. Keys: Provide universal keys for access to toilet accessory units requiring internal access for servicing, resupply, etc. Provide minimum of six keys to Owner's representative.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

A. Install toilet accessory units according to manufacturers' instructions, using fasteners appropriate to substrate as recommended by unit manufacturer. Install units plumb and level, firmly anchored in locations and at heights indicated.

B. Secure mirrors to walls in concealed, tamperproof manner with special hangers, toggle bolts, or screws. Set units plumb, level, and square at locations indicated, according to manufacturer's instructions for type of substrate involved.

### 3.02 ADJUSTING AND CLEANING

A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.

B. Clean and polish all exposed surfaces strictly according to manufacturer's recommendations after removing temporary labels and protective coatings.

3.03 SCHEDULE OF ACCESSORIES

A. Manufacturer: The following catalog numbers refer to products from American Specialties, Inc., and these scheduled products serve as the standard of quality required for this project. Provide these or comparable products from other manufacturers if they meet or exceed this standard of quality.

1. Paper Towel Dispenser: 0210 - Surface-Mounted Paper Towel Dispenser.

2. Soap Dispenser: 0347 – Surface-Mounted Soap Dispenser (40 fl. oz. capacity).

3. Toilet Tissue Dispenser: 0264-1A - surface mounted.

4. Mirror: 0620 - 18 inch x 36 inch framed mirror.

5. Waste Receptacle: 0811 – 13 inch x 13 inch x 22 inch.

**END OF SECTION**

**SECTION 11205**

**FINISHED WATER PUMPING UNIT REHABILITATION**

PARAGRAPH INDEX

## SECTION 11205

## FINISHED WATER PUMPING UNIT REHABILITATION

## PART 1 - GENERAL

1.01 SCOPE

This section describes and identifies the requirements for furnishing all labor, materials, equipment and appurtenances for rehabilitation of the Towson Pumping Station No. 3 Finished Water Pumping Units (Pumping Units).

1.02 DEFINITIONS

A. "As-Found": units currently in use prior to construction contract award. Units that have not be rehabilitated to the full extent of the requirements herein. Units to be tested prior to rehabilitator's work.

B. "As-Left": units rehabilitated to the full extent of the requirements herein. Units to be tested for performance before leaving the rehabilitator's factory or possession.

1.03 SUBMITTALS

Submit the following Shop Drawings in accordance with Section 01900, entitled SPECIAL CONDITIONS:

A. Pump

1. The Contractor shall submit the name and address of the pump manufacturing company (Pump Rehabilitator) that will be responsible for rehabilitating and testing the Pumping Unit for approval.

2. Pump factory performance test curve showing total dynamic head (TDH) versus capacity, pump efficiency vs. capacity, and pump horsepower vs. capacity at the lowest observed operating speed measured in revolutions per minute (RPM).

3. Pump factory performance test results showing TDH, pump efficiency and pump horsepower at the testing speed.

4. Pump factory performance test procedure at least forty five (45) days prior to testing, which includes:

   a. Dimensioned sketch of test rig and pump assembly for test

   b. Description of instrumentation arrangement for measuring flow, pressure and power.

5. Pump casing hydrostatic test results.

6. Material and Parts list including quantity, nominal sizes and material specification references for all new parts installed for the Pump.

7. Catalog Cuts of new mechanical seals installed on the Pump.

8. Pump inspection report detailing deficiencies found in the Pump. This report shall be submitted and approved prior to doing any repair work to the pump. Inspection report shall include measured dimensions of the pump rotating assembly, bearings and wear rings.

9. Pump and motor alignment criteria and final alignment readings in the field.

B. Pump Motor - New

1. Motor nameplate data submitted in accordance with NEMA Standard MG-1 and including the following:

   c. manufacturer's name and machine serial number

   d. output

   e. time rating

   f. temperature rise

   g. speed (rpm)at full load

   h. voltage, frequency, number of phases

   i. full load current

   j. code letter

   k. predicted motor performance data to be submitted:

      i. inrush kVA

      ii. locked rotor amperes

      iii. locked rotor, minimum and breakdown torques

      iv. calculated acceleration time for starting pump and motor

      v. temperature rise at 1.0 service factor

      vi. maximum no load vibrational level (peak to peak, in.)

      vii. guaranteed efficiency at full, 3/4 and 1/2 load as described in latest revision of IEEE Standard No. 112 and NEMA Standard MG-1.

      viii. power factor at 1/2, 3/4 and full load

      ix. motor performance curves, computed over the entire range from zero to full load, shall be prepared and shall provide the following information:

1) speed vs. torque

2) efficiency vs. load

3) saturation

x. Sound pressure levels for the eight octave bands.

xi. Limitations for starting motor.

2. Motor Construction Details

a. Motor outline drawings showing all principal overall dimensions and construction notes.

b. Motor assembly drawings showing in specific detail the construction of the following:

i. Stator and frame with windings and embedded temperature detectors.

ii. Rotor.

iii. Bearing assemblies including details of oil lubrication systems; bearing temperature detectors and installation; shaft current insulation at bearing assemblies. Bearing babbitt composition, alloy numbers and characteristics.

iv. Space heater wattage, location and mounting details.

v. Access covers for bearings, space heaters and bearing temperature detectors.

vi. The shop drawings shall include a bill of material which shall be keyed by numbers to all of the components of the motor identifying them by name and part or catalog number. The drawings shall, in all respect, provide clear, detailed information which shall facilitate the ordering of spare or replacement parts by the Owner.

vii. Drawings shall be full size, approximately 22" x 34", and shall include all required exploded views.

viii. Showing correlated details of the motor connection to the pump shaft, including details of the shaft coupling.

3. Motor Service and Maintenance Details and Information

a. Detailed drawings of shaft-end alignment which shall clearly indicate application areas for dial indicators and other devices for the purpose of shaft and coupling alignment for motor and pump.

b. Detailed drawings and adjustment procedure for motor shaft end play.

c. Complete specification, weight, type, purchasing data, and maintenance recommendations for motor bearing lubrication oil.

4. Catalog cuts of the bearing and winding temperature detection system indicating all features including physical dimensions. Included in this drawing shall be the intended location of embedding for both the pump and motor.

C. Provide Manufacturer's Certificate for the pumping units in accordance with Section 01900, entitled SPECIAL CONDITIONS, indicating that the rehabilitated pumping unit was installed in the field in accordance with Pump Rehabilitator guidelines and Hydraulic Institute Standards, as applicable.

D. Submit Operation and Maintenance Information.

1. Submit complete Manual in accordance with Section 01900, entitled SUBMITTALS for the new pump motor.

2. Submit Lubrication schedules, identifying type and frequency of lubrication for the bearings on the rehabilitated pump.

E. Submit detailed description of the factory pump performance test procedure including location and size of all piping valves, meters; description of all meters, location of all manometer and test connections, calibration certificates and curves for all test equipment and all other appurtenant information. Said items shall be submitted for review at least 30 calendar days prior to the scheduling of the factory witnessed tests.

F. Submit schedule of the specific date and time each manufacturer plans to conduct the pump and the motor shop tests at least 30 calendar days in advance of each test to permit the County to make arrangements to witness the tests.

G. Submit five copies of the certified factory pump and motor test reports including test data and certified curves of pump and motor test performances. Include certification of pump casting hydrostatic test. Include results of all required factory motor noise testing.

H. Pumping Units field testing procedure and field testing results

I. Pumping Unit field vibration results.

1.04 QUALITY ASSURANCE

A. Requirements of Section 15010, entitled GENERAL MECHANICAL REQUIREMENTS, and Section 16050 entitled GENERAL ELECTRICAL shall apply to this section.

B. All work described in this section, including all pump repair and pump factory testing, shall be supplied by a single pump manufacturing company (Pump Rehabilitator) at their testing facility.

C. The County's representative reserves the right to visit the Pump Rehabilitator's facilities during the repair and testing of the Pumping Unit. The County shall be informed of the pump test at least 30 days prior to its occurrence, and reserves the right to send representatives to witness certified performance testing. Factory testing shall be in accordance with the American National Standard for Rotodynamic Pumps for Hydraulic Performance Acceptance Tests, (ANSI/HI 14.6) unless specified otherwise in this Section.

1. Each pump shall be tested at the normal design speed of the job motor. The details of test procedure, dimensioned sketch of test pit and pump assembly for test, and description of instrumentation arrangement for measuring flow, pressure and power shall be furnished to the Engineer for his review minimum 30 days prior to scheduling any tests.

2. Tests shall include flow and TDH characteristics, horsepower requirements, and efficiency over the capacity range from shut-off to the supplemental design TDH. Not less than six points along the curve (to include shutoff, design point and supplemental design point) shall be tested and each point shall be tested twice.

D. The new pumping unit motors shall be supplied by a single motor manufacturer, sub-contracted to the Pump Rehabilitator defined herein. The County's representative reserves the right to visit the motor manufacturing company's facilities during electrical testing of this equipment.

E. Warranty on the rehabilitated pumping unit shall be shall consistent with that provided by the Contractor for the entire contract work as specified in Section 01900.

F. Factory Motor Testing

1. Perform all tests described below on each of the motors being supplied under this Contract. Test results from similar motors will not be accepted.

2. Conduct routine tests at the factory as specified in NEMA Standard MG-1 and the latest revision of IEEE Standard No. 112.

3. Certified tests at the factory must be conducted and test reports submitted before the motor will be finally approved. These tests shall be as follows:

a. Insulation resistance

b. Stator resistances - Hot and Cold

c. Measurement of air gap by gage

d. Accelerating time for starting

e. Balance

f. Sound pressure level shall be measured for each motor on a minimum six point hemisphere in accordance with the latest revision of ISO 1680-2 and NEMA Standard MG-3, Sound Level Prediction for Installed Rotating Electrical Machines.

g. Efficiency at full, 3/4 and ½ loads

h. Temperature rise

i. Starting characteristics, including starting torque and current and accelerating torque and current.

j. A speed-torque and speed-current test shall be performed on each motor with results submitted as a plot of torque and current against speed.

k. Conduct and record all tests in accordance with the latest revisions of the following standards.

   i. IEEE Standard No. 43, Recommended Practice for Testing Insulation Resistance of Rotating Machinery.

   ii. IEEE Standard No. 112, Test Procedure for Polyphase Induction Motors and Generators

1.05 NAMEPLATE/OEM INFORMATION

For reference purposes, the following is nameplate and/or original equipment manufacturer (OEM) information available for the existing Pumping Units:

In general, the pumps are centrifugal, horizontal suction, horizontal discharge, single stage, double suction, type. Motors are medium voltage, horizontal, induction type.

**PUMPS E & F**

| **Parameter/Description** | **Value - PUMP E** | **Value - PUMP F** |
|---|---|---|
| Manufacturer | Delaval Turbine Inc – Trenton NJ | Delaval Turbine Inc – Trenton NJ |
| Serial #. | 703307 | 708209 |
| Frame Type | P 18 16 | P 18 16 |
| GPM | 9000 | 9000 |
| Total Head | 125 | 125 |
| Speed | 880 | 880 |

**MOTORS E & F**

| Parameter/Description | Value – MOTOR E | Value – MOTOR F |
|---|---|---|
| Manufacturer | General Electric | General Electric |
| Line | Custom 8000 - Induction Motor | Custom 8000 - Induction Motor |
| Capacity (Hp) | 350 | 350 |
| Volts | 2400 | 2400 |
| Phase / Cycle (Hz) | 3 / 60 | 3 / 60 |
| Full Load Amps (FLA) | 78 | 78 |
| Temperature Rise (°C) | 40 | 40 |
| Speed (RPM) | 880 | 880 |
| Type | K | K |
| Frame | 82888 | 82888 |
| Time Rating | Continuous | Continuous |
| Service Factor | 1.15 | 1.15 |
| Code | F | F |
| Maint. Instructions | GEH 3160 | GEH 3160 |
| Oil Lubrication | | |
| Model # | 5K8288446A21 | 5K8288446A21 |
| Serial # | LA8358110 | LA8358109 |

**PUMP G**

| Parameter/Description | Value – PUMP G |
|---|---|
| Manufacturer | Goulds Pumps - Seneca Falls, NY |
| Type | 20 x 24 300V |
| Material Construction | BF |
| Impeller Diameter (inch) | 26.75 |
| Model | 3420 |
| RPM | 900 |
| Head ( ft) | 125 |
| GPM | 12000 |
| (Serial No.) | 209C898 |
| | |
| Blank Nameplate | W/MBU.M92070C0I |
| Nameplate on Bearing: | EESCO Pump & Valve Inc. Job No. 24778 |

**MOTOR G**

| Parameter/Description | Value – MOTOR G |
|---|---|

| Parameter/Description | Value – MOTOR G |
|---|---|
| Manufacturer | US Motors |
| Line | The Titan Line |
| Capacity (Hp) | 500 |
| Volts | 2400 |
| Phase / Cycle (Hz) | 3 / 60 |
| Full Load Amps (FLA) | 114 |
| Temperature Rise (°C) | 40 |
| | 30°C Rise at 1.0 SF |
| Speed (RPM) | 885 |
| Type | HS |
| Frame | 6809MS |
| Time Rating | Continuous |
| Service Factor | 1.15 |
| ID# | B 04 20192090-001 R 001 |
| | |
| Separate Nameplate for Oil Lubricated Bearings | |
| Oil Lubricated Bearings | |
| Model # | unknown |
| Serial # | unknown |

1.06 RELATED WORK SPECIFIED ELSEWHERE

A. New power factor correction capacitors and local disconnect for each pump motor shall be installed as indicated on the Drawings and per DIVISION 16.

B. Pump Discharge Cone Valve Rehabilitation work for Pump G only, is specified in Section 15102.

## PART 2 - MATERIALS

2.01 PUMP

A. The rehabilitated pumps shall be capable of operating at the following design point conditions:

| Parameter | PUMPS E & F | PUMP G |
|---|---|---|
| Design TDH (Feet) | 125 | 125 |
| Minimum Capacity at Design TDH (GPM) | 9,000 | 12,000 |
| Minimum Pump Efficiency at Design TDH | TBD (1) | TBD (1) (2) |

| Parameter | PUMPS E & F | PUMP G |
|---|---|---|
| Minimum Pump Operating Head (Run-Out Head) Ft. | 85 | 90 |
| Maximum Pump BHP from Shutoff to Run-Out Head (Hp) | 350 | 500 |
| Rated Pump Speed (RPM) | Full Load Speed of new motor | Full Load Speed of new motor |
| Maximum Pump Speed | 895 | 895 |

TABLE NOTES:

1) Pump Efficiency shall not be any less than that determined by initial As-Found Pump Factory Performance Testing to determine performance baseline.

2) For reference only, per County records Pump G minimum required design point pump efficiency when the pump was first built was 85%, Minimum.

B. The fluid being pumped is finished water with a temperature range of 40 to 70°F.

C. At no operating point on the pump's head versus flow performance curve shall the brake horsepower exceed the associated motor's rated horsepower.

D. New components for the pump shall be supplied with the approval of the Engineer. New components shall be of the same materials of construction as the existing components or better. Pump components to be replaced shall be as follows:

1. Shaft sleeves
2. Bearings (Thrust and Guide)
3. Impeller and Casing Wear Rings
4. Bolting Hardware and Gaskets
5. Mechanical Seals
6. Lip seals
7. Flexible Couplings

E. Other existing pump parts (not listed above) identified by the inspection report as needing to be replaced or repaired will be evaluated by the Engineer. In the event that the Engineer concurs with the recommendations of the report, such repair or replacement of other parts shall be paid for as extra (contingent) work to the Contract. Contingent items as defined in Specification Section 01025 include:

1. Pump Casing Machining
2. Impeller Reconstruction
3. Replacement of Pump Shaft
4. Replacement of Pump Impeller

F. Each Pump Bearing Housing shall be prepared for RTD installation, as specified herein.

G. Each pump impeller shall be machine balanced in accordance with ISO 1940/1, G 6.3.

H. Pumping Unit Baseplate – Pump Rehabilitator shall inspect the pump baseplate and determine what modifications, if any, are required to support the new motor and rehabilitated pumping unit. For bidding purposes, Pump Rehabilitator shall assume that the existing baseplate motor mounts can not be used as is and must be relocated on the baseplate.

I. Rehabilitation vendors shall be Flowserve, Kennedy Industries, Xylem Inc., or Fairbanks Nijhuis.

2.02 PUMP MOTOR - NEW

A. The motors shall be the horizontal, quiet running, alternating current squirrel cage induction type of premium efficiency and shall be built and tested in accordance with the latest version of NEMA Standard MG-1 and all other standards specified herein.

B. The motors shall be designed for operation in a damp environment and for use with horizontal, centrifugal type water pumps. The motor manufacturer shall coordinate with the manufacturer of the pumps furnished to ascertain the actual $WR^2$, the torque requirements for starting and for normal running and mounting dimensions.

C. Motor Rating

1. Voltage - 2300 volts, for operation in a nominal 2400 volt, 3 phase, 60 hertz, power circuit
2. Motor Starter Type - Pumps E &F

   Motor shall be Invertor Duty rated, and fully capable of being started and powered with any of the following types of motor starters:

   a. Full Voltage Across-the-Line type starter
   b. Reduced Voltage Solid State (RVSS)
   c. Variable Frequency Drive (VFD).

3. Motor Starter Type - Pump G only

   Motor shall be rated, and fully capable of being started and powered by the following types of motor starters:

   a. Full Voltage Across-the-Line type starter,

   b. Reduced Solid State starter (RVSS).

4. Sizes – 350 (Pumps E & F) and 500 (Pump G) horsepower

5. Time Rating: Continuous duty

6. Nominal full load Speed 880 rpm

7. Insulation - Class F

8. Temperature Rise - 80°C over 40°C ambient, at nameplate rated horsepower.

9. Service factor - 1.15

10. Minimum Guaranteed Efficiency, per IEEE Standard No. 112 Method B:

| | E & F (350 HP) | G (500 HP) |
|---|---|---|
| Full Load | 94.2% | 94.5% |
| 3/4 Load | 93.7% | 94.0% |
| ½ Load | 93.2% | 93.5% |

11. Motor Power Factor, Minimum:

| | E & F (350 HP) | G (500 HP) |
|---|---|---|
| Full Load | 79% | 81% |
| 3/4 Load | 75% | 78% |
| ½ Load | 67% | 69% |

    Note: Power Factor After Correction: Minimum 91, Maximum 93 percent, from ½ Load to Full Load. See Division 16 Specifications for Power Factor Correction Capacitors.

12. Locked rotor, pull-in and pull-out torque shall not be less than those specified in NEMA Standard MG-1 and shall be as required by the pump.

13. Number of starts per hour shall be in accordance with NEMA Standard MG-1. Provide nameplate on motor identifying starting limitations.

14. Overload and short-circuit requirements shall be in accordance with the latest revisions of ANSI Standards.

15. Balance of motor shall not exceed a maximum amplitude of 0.0015 inches and shall be measured in accordance with NEMA Standard MG-1.

16. Direction of rotation shall be as required by the pump. Direction of rotation shall be verified in respect to phase rotation.

17. The sound level shall be measured in accordance with the latest revisions of NEMA MG-3 “Sound Level Prediction for Installed Rotating Electrical Machines” and ISO 168-2, "Test Procedure for Airborne Sound Measurements on Rotating Electric Machinery". Measurements shall be made with motor running at no load, at rated speed and at rated line voltage. The measurements shall be made with the microphone at six evenly spaced points around the circumference of the motor, five feet from the motor and at four feet above the motor base and one measurement shall be made five feet atop the motor base and one measurement shall be made five feet atop the motor center. A frequency analysis shall be made for each measurement point using an octave-band analyzer, and center frequency sound pressure levels shall not exceed the following:

| Center Frequency (Hertz) | Sound Pressure Level (dB) |
|---|---|
| 62 | 85 |
| 125 | 84 |
| 250 | 84 |
| 500 | 82 |
| 1000 | 81 |
| 2000 | 79 |
| 4000 | 77 |
| 8000 | 74 |

18. If any measured sound pressure levels exceed the above-specified limits, the motor manufacturer shall take all necessary corrective measures and shall retest the motor (s) at no additional cost to the County.

D. Enclosure/Frame

1. The enclosure for each motor shall be type WP-1.

   a. A WP-1, (weather protected Type I) machine is an open machine with its ventilating passages constructed to minimize the entrance of rain, snow, and air-borne particles to the electric parts. Its ventilation openings are also constructed to prevent the passage of a cylindrical rod 0.75” in diameter.

2. The enclosure shall be of cast iron or welded plate construction and shall be designed to support the weight of the motor and shaft.

3. Each motor shall be self-ventilated; the enclosure shall have a sufficient number of generously sized openings to provide adequate ventilation throughout the motors. Ventilation air discharged shall be upward, from the top or sides of the unit. Motors shall be suitable for continuous operation with an ambient air temperature of 40°C.

4. The enclosure shall be provided with readily removable access covers to facilitate inspection and maintenance of bearings and space heaters.

5. The motor frame shall be cast iron construction, constructed to a NEMA standard frame size.

6. Embedded stator temperature detectors shall be provided as specified hereinafter. Provide a terminal box on the exterior of the enclosure to provide a point to disconnect and to identify all temperature detector wiring.

E. Space Heaters

A minimum of one strip heater shall be installed in the interior of each motor for the purpose of maintaining an interior temperature above ambient to prevent the accumulation of moisture within the motor during periods of shutdown. Individual conductors from each heater terminal shall be brought out to a terminal strip in an external terminal connection box. The strip heaters shall be suitable for 120 volt, single phase, 60 Hz and sized as required for this duty.

F. Temperature Detectors

1. RTD's shall be provided for the motor stator and bearings as specified herein.

G. Rotors

1. The rotor shall be capable of operating at 125% of rated speed in either direction of rotation.

2. Screw jacks with retracted position locking safety, or equal, integral with the motor enclosure shall be provided for lifting and supporting the rotor for maintenance on or removal of bearings and other assemblies.

3. Rotor blocking for shipping shall be provided.

H. Shafts

1. The motor shaft shall be solid 1040 type carbon steel, machined and polished.

2. The shaft shall be prepared to accommodate one-half coupling provided with the pump, as specified herein.

3. The motor shaft flange shall be match marked and this match-marking shall be correlated with the match-marking on the pump shaft flange.

4. Shaft end play and rotor float for each motor shall be in accordance with NEMA Standard MG-1.

I. Bearings

1. Each motor shall be provided with two bearings. The bearings shall be split sleeve type designed and constructed for full load 24 hours per day duty. The bearings shall be ring oil lubricated. The design of the lubrication system shall be such that the temperature of bearings shall not exceed 90 °C given an ambient temperature of 40 °C.

J. Boxes

1. All connection and terminal boxes shall be located on the exterior of the motor frame where shown on the Drawings with an orientation keyed to the location of the motor stator, motor main leads, connection box.

2. The motor main stator winding shall be brought out of the stator into a removable connection box.

3. The connection box shall be sized to provide adequate interior capacity to conveniently contain the stator leads.

4. The motor stator leads, shall have identification tags of brass with stamped characters or engraved, laminated plastic.

5. The exterior of the motor stator frame shall be provided with a connection box for each of the following services:

   a. Stator Temperature Detectors

   b. Inboard Bearing Temperature Detector

   c. Outboard Bearing Temperature Detector

   d. Motor Space Heater

6. Combinations, or pairing of the above service may be grouped in single boxes where advantageous, to reduce the total number of boxes and permit a more orderly approach of the conduits and conductors serving the boxes.

7. Each box shall be provided with terminal strips to permit rapid disconnect and positive identification of each conductor.

8. The cover of each box shall have an engraved, laminated plastic nameplate identifying the service, or services, in the box.

K. The following lists acceptable motor manufacturers which may meet these motor specification requirements. Proposed motor selections are subject to approval by the Engineer:

1. U. S. Electrical Motors

2. Siemens Energy and Automation, Inc.

3. Reliance Electric Company

4. Toshiba International Corporation

5. General Electric Company

6. Baldor Electric Company (ABB)

7. Hyundai Ideal Electric and Manufacturing Company

2.03 SIZE OF REHABILITATED PUMPING UNITS

Due to existing pump station building structural constraints, the maximum permissible length for the rehabilitated pumping unit, measured from the outboard motor bearing to the pump discharge centerline, cannot exceed that of the existing installation. Contractor shall measure and record this dimension prior to the start of any pumping unit demolition activity.

2.04 SHAFT COUPLINGS

A. Shaft couplings shall be provided for each pumping unit. The motor end of the shaft shall be provided with forged or cast steel limited end float gear type flexible coupling. The product shall be of The Falk Rexnord Corporation, the "Fast" coupling of Kop-Flex Industries, or other approved equal.

B. One-half of the coupling shall be firmly fixed and keyed to the pump shaft with the other half similarly secured to the motor shaft. The method of connecting the coupling halves shall be as such to permit a slight angular and/or parallel misalignment of the connected shafts without imposing any strain upon the adjacent bearings. The amount of allowable misalignment shall be clearly identified by the coupling manufacturer.

C. The ends of the bolts and nuts shall be recessed beneath the surface or otherwise surrounded so as to satisfy all requirements of safety in operation. The couplings shall be finished and polished all over and both the inside faces and outside perimeters shall be turned and ground to exact dimensions

to facilitate the checking of the alignment of the connected shafts. The couplings shall be placed as close as possible to the pump and motor bearings so as to make compactly arranged units.

D. Couplings shall be built as to comply with OSHA safety regulation 1910.219(i)(2), detailing their construction and placement relative to the shaft.

E. Galvanized steel mesh screen shaft guards shall be provided all around the coupling and exposed shafting as required to meet OSHA regulations and as indicated in the Drawings. Screen guards shall be easily removable for coupling maintenance.

2.05 MECHANICAL SEALS

A. Mechanical Seals

1. Split Mechanical seal shall be comprised of four component parts, two rotating halves and two stationary halves, for ease of assembly and installation. All seal faces shall be constructed of silicon carbide. For pumped media seal lubrication, provide a 316 stainless steel bushing capable of solids rejection while letting liquid pass.

2. The split mechanical seal shall be the Chesterton Model 442, split mechanical Seal with SpiralTrac bushing Version D, Type A. No substitutions shall be permitted.

2.06 TEMPERATURE DETECTION SYSTEMS

A. Each pump and motor bearing shall be provided with resistance temperature detectors, RTDs, each of which will be connected to a digital motor protection relay; one per pumping unit for pump and motor RTDs, located at the existing 2.4 kV Motor Control Center.

B. The stator in each motor shall be provided with six (6) RTDs, two per phase, all of which shall be connected to the same digital motor protection relay located in the 2.4 kV Motor Control Center.

C. All RTD's shall be:

1. 3-wire nickel construction, rated for 120 ohms at 0°C.

2. manufactured by MINCO Products, or equal.

D. Bearings

1. RTDs shall be designed to be embedded in the pump and motor bearings.

2. Units for the radial bearings shall be the tip sensitive type. RTDs for the thrust bearing shall be miniature tip embedded type. The metal of the bearings and mountings shall be drilled, milled and tapped so as to place the sensitive detector tips at the hottest points of the bearings and within 1/8 inch of the babbitt, for the sleeve guide bearings, and within 1/16 inch of the babbitt for the thrust bearings shoes. Installation shall be in accordance with the recommendations of the RTD manufacturer.

E. Motor Stators

1. RTDs shall be suitable in all respects for placement in the motor stator by the motor manufacturer.

2. Suitable accessories and associated hardware to include holders, head connection and seals shall be provided to enable the complete mounting of each RTD in accordance with the manufacturer's recommendations.

2.07 FACTORY FINISH

A. The exterior of each Pump and baseplate, shall be prepared and factory primed per Section 09900, entitled PAINTING.

B. The interior casing of each Pump shall be primed and finish coated with an NSF Standard 61 approved (for contact with potable water) epoxy coating system.

C. Each Pump Motor shall be prime coated inside and outside plus factory finished with the manufacturer's standard heat-resistant enamel coating system.

2.08 SPARE PARTS

A. The following spare parts shall be furnished, one for each size of finished water pumping unit or motor (unless otherwise noted) and shall be delivered by the Contractor to the Baltimore City DPW Pumping Section Maintenance Facility, identified in Section 01900, entitled Special Conditions:

<u>PUMPS E & F</u>

1. Pump Spare Parts (for each pump):

a. One Mechanical Seal Assembly

b. One set of inboard and outboard bearings (Total-4 bearings)

c. Six months supply of lubricating oil,

d. One container coupling grease

2. Motor Spare Parts (for each motor):

   a. One complete set of inboard and outboard seals (Total-4 seals)

   b. One set of inboard and outboard bearing liners (Total-4 bearing liners)

   c. Six months supply of lubricating oil

   d. One oil ring (Total-2)

PUMP G

3. Pump Spare Parts:

   a. One Mechanical Seal Assembly.

   b. One set of inboard and outboard bearings

   c. Six-month supply of lubricating oil,

   d. One container coupling grease

## PART 3 - EXECUTION

### 3.01 STATION OPERATIONAL LIMITATIONS

To perform the work described in this section, no more than one pumping unit in Pumping Station No. 3 may be out of service at any time without prior written permission from the County. For additional construction sequencing parameters, see Specification Section 01010.

### 3.02 PUMP REHABILITATION

A. The Contractor shall disassemble and visually inspect the pump at the pumping station, documenting any unusual conditions discovered during initial disassembly and prior to any transport or repair work. If any exceptions are noted then the Contractor shall submit an initial inspection report to the Engineer.

B. The Contractor shall remove each Main Pumping Unit from the Pumping Station, and be responsible for transporting the pump to and from the Pump Rehabilitator's facility. This includes the pump, the pump's baseplate, and any accessories. The existing pump motor is to be demolished as indicated in the Drawings.

C. Work at the Pump Rehabilitator's facility shall include, but not be limited to:

1. Provide certified factory performance testing of the delivered (As-Found) pumping unit to establish a pump performance baseline.

2. Disassemble and visually inspect all pump components. Measure and record all machine fits including: bearings, couplings, sleeves, etc..

Measure and record pump impeller diameter and number of vanes. Note all materials of construction of the various parts.

3. Submit a factory inspection report, which documents the existing (As-Found) disassembled pump conditions and recommends all work required and replacement parts needed to ensure that the rehabilitated pump is acceptable for use in all aspects.

4. Supply new pump components as identified in the Engineer approved "As Found" inspection report, to allow the pump to operate properly. Reassemble pump and provide new oil for bearings as required. Record type of oil used for record purposes.

5. Provide Factory applied coating systems to the interior and exterior as indicated in this Section and approved by the Engineer.

6. Provide a certified factory performance test of the repaired (As-Left) pumping unit.

D. Factory Performance Testing

1. Perform certified factory performance tests on the repaired pump in accordance with ANSI/HI 14.6. Test equipment used shall be calibrated and calibration records provided which can be traceable to the National Institute of Standards and Testing (NIST).

2. As-Found test points utilized shall be used to measure pump performance against the As-Left Factory rehabilitated units. As-Found test points shall mirror those used for the As-Left (factory and field) tests. Each point shall be tested at least two times. Tests shall include flow and TDH characteristics, horsepower requirements and efficiency. Test the pump at a minimum of five different operating points, to include:

   a. Shutoff Head

   b. 120% of Design TDH

   c. Design TDH

   d. 80% of Design TDH

   e. Run-out Head

3. As-Found Factory performance tests on all pumps may be tested using a factory supplied driver. As-Left Factory performance tests on all pumps shall be performed using the new job motor.

4. As-Found performance test results shall be documented at the pump's original rated speed (See Name Plate Information). Repaired (As-Left) Factory Performance Tests shall be performed with their

associated new pump motor. Testing results for comparison purposes shall be documented at:

a. the original pump rated speed, to compare with the previous As-Found results, and

b. at the lowest measured operating speed of the new motor and pump, for approval purposes. This lowest measured operating speed shall be considered the full load speed of the motor.

5. Approval of repaired (As-Left) pump test results by the Engineer shall be precedent to shipment of the repaired pump back to the Pumping Station.

6. After pump repairs have been made, should the pump fail to meet the specified performance requirements, the Contractor shall make all necessary modifications to the pump and conduct an entire retest as specified above. All expenses incurred in making these modifications, conducting the retest and expenses of the County's representative witnessing the retest, shall be done at no additional cost to the County.

E. Factory Hydrostatic Testing - All pump casings shall be hydrostatically tested at a pressure equal to 200 psi. Hydrostatic Testing shall be performed prior to the performance testing specified herein.

3.03 PUMP AND MOTOR INSTALLATION

A. The repaired pump and new motor (Rehabilitated Pumping unit) shall be installed at the Pumping Station by the Contractor with assistance from the Pump Rehabilitator, via a factory trained and certified field startup technician.

B. Installation shall follow Pump Rehabilitator recommendations, and the guidance in "Rotodynamic (Centrifugal) Pumps for Manuals Describing Installation Operation and Maintenance" (ANSI/HI 1.4).

C. Set baseplate assembly on prepared foundation. Allow 3/4" to 1-1/2" gap between pump baseplate and top of foundation for final grouting. Support level baseplate with metal blocks, or shims.

D. Provide drain piping from the pumping unit baseplate, routed to nearest floor drain. See Section 15060.

E. Check the intermediate pump coupling and pump motor coupling parallel and angular alignments. Alignment criteria shall be defined by either the original pump manufacturer or the Pump Rehabilitator. This criteria shall be

obtained, submitted, approved by the Engineer and followed by the Contractor.

F. Use dial indicators or laser type devices to provide an accurate final alignment. Submit final readings to the Engineer for approval when coupling alignment checks are made.

G. When alignment is correct, secure the pump and motor to the baseplate.

H. Fill pump and motor bearings with lubricating oil as recommended by the pump repair and the motor manufacturer, as applicable.

I. Reconnect station piping to the pumping unit and verify the alignment of the pump and motor. Repeat the alignment procedure if necessary.

J. After field testing of the pumping units is complete and the pump has operated for a minimum of seventy-five (75) hours, a final alignment and doweling of the pump and motor to the baseplate shall be done.

K. Connect motor space heaters and protect the motors from dust and other construction debris before and after installation. Contractor shall hire a qualified motor repair outfit to clean the motors at no additional cost to the County, if in the opinion of the County, motors are subjected to dust and construction debris.

L. If at any time, the pumping unit's baseplate is cut or torch burned during the installation in the field, then this is cause for rejection of the pumping unit by the County.

3.04 FIELD TESTING

A. The Contractor shall procure and pay for the services of an independent pumping unit testing agency, approved by the Engineer, to determine if the installed pump functioning as specified and is performing as anticipated based upon documented factory test results.

1. The Contractor shall submit the testing agency's field test procedure prior to the start of testing and all testing results when all field testing is completed.

B. Field testing shall include but not be limited to:

1. Functional testing of the pumping unit and the pump discharge cone valve operation to determine that all normal startup, shutdown, emergency shutdown and incomplete PCS valve sequence equipment operations and durations are acceptable.

2. Performance testing of each pumping unit to determine if its performance is consistent with that documented during factory testing of the repaired pumping unit.

3. Vibrational testing of the pump and motor, which may be performed in parallel with the performance testing.

C. If results of this testing are determined to be unacceptable, the Contractor shall perform all corrective actions as necessary and retest at no additional cost to the Contract.

D. Functional Testing - Pumping Unit

1. Normal Starting and Stopping Sequence - Each Pump shall be started and stopped manually at the station, a minimum of two times each to determine that all control indications are operating normally, the pump discharge cone valve fully opens and closes on startup and shutdown, respectively.

2. Emergency Stopping Sequence - Each Pump shall be emergency stopped once manually at the station, to determine that the pump discharge cone valve properly closes under the fast closure mode.

E. Performance Testing - Pumping Unit

1. Pumping Unit Performance Testing may be done in parallel with functional testing of the pumping unit.

2. The Contractor shall provide calibrated field instrumentation to supplement and be used in conjunction with new and existing permanent instrumentation.

3. The following parameters to be monitored during performance testing include but not be limited to:

   a. Pump Suction Pressure

   b. Pump Discharge Pressure

   c. Pump Flow (from its factory curve)

   d. Pump Speed

   e. Motor Electrical Real and Apparent Power

   f. Motor Current

   g. Motor Voltage

## 3.05 VIBRATION TESTING

A. The Contractor shall procure and pay for the services of an independent vibration testing agency, approved by the Engineer, to determine the vibration spectrum of each pumping unit under actual operating conditions.

B. Vibration testing shall be performed under the following scenarios:

1. As-Found Pumps shall be field tested prior to disassembly and removed to determine baseline standards to be met. Testing shall be coordinated with the Owner to ensure available demand/runtime for each pump.

2. As-Left Pumps shall be field tested following installation and startup.

C. Vibration shall be measured using an accelerometer and data collection unit for each pump and motor bearing, in directions parallel to discharge, perpendicular to discharge and along the centerline axis of the shaft (thrust)

D. Vibration readings will be taken under normal operating conditions, with the pump operating at full load speed, unless otherwise noted by the Engineer.

E. Upon completion of the pumping vibration test monitoring, the testing agency shall submit the following data to the Engineer:

1. Unfiltered RMS Velocity, for each location monitored.

2. A set of velocity vs. frequency graphs for each location monitored. Multiples of pump running speed, from 1 to 20, shall be clearly indicated on these graphs.

3. The pumping unit shall meet all requirements and limits of the American National Standard for Rotodynamic Pumps for Vibration Measurement and Allowable Values (ANSI/HI 9.6.4).

4. Vibrations beyond the limits of the standard shall be corrected by the Contractor, and the pumping unit shall be entirely retested for vibration at no additional cost to the Owner.

F. As-Left Pumps shall not exceed any of the aforementioned parameters as compared to initial pump station testing of the As-Found Pumps in order to receive final approval.

3.06 FIELD FINISH

A. The Pumping units shall be field finished per Section 09900, entitled PAINTING, including the pump, and pump baseplate.

B. The new pump motor shall be field finish touched up as required, based on motor manufacturer recommendations.

END OF SECTION

**SECTION 11210**

**FINISHED WATER PUMPING UNITS**

PARAGRAPH INDEX

## SECTION 11210

## FINISHED WATER PUMPING UNITS

## PART 1 - GENERAL

1.01 SCOPE

This section covers the requirements for furnishing all labor, materials, equipment and appurtenances for the complete and satisfactory installation of the finished water pumping units as shown on the Drawings and as required for a complete installation as specified. Two units total will be installed in Pumping Station No. 2 to replace Pump Nos. C and D.

1.02 SUBMITTALS

A. Submit the following Shop Drawings in accordance with Section 01900, entitled SPECIAL CONDITIONS:

1. Performance curve of the pump showing total dynamic head (TDH) versus capacity, net positive suction head required (NPSHR) versus capacity, pump efficiency vs. capacity and horsepower vs. capacity at the anticipated operating speed. Pump and motor inertia ($WR^2$) values.

2. Cross section of the pump with individual components identified and positions and sizes of pipe taps indicated. The shop drawings shall be large size, approximately 22" x 34", and shall include all required exploded views. Shop drawings shall include a bill of material which shall be keyed by numbers to all components of the pump identifying them by name and part or catalog number. The drawings shall, in all respects, provide clear, detailed information which shall facilitate the ordering of spare or replacement parts.

3. Materials lists, including material specification references.

4. Dimensioned assembly drawing of the pump and motor with weights of major sub-assemblies indicated.

5. Detail of shaft coupling including maximum allowable angular and parallel misalignment.

6. Maximum vibration of the pump and motor, measured as specified hereinafter.

7. Maximum temperature of pump and motor bearings, measured by the bearing temperature sensors specified hereinafter.

8. Computations of L-10 bearing life, showing all factors for the pumps and motors.

9. Motor nameplate data submitted in accordance with NEMA Standard MG-1 and including the following:

   a. manufacturer's name and machine serial number

   b. output

   c. time rating

   d. temperature rise

   e. rpm at full load

   f. voltage, frequency, number of phases

   g. full load current

   h. code letter

   i. Predicted motor performance data to be submitted

      i. inrush kVA

      ii. locked rotor amperes

      iii. locked rotor, minimum and breakdown torques

      iv. acceleration time for starting pump and motor

      v. temperature rise at 1.0 service factor

      vi. maximum no load vibrational level (peak to peak, in.)

      vii. guaranteed efficiency at full, 3/4 and 1/2 load as described in latest revision of IEEE Standard No. 112 and NEMA Standard MG-1.

      viii. power factor at 1/2, 3/4 and full load

      ix. motor performance curves, computed over the entire range from zero to full load, shall be prepared and shall provide the following information:

         1) speed vs. torque

         2) efficiency vs. load

         3) saturation

      x. Sound pressure levels for the eight octave bands.

      xi. Allowable Starts per Hour.

10. Motor Construction Details

   a. Motor outline drawings showing all principal overall dimensions and construction notes.

   b. Motor cross-section and detail drawings showing in specific detail the construction of the following:

i. Stator and frame with windings and embedded temperature detectors.

ii. Rotor.

iii. Bearing assemblies including details of oil lubrication systems; bearing temperature detectors and installation; shaft current insulation at bearing assemblies. Bearing babbitt composition, alloy numbers and characteristics.

iv. Space heater wattage, location and mounting details.

v. Access covers for bearings, space heaters and bearing temperature detectors.

vi. The shop drawings shall include a bill of material which shall be keyed by numbers to all of the components of the motor identifying them by name and part or catalog number. The drawings shall, in all respect, provide clear, detailed information which shall facilitate the ordering of spare or replacement parts by the Owner.

vii. Drawings shall be full size, approximately 22" x 34", and shall include all required exploded views.

viii. Showing correlated details of the motor connection to the pump shaft, including details of the shaft coupling.

11. Motor Service and Maintenance Details and Information

    a. Detailed drawings of shaft-end alignment which shall clearly indicate application areas for dial indicators and other devices for the purpose of shaft and coupling alignment for motor and pump.

    b. Detailed drawings and adjustment procedure for motor shaft end play.

    c. Complete specification, weight, type, purchasing data, and maintenance recommendations for motor bearing lubrication oil.

12. Thrust bearing load capability and pump thrust requirements.

13. Catalog cuts of the bearing and winding temperature detection system indicating all features including physical dimensions. Included in this drawing shall be the intended location of embedding for both the pump and motor.

14. Designs, design criteria and computations for the pump and motor bedplate and the anchoring of the bedplate to the concrete foundation to demonstrate compliance with the specified requirements. The

designs and computations shall be reviewed for adequacy and completeness and shall be signed and sealed by a professional engineer.

15. Designs, design criteria and computations for the pump feet to demonstrate compliance with the specified requirement. The designs and computations shall be reviewed for adequacy and completeness and shall be signed and sealed by a professional engineer.

B. Provide two Manufacturer's Certificates; one for the pumps and one for the motors indicating installation was in accordance with manufacturer recommendations in accordance with Section 01900, entitled SPECIAL CONDITIONS.

C. Submit Operation and Maintenance Manuals in accordance with Section 01900, entitled SUBMITTALS.

D. Submit detailed description of the factory pump test procedure including location and size of all piping valves, meters; description of all meters, location of all manometer and test connections, calibration certificates and curves for all test equipment and all other appurtenant information. Said items shall be submitted for review at least 30 calendar days prior to the scheduling of the factory witnessed tests.

E. Submit schedule of the specific date and time each manufacturer plans to conduct the pump and the motor shop tests at least 30 calendar days in advance of each test to permit the County to make arrangements to witness the tests.

F. Submit the certified factory pump and motor test reports including test data and certified curves of pump and motor test performances. Include certification of pump casting hydrostatic test. Include results of all required factory motor noise testing.

G. Pumping Units field testing procedure and field testing results

H. Pumping Unit field vibration results.

1.03 QUALITY ASSURANCE

A. General

1. This section includes provisions for two finished water pumping units.

2. Unless otherwise specified herein, starters, H-O-A switches, pushbuttons, and other electrical devices shall be specified and

provided under DIVISION 16 of the specifications, and shall be arranged as shown on the electrical drawings.

3. All pumps shall be of the same manufacturer. Pumps of the same nominal capacity shall be of the same model and shall be identical except rotation. Each pump and motor unit shall be the single responsibility of the pump manufacturer. Motors shall be of the same manufacturer. Motors of the same capacity shall be identical.

4. All pumping units shall be manufactured at a facility which is at the time of Contract award, registered and in conformance with ISO 9001, Quality Systems, Model for Quality Assurance in Design/Development, Production, Installation, and Servicing.

5. The Contractor shall correct any item or equipment that fails to meet any overall specified performance requirements at no additional cost to the Owner.

6. Perform factory pump tests and submit certified test reports as hereinafter specified. The County's representative reserves the right to visit the pump and the motor manufacturers' plants during fabrication and assembly. The County shall be informed of each test at least three weeks prior to its occurrence and reserves the right to send representatives to witness certified performance tests at each (pump and motor) factory. All units shall be tested during the same trip. Factory pump tests shall be in accordance with the American National Standard for Rotodynamic (Centrifugal and Vertical) Pump Tests (ANSI/HI 14.6).

B. MATERIALS IN CONTACT WITH FINISHED (POTABLE) WATER

1. Components manufactured from bronze or brass alloys with have a high zinc content, (> 6% composition), shall not be utilized where the component is in regular or continuous contact with potable water. This provision is to prevent a process called ‘dezincification’ which weakens components over time.

2. Components, component surfaces or coatings over component surfaces, as applicable, in regular or continuous contact with potable water shall be certified or listed as NSF 61, shall have documentation included with its shop drawing submittal that the material has been tested and meets this standard.

3. Pipe, pipe fittings, plumbing fittings and plumbing fixtures shall be “leadfree” as per the Safe Water Drinking Act (SDWA), where such products shall meet a weighted average lead content of no greater than 0.25 percent as indicated in the SDWA.

C. Pumps

1. Perform certified shop performance tests on each of the pumps in the plant of the manufacturer in accordance with the American National Standard for Centrifugal Pump Tests, except as modified herein. Each pump shall be tested at the normal design speed of the job motor. The details of test procedure, dimensioned sketch of test pit and pump assembly for test, and description of instrumentation arrangement for measuring flow, pressure and power shall be furnished to the Engineer for his review minimum 30 days prior to scheduling any tests. Flow measurement shall be made with a venturi type flow tube and U-tube manometer or precision differential pressure transducer. The use of magnetic flow meters will not be acceptable.

2. All certified pump tests shall be conducted at the specified full speed. The results of reduced speed testing will not be acceptable. Tests shall include flow and TDH characteristics, horsepower requirements, and efficiency over the capacity range from shut-off to the supplemental design TDH. Not less than six points along the curve (to include shutoff, design point and supplemental design point) shall be tested and each point shall be tested three times. Each pump shall be tested and readings recorded at six operating points from shutoff to supplementary point TDH and this procedure shall be repeated two additional times so as to provide three tests at each point. A test of the net positive suction head required (NPSHR) at the supplementary point TDH shall also be performed. It shall be the manufacturer's responsibility to provide a testing facility with adequate NPSHA at the supplemental point flow rate to insure an adequate demonstration of the pump NPSHR.

3. Each pump shall be tested with its job motor. The job motors used for factory tests, shall be identified such that the motor/pump pair tested in the factory is installed as a pair in the field. Test results shall be submitted to the Engineer and shall include tabulated data and results plotted as head versus capacity, pump efficiency versus capacity, brake horsepower versus capacity and NPSHR at the supplemental TDH. The results of all performance testing shall be submitted, and be evaluated, at the actual factory test full load speed. No correction to specified nominal operating speed shall be performed. Approval of results shall be precedent to shipment of pumps.

4. Should the pump fail to meet the specified performance requirements, the manufacturer shall make all necessary modifications to the units and shall conduct all additional shop certified tests necessary, to ensure full compliance with the specified requirements. All expenses incurred in making the modification and in conducting such additional shop certified tests, to include additional costs associated

with witnessing of the test by County representatives, shall be borne by the Contractor at no additional cost to the County.

5. Prior to commencement of the capacity tests, each pump and motor shall be run for 30 minutes at the design point TDH. During that 30 minute period, test area ambient temperature, all bearing temperatures (pump and motor) and motor stator temperatures shall be recorded in 15 minute intervals. All temperatures shall be measured with the job supplied RTDs. Pump manufacturer shall provide instrumentation to read the job supplied RTDs. Bearing temperatures shall continue to be recorded at 15 minute intervals throughout the pump performance testing.

6. All pump casings shall be hydrostatically tested at a pressure equal to twice the design head TDH, or one and one-half times the shutoff head whichever is greater. Certification by the manufacturer shall be furnished that hydrostatic tests in conformity with these specifications have been performed.

7. As soon as possible after completion of the pump tests, submit to the Engineer certified curves and data sheets of the test results. Approval of the test results shall be precedent to shipment of pumps.

D. Motors

1. Perform all tests described below on each of the motors being supplied under this Contract. Test results from similar motors will not be accepted.

2. Conduct routine tests at the factory as specified in NEMA Standard MG-1 and the latest revision of IEEE Standard No. 112.

3. Certified tests at the factory must be conducted and test reports submitted before the motor will be finally approved. These tests shall be as follows:

   a. Insulation resistance

   b. Stator resistances - Hot and Cold

   c. Balance

   d. Sound pressure level shall be designed and calculated for each motor on a minimum six point hemisphere in accordance with the latest revision of ISO 1680-2 and NEMA Standard MG-3, Sound Level Prediction for Installed Rotating Electrical Machines.

   e. Efficiency at full, 3/4 and ½ loads

   f. Temperature rise

g. Starting characteristics, including starting torque and current and accelerating torque and current.

h. Conduct and record all tests in accordance with the latest revisions of the following standards.

i. IEEE Standard No. 43, Recommended Practice for Testing Insulation Resistance of Rotating Machinery.

ii. IEEE Standard No. 112, Test Procedure for Polyphase Induction Motors and Generators

4. Certified design calculations shall be submitted with factory test reports prior to final approval. The following calculations based on design data shall be provided:

a. Measurement of air gap by gage

b. Accelerating time for starting

c. A speed-torque and speed-current test shall be performed on each motor with results submitted as a plot of torque and current against speed.

5. The Contractor is required to provide proofs of design by the pump manufacturer for the anchoring system, the pump and motor bedplate, and the pump feet. If any of these designs cannot be provided or are deemed unacceptable by the County, the Contractor shall furnish and install suction and discharge pipe anchors for each pump as designed by the Engineer at no additional cost to the County.

## PART 2 - PRODUCTS

2.01 CONDITIONS OF SERVICE FOR PUMPING UNITS

A. The pumping units shall be suitable in all respects for pumping finished water with a temperature range of 40 to 70°F.

B. The pumping units shall be designed and constructed to meet the following requirements:

| Parameter | Value |
|---|---|
| Nominal Pump Capacity | 8.6 MGD |
| Suction Size (inches, diameter, minimum) | 14 |
| Discharge Size (inches, diameter, minimum) | 12 |
| Maximum Motor Capacity (horsepower) | 250 |
| Maximum Pump Speed (rpm) | 1190 |
| Minimum Shutoff Head (Feet) | 160 |
| Continuous Operating Range TDH (Feet) | 80 - 145 |

| Parameter | Value |
|---|---|
| Design Point TDH (Feet) | 125 |
| Minimum Capacity at Design Point TDH (GPM) | 6,000 |
| Minimum Pump Efficiency at Design Point TDH (%) | 84.5 |
| Supplementary Point TDH (Feet) | 80 |
| Minimum Capacity at Supplementary Point TDH (GPM) | 7,250 |
| Minimum Pump Efficiency at Supplementary TDH (%) | 75 |
| Maximum NPSHR at Supplementary TDH (Feet) | 33 |
| Maximum Allowable BHP at any Point on Pump Curve within the Continuous Operating Range TDH | 250 |

## 2.02 PUMPING UNITS

### A. General

The pumping units shall be of the centrifugal, horizontal suction, horizontal discharge, single stage, double suction, single or double volute type, with horizontal split casing. Each unit shall be complete with pump, motor, bedplate for pump and motor, coupling, guard for coupling accessories, bearing temperature detectors and all appurtenances.

### B. Foundations and Anchor Bolts

Concrete foundations, properly located to suit the piping arrangement and of suitable size for the pumping unit, shall be provided. The pump manufacturer shall furnish anchor bolts of suitable size and number for the anchoring of the pumping unit. The bolts shall be suitable for embedment of sufficient depth to:

1. Withstand the thrust of the discharge and suction piping to which the pump is attached, or
2. To withstand the thrust generated by the pump without any connection to the discharge and suction piping, whichever is greater. The thrusts shall be calculated at a discharge pipe pressure equal to the pump shut-off head and zero pressure in the suction pipe. Design criteria for both scenarios shall be included in the submittal. The detail of concrete foundation and reinforcing shown on the structural drawings shall be used as a general guide and shall be considered as a minimum requirement. Designs for the concrete foundation and anchor bolts including design criteria and computations shall be

prepared and submitted for approval by the pump manufacturer or an engineer under contract with the pump manufacturer.

C. Bedplate

1. The bedplate shall be of ASTM A36 structural steel, of sufficient depth and strength to provide a rigid mounting platform for the pump and motor. Bedplate shall be designed for overturning moment and shear generated by the design loads on the pump. The design load is the shut-off head multiplied by the discharge nozzle area with zero axial tension reaction from the interface with the piping system. Bedplate shall be anchored to the foundation and shall anchor the pump and motor to the foundation. Accurately machined pads shall be provided for securing the pump and motor, with tapped holes to receive the hold down bolts. Lugs with cored or drilled holes shall be provided on the bedplate to receive the anchor bolts. The bedplate shall also be provided with a suitable number of holes of the proper size for grouting. The design, design criteria and computations for the design of the bedplate shall be submitted for approval.

2. Each bedplate shall include drainage gutters for collecting drainage from packing boxes and miscellaneous sources. Gutters shall be provided with 1-inch tapped openings for connection to the drainage system. Pump and motor shall be mounted on the bedplate at factory by the pump manufacturer.

D. Casings

1. Casings shall be gray iron castings conforming to ASTM A48 Class 40, minimum or ductile iron conforming to ASTM A536 Grade 60-40-18 minimum, and shall be free from injurious defects. Surfaces shall be free from burnt-on sand and reasonably smooth. Risers, fins and projections used to facilitate the making of the casting shall be removed. Surface imperfections or minor defects over an area of not more than 1 square inch may be repaired by welding or threaded plugging provided the depth of the plug required is not greater than 50 percent of the thickness of the section and the diameter of the plug does not exceed the depth of the plug. The County reserves the right to examine and reject any casting with any defect other than those demonstrated as minor.

2. The pump casings shall be horizontally split and the horizontal parting line shall be provided with flanges and an appropriate number of hexagonal head bolts or studs with hexagonal nuts. The casings shall be as required to meet the direction of rotation as indicated by the layout of the piping as shown on the Drawings. The parting flange faces shall be machined to a truly flat surface and ground, if

necessary, so that the flange joint may be made tight by means of a thin paper gasket; the use of red lead or similar material to make these joints tight will not be permitted. The backs of the flanges shall be spot-faced at the bolt holes and the edges shall match up so as to show no jog or off-set when the casings are bolted together. The alignment of casing halves shall be assured by the use of taper dowel pins located at diametrically opposite points of the flanges. Jack bolts shall be provided to break the seal for disassembly.

3. Each upper casing half shall be provided with connections for air vent and water seals to the packing boxes. The air vent connection at the top of each casing shall be a minimum of 1/2 inch and provided with a lever handle ball valve. Similar valves shall also be provided in each casing at the points where the suction passages lead into the impeller suction eyes. Cocks shall be of brass, finished and polished all over. Globe style valves may be substituted for ball valves.

4. Each lower casing half shall be provided with side suction and side discharge connections which shall be flanged and faced. Flanges shall be rated for a working pressure of not less than 250 psi. Suction and discharge flanges shall be drilled and faced in accordance with ANSI B16.1, Class 125. On the horizontal and vertical centerline of the suction and discharge connections near the flanges, or tapped flanges may be used, there shall be provided plugged reinforced taps, ½ or 3/4 inch pipe size, for pressure gage connections. Tapped and plugged holes shall also be provided in the lowest part of the casings for dewatering the pump. The lower casing halves shall be provided with feet, machined on the underside, with spot-faced holes and threaded dowel pins for securing the casings to the baseplate. The feet shall be designed for the shear and overturning moment loads generated from the shut-off head multiplied by the discharge nozzle area. The design shall not include any reactions from the piping system. The feet shall anchor the pump to the foundation. The design, design criteria and computations for the pump feet shall be submitted for approval. Threaded dowel pins shall also be used for securing the motor mounting to the bedplate.

E. Impeller and Case Wearing Rings

1. The suction eyes of the impellers shall be fitted with one-piece C952 aluminum bronze to conform to ASTM B148, and C907 tin bronze wear rings of a design which, in connection with the casing rings, requires the leakage of water past the ring to make a plurality of right angle turns in passing from the high to the low pressure side minimizing the leakage past the rings. The rings shall be readily removable and fastened to the impeller in such a manner as will prevent rotative or axial movement, regardless of the direction of

rotation of the pumps. One-piece bronze, ASTM B584, Alloy 903 wearing rings to match the impeller rings shall be fitted into recesses machined within the top and bottom casing halves and secured against rotation.

F. Impellers

The impellers shall be of bronze, ASTM B148, Alloy 952, double suction enclosed type, with all surfaces finished smooth. The impellers shall be machine balanced in accordance with ISO 1940/1, G 6.3. The impellers shall be secured to the shaft with suitable provisions made to maintain their axial position. The rotor assemblies shall be able to withstand 125% of normal forward speed in reverse direction without damage to the pump for a duration of one minute. Impellers shall be of one piece construction without any patching of sand holes or other imperfections (e.g. porosity, cracks, etc.) The direction of rotation shall be as required to meet the layout of the pumping units as shown on the Drawings.

G. Shafts

The shafts shall be constructed of high carbon steel, ASTM A576 Grade 1040, ground and polished all over. The ends shall retain the original centers upon which the shafts were turned and ground, and the outboard end shall be exposed and contain an ample recess for the insertion of a hand mechanical tachometer. Where the shafts emerge from the bearings, they shall be fitted with grooves or collars to prevent oil from creeping along the shaft to outside the bearing brackets and they shall also be provided with suitable collars outside the brackets to prevent the entrance of water or other foreign substances to the interior of the bearing housings. The complete rotating element shall be of such design that it can be completely removed from the lower casing without disturbing the suction or discharge piping.

H. Shaft Sleeves

The shafts shall be protected by renewable one-piece machine cast aluminum bronze, ASTM B148, C952 sleeves, extending from the impeller hubs to the outside of the stuffing boxes. Sleeves shall be closely fitted to the shafts and held in place against the impeller hubs using the manufacturer's standard method.

I. Bearings

The pump shaft shall be supported by anti-friction type single row bearings. Bearings shall have the capability of being easily removed without disturbing any parts of the pump other than the bearing caps. The thrust bearings shall be of the anti-friction type double angular contact bearings, adequate to withstand all thrusts, and shall be designed and constructed to maintain the shafts in a fixed axial position without undue heating or the necessity of

adjustment or attention. All bearings both radial and thrust, shall be ring oil lubricated. Each bearing shall include a Trico Constant Level bottle oiler. Bearings shall be designed and constructed for a L-10 life of not less than 100,000 operating hours at full motor load (supplementary point TDH). Bearings shall be provided with temperature detector probes as specified hereinafter. Bearings shall be designed to operate at a temperature not to exceed 185°F at an ambient temperature of 104°F.

J. Bearing Frames

The bearing frames and housings shall be supplied by the bearing manufacturer and shall be of sufficient size and strength to adequately support the bearings for the 100,000 hours life specified above. The bearing frames shall be suitable for mounting of the temperature detectors as specified hereinafter.

K. Stuffing Boxes

Stuffing boxes shall be provided with mechanical shaft seals. Stuffing boxes shall be capable of accepting packing or a split mechanical seal without modification to the stuffing box.

L. Mechanical Seals

1. Split Mechanical seal shall be comprised of four component parts, two rotating halves and two stationary halves, for ease of assembly and installation. All seal faces shall be constructed of silicon carbide. For pumped media seal lubrication, provide a 416 stainless steel bushing capable of solids rejection while letting liquid pass.

2. The split mechanical seal shall be the Chesterton Model 442, split mechanical Seal with SpiralTrac bushing Version D, Type A. No substitutions shall be permitted.

M. Manufacturers

Acceptable pumping unit manufacturers and model numbers or equal are:

Flowserve Model 300-LNN-475,

Patterson Model 14 x 12 MAB-C

## 2.03 SHAFT COUPLINGS

A. Shaft couplings shall be provided for each pumping unit. The motor end of the shaft shall be provided with forged or cast steel limited end float gear type flexible coupling. The product shall be of Falk by Rexnord Corporation, the "Fast" coupling of Kop-Flex Company, or other approved equal.

B. One-half of the coupling shall be firmly fixed and keyed to the pump shaft with the other half similarly secured to the motor shaft. The method of connecting the coupling halves shall be as such to permit a slight angular and/or parallel misalignment of the connected shafts without imposing any strain upon the adjacent bearings. The amount of allowable misalignment shall be clearly identified by the coupling manufacturer. The ends of the bolts and nuts shall be recessed beneath the surface or otherwise surrounded so as to satisfy all requirements of safety in operation. The couplings shall be finished and polished all over and both the inside faces and outside perimeters shall be turned and ground to exact dimensions to facilitate the checking of the alignment of the connected shafts. The couplings shall be placed as close as possible to the pump and motor bearings so as to make compactly arranged units.

C. Galvanized steel mesh screen shaft guards shall be provided all around the coupling and exposed shafting as required to meet OSHA regulations and as indicated in the Drawings. Screen guards shall be easily removable for coupling maintenance.

2.04 MOTORS

A. The motors shall be the horizontal, quiet running, alternating current squirrel cage induction type of premium efficiency and shall be built and tested in accordance with the latest version of NEMA Standard MG-1 and all other standards specified herein.

B. The motors shall be designed for operation in a damp environment and for use with horizontal, centrifugal type water pumps. The motor manufacturer shall coordinate with the manufacturer of the pumps furnished to ascertain the actual $WR^2$, the torque requirements for starting and for normal running and mounting dimensions.

C. Each motor shall meet the following requirements:

D. Rating

1. Voltage - 2300 volts, for operation in a nominal 2400 volt, 3 phase, 60 hertz, power circuit

2. Motor Starter Type - Motor shall be Invertor Duty rated, and fully capable of being started and powered with any of the following types of motor starters:

   a. Full Voltage Across-the-Line type starter

   b. Reduced Voltage Solid State (RVSS)

   c. Variable Frequency Drive (VFD).

3. Size = 250 horsepower, continuous

4. Speed = 1190 rpm nominal speed at full load.

5. Insulation - Class F

6. Temperature Rise - 80°C over 40°C ambient, at nameplate rated horsepower.

7. Service factor - 1.15.

8. NEMA Design - B

9. Minimum Guaranteed Efficiency, per IEEE Standard No. 112 Method B:

| | |
|---|---|
| Full Load | 94.0 % |
| 3/4 Load | 93.5 % |
| ½ Load | 93.0 % |

10. Motor Power Factor, Minimum:

| | C & D (250 HP) |
|---|---|
| Full Load | 78% |
| 3/4 Load | 74% |
| ½ Load | 65% |

Note: Power Factor After Correction: Minimum 91, Maximum 93 percent, from ½ Load to Full Load. See Division 16 Specifications for Power Factor Correction Capacitors.

11. Locked rotor, pull-in and pull-out torque shall not be less than those specified in NEMA Standard MG-1 and shall be as required by the pump.

12. Number of starts per hour shall be in accordance with NEMA Standard MG-1. Provide nameplate on motor identifying limitations.

13. Overload and short-circuit requirements shall be in accordance with the latest revisions of ANSI Standards.

14. Balance of motor shall not exceed a maximum amplitude of 0.0015 inches and shall be measured in accordance with NEMA Standard MG-1.

15. Direction of rotation shall be as required by the pump. Direction of rotation shall be verified in the field with respect to phase rotation.

16. The sound level shall be designed and calculated in accordance with the latest revisions of NEMA MG-3 “Sound Level Prediction for Installed Rotating Electrical Machines” and ISO 1680-2, "Test Code

for the Measurement of Airborne Noise Emitted by Rotating Electrical Machinery -- Part 2: Survey Method".

17. Measurements shall be made with motor running at no load, at rated speed and at rated line voltage. The measurements shall be made with the microphone at six evenly spaced points around the circumference of the motor, five feet from the motor and at four feet above the motor base and one measurement shall be made five feet atop the motor base and one measurement shall be made five feet atop the motor center. A frequency analysis shall be made for each measurement point using an octave-band analyzer, and center frequency sound pressure levels shall not exceed the following:

| Center Frequency (Hertz) | Sound Pressure Level (dB) |
|---|---|
| 62 | 85 |
| 125 | 84 |
| 250 | 84 |
| 500 | 82 |
| 1000 | 81 |
| 2000 | 79 |
| 4000 | 77 |
| 8000 | 74 |

18. If any measured sound pressure levels exceed the above-specified limits, the motor manufacturer shall take all necessary corrective measures and shall retest the motor(s) at no additional cost to the County.

E. Enclosure/Frame

1. The enclosure for each motor shall be type, WP-1.

   a. A WP-1, (Weather Protected Type I) machine is an open machine with its ventilating passages constructed to minimize the entrance of rain, snow, and air-borne particles to the electric parts. Its ventilation openings are also constructed to prevent the passage of a cylindrical rod 0.75” in diameter.

2. The enclosure shall be of cast iron or welded plate construction and shall be designed to support the weight of the motor and shaft.

3. Each motor shall be self-ventilated; the enclosure shall have a sufficient number of generously sized openings to provide adequate ventilation throughout the motors. Ventilation air discharged shall be upward, from the top or sides of the unit. Motors shall be suitable for continuous operation with an ambient air temperature of 40°C.

4. The enclosure shall be provided with readily removable access covers to facilitate inspection and maintenance of bearings and space heaters.

5. The motor frame shall be cast iron construction, constructed to a NEMA standard frame size.

6. Embedded stator temperature detectors shall be provided as specified hereinafter.

F. Space Heaters

A minimum of one strip heater shall be installed in the interior of each motor for the purpose of maintaining an interior temperature above ambient to prevent the accumulation of moisture within the motor during periods of shutdown. Individual conductors from each heater terminal shall be brought out to a terminal strip in an external terminal connection box. The strip heaters shall be suitable for 120 volt, single phase, 60 Hz and sized as required for this duty.

G. Rotors

1. The rotor shall be capable of operating at 125% of rated speed in either direction of rotation.

2. Screw jacks with retracted position locking safety, or equal, integral with the motor enclosure shall be provided for lifting and supporting the rotor for maintenance on or removal of bearings and other assemblies.

3. Rotor blocking for shipping shall be provided.

H. Shafts

1. The motor shaft shall be solid 1040 type carbon steel, machined and polished.

2. The shaft shall be prepared to accommodate one-half coupling provided with the pump, as specified herein.

3. The motor shaft flange shall be match marked and this match-marking shall be correlated with the match-marking on the pump shaft flange.

4. Shaft end play and rotor float for each motor shall be in accordance with NEMA Standard MG-1.

5. One lever, spanner type, shall be provided with the motors. The lever shall be used for rotating each motor rotor and shaft through small portions of a revolution to effect precise alignment between the holes in the motor shaft flange and the holes in the pump shaft flange.

6. The lever shall be designed to span a portion of the motor shaft, laying flat on the top surface of the flange and encompassing three of the flange bolt holes. The lever shall extend beyond the pump discharge head with a hole at the end suitable for the application of a chain hoist hook for the purpose of pulling on the lever to move the motor shaft. The width and thickness of the lever shall be sized to deliver the required torque to rotate the entire pumping unit, i.e., motor rotor, pump shaft, and impeller.

7. The lever shall be furnished with fitted bolts, including washers and nuts, to attach the lever to the motor shaft. Two sets of bolts shall be provided; a short set for attaching the lever to the motor shaft flange along; and a long set for attaching the lever to the completely assembled motor-to-pump coupling where the lever will be employed to rotate the entire pumping unit.

I. Bearings

Each motor shall be provided with two bearings. The bearings shall be split sleeve type designed and constructed for full load 24 hours per day duty. The bearings shall be ring oil lubricated. The design of the lubrication system shall be such that the temperature of bearings shall not exceed 85°C given an ambient temperature of 40°C.

J. Boxes

1. All connection and terminal boxes shall be located on the exterior of the motor frame where shown on the Drawings with an orientation keyed to the location of the motor stator, motor main leads, connection box.

2. The motor main stator winding shall be brought out of the stator into a removable connection box.

3. The connection box shall be sized to provide adequate interior capacity to conveniently contain the stator leads.

4. The motor stator leads, shall have identification tags of brass with stamped characters or engraved, laminated plastic.

5. The exterior of the motor stator frame shall be provided with a connection box for each of the following services:

   b. Stator Temperature Detectors

   c. Inboard Bearing Temperature Detector

   d. Outboard Bearing Temperature Detector

   e. Motor Space Heaters

6. Combinations, or pairing of the above service may be grouped in single boxes where advantageous, to reduce the total number of boxes and permit a more orderly approach of the conduits and conductors serving the boxes.

7. Each box shall be provided with terminal strips to permit rapid disconnect and positive identification of each conductor.

8. The cover of each box shall have an engraved, laminated plastic nameplate identifying the service, or services, in the box.

K. The following lists acceptable motor manufacturers which may meet these motor specification requirements. Proposed motor selections are subject to approval by the Engineer:

1. U. S. Electrical Motors

2. Siemens Energy and Automation, Inc.

3. Reliance Electric Company

4. Toshiba International Corporation

5. General Electric Company

6. Baldor Electric Company (ABB)

7. Hyundai Ideal Electric and Manufacturing Company

2.05 MAINTENANCE TOOLS

A. The Contractor shall furnish with the pumping units all special tools, that may be required to assemble, dismantle, repair or adjust the pumps and motors including one set of the following:

1. Jigs, fixtures, etc., necessary for the removal of the rotor, bearings and other assemblies.

2. Coupling adjusting nut turning lever for the coupling.

2.06 TEMPERATURE DETECTION SYSTEMS

A. Each pump and motor bearing shall each be provided with two resistance temperature detectors, RTDs. Each RTD of which will be connected to a digital motor protection relay; one per pumping unit for pump and motor RTDs, located at the 2.4 kV Motor Control Center, located in Pumping Station No. 3.

B. The stator in each motor shall be provided with six (6) RTDs, two per phase, all of which shall be connected to the same digital motor protection relay located in the 2.4 kV Motor Control Center.

C. All RTD's shall be:

1. 3-wire nickel construction, rated for 120 ohms at 0°C.
2. manufactured by MINCO Products, or equal.

D. Resistance Temperature Detectors, RTDs

1. Bearings
   a. RTDs shall be designed to be embedded in the pump and motor bearings.
   b. Units for the radial bearings shall be the tip sensitive type, RTDs for the thrust bearing shall be miniature tip embedded type,
   c. The metal of the bearings and mountings shall be drilled, milled and tapped so as to place the sensitive detector tips at the hottest points of the bearings and within 1/8 inch of the babbitt, for the sleeve guide bearings, and within 1/16 inch of the babbitt for the thrust bearings shoes.
2. Motor Stators
   a. RTDs shall be suitable in all respects for placement in the motor stator by the motor manufacturer.
   b. Suitable accessories and associated hardware to include holders, head connection and seals shall be provided to enable the complete mounting of each RTD in accordance with the motor manufacturer's recommendations.

## 2.07 SPARE PARTS

A. The following spare parts shall be furnished, one for each size of finished water pumping unit or motor (unless otherwise noted) and shall be delivered by the Contractor to the Baltimore City DPW Pumping Section Maintenance Facility, identified in Section 01900, entitled Special Conditions:

1. Pump spare parts:
   a. One spare rotating assembly for each pump
   b. Impeller wearing ring (Total -2)
   c. Casing wearing ring (Total-2)
   d. One set of inboard and outboard bearings (Total-4 bearings)
   e. Mechanical Seal Assemblies (Total – 2)
   f. Six months supply of lubricating oil (for all pumps)
   g. One Cartridge of Coupling Lubrication

2. Motor spare parts:

a. One complete set of inboard and outboard seals (Total-4 seals)

b. One set of inboard and outboard bearing liners (Total-4 bearing liners)

c. Six months supply of lubricating oil (for all motors)

d. One oil ring (Total-2)

2.08 SIZE OF PUMPING UNITS

A. The maximum permissible dimensions for the pump and motor assembly shall not exceed the following:

1. Pump centerline to end of motor = 7'-8" inches

(From the outboard motor bearing to the pump discharge centerline)

2. Pump Baseplate Dimension in plan, shall not exceed existing concrete foundation dimensions.

2.09 FACTORY FINISH

A. Interior of pumps shall be shop painted in accordance with Section 09900, entitled PAINTING.

B. Outside of pumps shall be shop prime painted, in accordance with Section 09900, entitled PAINTING.

C. Motors shall be prime coated inside and outside plus factory finished with the manufacturer's standard heat-resistant enamel coating system.

2.10 LIFTING AND HOISTING REQUIREMENTS

A. Bedplate

The bedplate for the pump and motor assembly shall be designed to allow the pump, motor and bedplate assembly to be lifted as a single unit.

B. Rigging Points

Both the pump and the motor enclosure shall be provided with lifting eyes to allow the following to be hoisted by a crane:

1. The top half of the pump and its associated half coupling.

2. The motor and its associated half coupling.

C. Procedures for lifting the entire pump assembly shall be provide in the manufacturer's Operation and Maintenance Manual.

## PART 3 - EXECUTION

3.01 STATION PIPING

Station discharge piping centerline, for all pumps, shall be as indicated on the Drawings. On the pump discharge side only, combinations of eccentric (flat on top) and/or concentric reducers may be used to suit. On the pump suction side only eccentric (flat on top) reducers shall be used.

3.02 INSTALLATION

A. Pumps shall be installed as indicated. Pump bases shall be carefully leveled on a grout bed, and all anchorage fasteners securely tightened to prevent misalignment or shifting during operation. The following shall be accomplished:

1. Install pump and motor as described in the Pumping Unit Manufacturer's Installation Manual, and in "Rotodynamic (Centrifugal) Pumps for Manuals Describing Installation Operation and Maintenance" (ANSI/HI 1.4).

2. The pump manufacturer's factory trained and certified field startup technician shall be employed in the installation, starting and operation of the pumping equipment.

3. In the foundation bolt design, a pipe sleeve larger than the bolt shall be used to allow movement for final positioning of the bolts.

4. Check alignment of pump and motor assembly.

5. Set baseplate assembly on prepared foundation. Allow 3/4" to 1-1/2" gap between pump baseplate and top of foundation. Support level baseplate with metal blocks or shims.

6. Check pump and motor coupling for angular and parallel alignment. The permissible amount of misalignment will vary with type of pump and driver. The manufacturer's recommendations shall be obtained, submitted, approved, and followed.

7. Use dial indicators or laser type devices to place the coupling halves in the final accurate alignment. Furnish final readings to the Engineer for approval when coupling alignment checks are made.

8. When alignment is correct, tighten foundation bolts evenly but not too firmly. Grout unit to foundation. Do not fully tighten foundation bolts until the grout is hardened, about 48 hours after pouring.

9. After the grout has set and the foundation bolts have been properly tightened, check pump and motor for parallel and angular alignment.

10. Connect remaining piping to pump.

11. Conduct alignment check again between pump and motor.

12. Prime pump and operate under normal operating conditions until temperatures have stabilized. Pump shall be operated at its design point head by throttling valves. Shut down unit and immediately check alignment of coupling. All alignment checks shall be made with the coupling halves disconnected.

13. Demonstrate that the pumping unit is operating in a satisfactory manner. All bearings shall be lubricated, and all adjustments made to suit anticipated operating conditions. The pumping equipment shall be tested to show that all components operate quietly, without excessive vibration, overheating, or other signs of distress.

14. After the unit has been running continuously for three days, the coupling halves shall be given a final check for misalignment caused by pipe strains or temperature strains. If the alignment is correct, both pump and motor shall be doweled to the baseplate. Pump shall be operated at its design point head by throttling valves.

15. If at any time, the pumping unit's baseplate is cut or torch burned during the installation in the field, then this is cause for rejection of the pumping unit by the County.

B. Connect space heaters and protect the motors from dust and other construction debris before and after installation. Contractor shall hire a qualified motor repair outfit to clean the motors at no additional cost to the County, if in the opinion of the County, motors are subjected to dust and construction debris.

C. Provide drain piping from the pumping unit baseplate, routed to nearest floor drain. See Section 15060.

D. Provide a minimum of three separate 8-hour days, (that is; two trips exclusive of travel time) for operation and maintenance instructional training to be as furnished by the pump manufacturer's Factory Service Engineer. Pump operators work in rotating 24-hour shifts and employees shall be provided a training duration independent of their shift.

E. Provide a minimum of three separate 8-hour days (that is; two trips exclusive of travel time) for operation and maintenance instructional training to be furnished by the motor manufacturer's Factory Service Engineer. Pump operators work in rotating 24-hour shifts and employees shall be provided a training duration independent of their shift.

3.03 FIELD TESTING

A. The Contractor shall procure and pay for the services of an independent pumping unit testing agency, approved by the Engineer, to determine if the installed pump functioning as specified and is performing as anticipated based upon documented factory test results.

B. Field testing shall include but not be limited to:

1. Functional testing of the pumping unit and pump discharge cone valve to determine that all normal startup, shutdown, emergency shutdown operations and durations are acceptable.

2. Performance testing of each pumping unit to determine if its performance is consistent with that documented during factory testing of the repaired pump and motor.

3. Vibrational testing of the pump and motor, which may be performed in parallel with the performance testing.

4. If results of this testing are determined to be unacceptable, the Contractor shall perform all corrective actions as necessary and retest at no additional cost to the Contract.

C. Functional Testing - Pumping Unit

1. Normal Starting and Stopping Sequence - Each Pump shall be started and stopped manually at the station, a minimum of two times each to determine that the indicating lights are energized in sequence and the pump discharge cone valve fully opens and closes.

2. Emergency Stopping Sequence - Each Pump shall be emergency stopped manually at the station to determine that the pump discharge cone valve properly closes under the fast closure mode.

D. Performance Testing - Pumping Unit

1. Pumping Unit Performance Testing may be done in parallel with functional testing of the pumping unit.

2. The Contractor shall provide calibrated field instrumentation to supplement and be used in conjunction with new and existing permanent instrumentation.

3. The following parameters to be monitored during performance testing include but not be limited to:

e. Pump Suction Pressure

f. Pump Discharge Pressure

g. Pump Flow (from its factory curve)

h. Pump Speed

i. Motor Electrical Real and Apparent Power

j. Motor Current

k. Motor Voltage

4. Acceptance of the field performance testing shall be determined by the following:

Input power into the motor for a given pump Total Dynamic Head and corresponding flow, shall be ±5 percent of that predicted by factory pump and motor testing.

3.04 VIBRATION TESTING

A. The Contractor shall procure and pay for the services of an independent vibration testing agency, approved by the Engineer, to determine the vibration spectrum of each pumping unit under actual operating conditions.

B. Vibration shall be measured using an accelerometer and data collection unit for each pump and motor bearing, in directions parallel to discharge, perpendicular to discharge and along the centerline axis of the shaft (thrust).

C. Vibration readings will be taken under normal operating conditions, with the pump operating at full load speed, unless otherwise noted by the Engineer.

D. Upon completion of the pumping vibration test monitoring, the testing agency shall submit the following data to the Engineer:

1. Unfiltered RMS Velocity, for each location monitored.

2. A set of velocity vs. frequency graphs for each location monitored. Multiples of pump running speed, from 1 to 20, shall be clearly indicated on these graphs.

3. The pumping unit shall meet all requirements and limits of the American National Standard for Rotodynamic Pumps for Vibration Measurement and Allowable Values (ANSI/HI 9.6.4).

4. Vibrations beyond the limits of the standard shall be corrected by the Contractor, and the pumping unit shall be entirely retested for vibration at no additional cost to the Owner.

3.05 FIELD FINISH

A. The Pumping units shall be field finished per Section 09900, entitled PAINTING, including the pump, and pump baseplate, as required.

B. The new pump motor shall be field finish touched up as required, based on motor manufacturer recommendations.

END OF SECTION

**SECTION 13410**

**SYSTEMS INTEGRATOR**

PARAGRAPH INDEX

**SECTION 13410**

**SYSTEMS INTEGRATOR**

**PART 1 -** GENERAL

1.01 DESCRIPTION

A. The work includes all labor, materials, equipment and services necessary for, and incidental to, the complete and satisfactory integration of the instrumentation, control, PLC and SCADA interface systems at the Towson Pump Station (PS).

B. The work also includes providing new data communications equipment at the PS for connection to and data transmission via the existing County of Baltimore (County) water distribution SCADA system.

C. Coordination with Verizon and county to obtain new wireless communication service to the site for point to point to communication for SCADA network.

D. Work also includes startup and testing of the new instrumentation, control and monitoring system, communications equipment and coordination with the County for testing of remote monitoring and control functions from the County Telemetry Control Center (TCC) via the existing SCADA system.

E. Included herein is the requirement for the Contractor to hire a Systems Integrator to perform specific tasks that form a part of the systems integration work in order to minimize the risk of critical tasks related to the controls and SCADA system modifications being performed by unqualified persons and/or contractors. Modification of existing computer screens at Ashburton Telemetry Control Center (TCC) for Towson Pumping Station shall be done by system integrator. Necessary hardware and software shall be furnished by the contractor. All software and hardware become property of Baltimore City.

1.02 CONTRACTOR RESPONSIBILITY

A. The Contractor shall hire the services of a qualified Systems Integrator (SI) to furnish the materials, equipment and services that form a part of the overall work related to the construction of the monitoring and control systems described herein. The SI shall be approved by the County after review of SI Qualifications Package.

B. Work included in the Contract Documents that is required to be performed by the SI is delineated in PART 3 – EXECUTION of this specification section. In general, the work includes furnishing control panels, field instrumentation, PLC and operator interface hardware and software, and data communications equipment. The work also includes providing

submittals, programming of PLC and operator interface software, testing, startup and training related to the control systems and instrumentation. Work involving the installation of SI furnished materials and equipment such as control panels and instrumentation shall be performed under the supervision of the SI. This requirement shall not relieve the Contractor of the responsibility for the work specified to be performed by the SI; the Contractor shall retain sole responsibility for the work described herein.

1.03 QUALIFICATIONS OF SYSTEMS INTEGRATOR

A. The SI shall be a qualified supplier of SCADA, instrumentation and control systems similar to the systems and corresponding equipment described herein. The SI shall have demonstrated capabilities in the design, construction and integration of similar types of control systems. The SI shall have a minimum of five (5) years of experience in the construction, furnishing, startup, testing and integration of such facilities for the water and wastewater industry, and shall submit documentation of the successful completion of at least two (2) such projects during the past five years. In addition to this requirement, the SI shall demonstrate with documentation that the SI has successfully completed a project of similar size and type within the last three (3) years.

B. The SI shall assign a Project Manager (PM) who shall manage the SI portion of the work and be the main point of contact for the SI. The SI shall provide documentation of the experience of the PM in performing work similar to the work described herein, and managing instrumentation and controls work similar to what is included in this project.

C. The SI shall have on their primary site a UL certified control panel fabrication shop which shall be located no greater than 250 miles from the PS site.

1.04 MEETINGS

A. Prior to making any submittals, a meeting shall be scheduled with the County specifically to introduce the SI's PM to the County, to discuss the requirements of the instrumentation and control requirements for the project, and the formatting and documentation of submittals. The Contractor's project manager and the SI's PM shall attend the meeting.

B. The Contractor and SI project managers shall attend a minimum of two (2) additional meetings separate and distinct from construction progress meetings during the course of the project to specifically discuss instrumentation, control, programming and testing issues. The meetings shall occur at mutually agreeable dates and times.

C. Additional meetings required to be attended by the SI PM and the Contractor's project manager shall include the following:

1. Kick off meeting to discuss control strategy descriptions, human machine interface (HMI) graphic displays, PLC programming standards, and alarms.

2. PLC and HMI programming 50% review meeting.

D. All meetings with the SI and Contractor shall take place at the County's facilities

1.05 SUBMITTALS

A. Submittals shall be developed and submitted in accordance with Section 01900.

B. Submit a qualifications package for the SI indicating compliance with the requirements specified herein

C. Submit the name and address of the nearest service location for the SI.

D. Provide submittals required in referenced specification sections that are delineated as the SI's responsibility.

E. Pre-Construction Site Inspection Report of the existing PLC panel and existing IO to be extended to new PLC in PSCP.

1. Provide written report of completion of site inspection of the existing I/O wiring which are required to extend to new PLC without any modification in the field devices.

2. Provide existing IO points junction pull and boxes, termination locations, and verification and testing of existing to remain equipment to the extent possible.

3. The report should include detailed as-built riser diagram and conduit schedule of the existing controls junction box located in the Towson PS No. 3. The drawings shall include all existing wire, conductors and terminations within the junction box and shall indicate all conductor source, destination and termination points.

4. Report should detail discrepancies found during testing. Include details about broken or inoperative equipment; missing devices; discrepancies with current as- built information; and other issues found at station that the Contractor should advise the Owner of prior to commencement of construction activities.

5. Reports for facilities or locations without found discrepancies shall indicate no discrepancies found.

6. Report should indicate if equipment was not able to be verified or tested and for what reason it was not.

7. As a minimum in the pre-construction site report, contractor should include following existing IO points (as a minimum) from valve control panel, field devices, 2,4kV MCC, existing chlorine building

| | | | |
|---|---|---|---|
| EX. RESERVOIR EAST INFLUENT VALVE | DI | ZNO-695 | RESERVOIR EAST INFLUENT VALVE OPEN STATUS |
| EX. RESERVOIR EAST INFLUENT VALVE | DI | ZNC-695 | RESERVOIR EAST INFLUENT VALVE CLOSED STATUS |
| EX. LOR SELECTOR SWITCH IN VCP | DI | HSN-695A | RESERVOIR EAST INFLUENT VALVE LOR SWITCH IN HAND POSITION |
| EX. PNL-PLC SELECTOR SWITCH IN VCP | DI | HSN-695B | RESERVOIR EAST INFLUENT VALVE PNL-PLC SWITCH IN PLC POSITION |
| EX. RESERVOIR WEST INFLUENT VALVE | DI | ZNO-696 | RESERVOIR WEST INFLUENT VALVE OPEN STATUS |
| EX. RESERVOIR WEST INFLUENT VALVE | DI | ZNC-696 | RESERVOIR WEST INFLUENT VALVE CLOSED STATUS |
| EX. LOR SELECTOR SWITCH IN VCP | DI | HSN-696A | RESERVOIR WEST INFLUENT VALVE LOR SWITCH IN REMOTE POSITION |
| EX. PNL-PLC SELECTOR SWITCH IN VCP | DI | HSN-696B | RESERVOIR WEST INFLUENT VALVE PNL-PLC SWITCH IN PLC POSITION |
| EX. RESERVOIR EAST EFFLUENT VALVE | DI | ZNO-697 | RESERVOIR EAST EFFLUENT VALVE OPEN STATUS |
| EX. RESERVOIR EAST EFFLUENT VALVE | DI | ZNC-697 | RESERVOIR EAST EFFLUENT VALVE CLOSED STATUS |
| EX. LOR SELECTOR SWITCH IN VCP | DI | HN-697A | RESERVOIR EAST EFFLUENT VALVE LOR SWITCH IN REMOTE POSITION |

| | | | |
|---|---|---|---|
| EX. PNL-PLC SELECTOR EX. SWITCH IN VCP | DI | HN-697B | RESERVOIR EAST EFFLUENT VALVE PNL-PLC SWITCH IN PLC POSITION |
| EX. RESERVOIR WEST EFFLUENT VALVE | DI | ZNO-698 | RESERVOIR WEST EFFLUENT VALVE OPEN STATUS |
| EX. RESERVOIR WEST EFFLUENT VALVE | DI | ZNC-698 | RESERVOIR WEST EFFLUENT VALVE CLOSED STATUS |
| EX. LOR SELECTOR SWITCH IN VCP | DI | HSN-698A | RESERVOIR WEST EFFLUENT VALVE LOR SWITCH IN REMOTE POSITION |
| EX. PNL-PLC SELECTOR SWITCH IN VCP | DI | HSN-698B | RESERVOIR WEST EFFLUENT VALVE PNL-PLC SWITCH IN PLC POSITION |
| EX. RESERVOIR BUTTERFLY VALVE | DI | ZNO-699 | RESERVOIR BUTTERFLY VALVE OPEN STATUS |
| EX. RESERVOIR BUTTERFLY VALVE | DI | ZNC-699 | RESERVOIR BUTTERFLY VALVE CLOSED STATUS |
| EX. LOR SELECTOR SWITCH IN VCP | DI | HSN-699A | RESERVOIR BUTTERFLY VALVE LOR SWITCH IN REMOTE POSITION |
| EX. PNL-PLC SELECTOR SWITCH IN VCP | DI | HSN-699B | RESERVOIR BUTTERFLY VALVE PNL-PLC SWITCH IN PLC POSITION |
| EX. INFL. CHL. VAULT | DI | XA-645A | INFL. CHL. VAULT SODIUM HYPO. LEAK |
| EX. INFL. CHL. VAULT | DI | LSH-645A | INFL. CHL. VAULT FLOOD |
| EX. EFFL. CHL. VAULT | DI | XA-645B | EFFL. CHL. VAULT SODIUM HYPO. LEAK |
| EX. EFFL. CHL. VAULT | DI | LSH-645B | EFFL. CHL. VAULT FLOOD |

| | | | |
|---|---|---|---|
| EX. INFL. WEST VAULT | DI | LAHH-681 | INFL. WEST VAULT FLOOD |
| EX. INFL. EAST VAULT | DI | LAHH-682 | INFL. EAST VAULT FLOOD |
| EX. EFFL. WEST VAULT | DI | LAHH-683 | EFFL. WEST VAULT FLOOD |
| EX. EFFL. EAST VAULT | DI | LAHH-684 | EFFL. EAST VAULT FLOOD |
| EX. WEST RESERVOIR | DI | LAHH-650B | WEST RESERVOIR OVERFLOW |
| EX. WEST RESERVOIR | DI | ZAH-650B | WEST RESERVOIR FLAP GATE ALARM |
| EX. EAST RESERVOIR | DI | LAHH-650A | EAST RESERVOIR OVERFLOW |
| EX. EAST RESERVOIR | DI | ZAH-650A | EAST RESERVOIR FLAP GATE ALARM |
| EX. UNDRN. VAULT | DI | LAHH-687 | UNDERDRAIN VAULT FLOOD |
| EX. BTFLY VALVE VAULT | DI | LAHH-685 | BUTTERFLY VALVE VAULT FLOOD |
| EX. 2.4 KV MCC | DI | IAH-701 | 2.4 KV MCC BUS A GROUND FAULT |
| EX. 2.4 KV MCC | DI | IAH-702 | 2.4 KV MCC BUS B GROUND FAULT |
| EX. PS SUCTION FLOW METER | AI | FI-644 | PS 42" SUCTION FLOW |

| | | | |
|---|---|---|---|
| UNDERGROUND VAULT - EX. 36" MAGNETIC FLOW METER | AI | FI-645A | TOWSON RESERVOIR BASIN INFLUENT FLOW - 36" MAGNETIC FLOW METER |
| EX. TOWSON RESERVOIR EAST - HYDRAULIC LEVEL SENSOR | AI | LI-650A | TOWSON RESERVOIR EAST LEVEL |
| EX. TOWSON RESERVOIR WEST - HYDRAULIC LEVEL SENSOR | AI | LI-650B | TOWSON RESERVOIR WEST LEVEL |
| UNDERGROUND VAULT - EX. FLOW METER | AI | FI-645B | TOWSON RESERVOIR BASIN EFFLUENT FLOW |

8. Contractor should also confirm in the report any modification of the existing fiber optic cable termination into PSCP(PLC Panel) from the 13.2kV switchgear and 2.4 kV switchgear.

F. Submittal of termination box (located next to the PSCP) to include point to point wiring details of the existing signal wiring which needs to be extended to PSCP.

**PART 2 - MATERIALS**

(Not Used)

**PART 3 - EXECUTION**

3.01 GENERAL DESCRIPTION

A. Definitions: For the purpose of delineation of work for the SI, the following definitions shall apply:

1. Furnish: Purchase and deliver to the site.

2. Provide: Furnish and install.

B. It shall be the SI's responsibility to furnish a complete and functional, fully integrated instrumentation and control system, and communications system as specified and shown in the Contract Documents. The SI shall furnish all software and hardware devices necessary to integrate the components of the control and data communication system up to and including the Verizon interface, as well as interface with other systems pertaining to the project.

3.02 SYSTEM INTEGRATOR'S RESPONSIBILITY

A. Attend the meetings specified in Part 1 – GENERAL of this specification section and any other meetings required by the Contractor or the County to

facilitate execution of the instrumentation, control and SCADA related work.

B. Develop and furnish all submittals, including catalog data, shop drawings, O&M Manuals and manufacturer's certifications, factory and field testing plans and training plans for instrumentation, equipment and control panels furnished by the SI.

C. Develop Loop Drawings and record drawings for all instrumentation, control and PLC I/O circuits in accordance with the requirements of Section 13450 – Control Panels and Controls.

D. Control panels shall bear the UL label and shall be manufactured in a UL certified panel shop operated by the SI. Design and furnish the following control panels per the Contract Drawings and Section 13450 – Control Panels and Controls:

1. Pump Station Control Panel (PSCP)

2. PS No.2 RIO Panel

E. Coordinate with the County and Verizon to obtain new wireless data communications service to the site. The SI shall ensure that Verizon requirements with respect to the equipment to be installed in the PSCP meet Verizon's requirements, and shall be responsible for coordinating the schedule for service installation. The County will procure the new Verizon services, and will be responsible for making payment to Verizon for the new services. The County or City will be responsible for paying monthly fees associated with the new services.

F. Provide PLCs and HMI as specified in Section 13460 – Programmable Logic Controllers and Operator Interface Terminal, including hardware, associated software and software licenses.

G. Provide programming of PLCs and HMI to accomplish the control strategies described in Section 13465 – Control Strategies. Work shall include downloading and copying existing PLC and HMI programs, converting them to the new PLC and HMI software and incorporating the converted PLC program and graphic displays into the new PLC and HMI programs, respectively.

H. Schedule and conduct Factory Acceptance Tests (FAT) for the PSCP, PS No. 2 RIO Panel. FAT requirements shall be as specified in Section 13450 – Control Panels and Controls.

I. Furnish all field instrumentation as indicated in the Contract Documents. Field instrumentation shall include that specified in Section 13490 – Process Field Instrumentation. Provide the services of factory and/or manufacturer's representatives to conduct field calibration, startup and training as specified.

J. Disconnect analog signals from existing chart recorders and remove signal wiring. Remove chart recorders and turn them over to City. Provide resistors inside existing PLC Panel as required to allow signal circuits to be input to existing PLC for temporary period until new PLC panel is for taking out the existing chart recorder and

K. Existing analog circuits wire extension into new PLC: Before extending existing analog circuits coordinate with City/County to re-calibrate and verify accuracy of existing analog signal inputs to existing PLC, and verify that the signal values appear correctly on existing OIT. Disconnect analog signals from existing PLCs, and confirm that existing analog circuits length are sufficient to use same wiring inputs to new PLC in new PSCP. Coordinate with City for temporary outages to existing analog signals.

L. Document existing annunciator alarm points, disconnect existing annunciator panel and similar graphical screen to duplicate annunciator functionality on the new HMI based on data from the PLC.

M. Participate in field testing of pump controls, monitoring and control system and SCADA system (Communication with TCC).

N. Assist the Contractor in developing the construction schedule in order to incorporate submittals, and installation of the instrumentation and control systems and equipment in order to facilitate maintaining operation of the existing control system and associated pump equipment during the installation of the new instrumentation and control system.

O. Provide on-site emergency services during startup and initial operation of the instrumentation and control systems, and during warranty period. Emergency services shall be provided by a competent representative of the SI within 8 hours of verbal notification by the County to the Contractor of an emergency condition at the PS involving instrumentation, controls or data communications. An emergency condition shall include, but not be limited to such issues that would cause the City to lose functionality of one or more pumps at the PS, loss of PLC, or loss of data communications or data transfer via the SCADA system. It would not include loss of utility power to the site, or loss of utility communications to the site.

3.03 MANUFACTURER'S CERTIFICATE

A. The Systems Integrator shall furnish the Owner with a Manufacturer's Certificate. This certificate shall certify that the instrumentation and control system and associated components have been installed under either the continuous or periodic supervision of the manufacturer's authorized representatives. Certificate shall also state that the equipment and systems have been tested, adjusted and initially operated in the presence of the manufacturer's authorized representatives and are operating in accordance with the specified requirements to the manufacturer's satisfaction.

3.04 WARRANTY

A. The warranty shall provide for (a) a maximum of 8 hour time period between notification to Contractor of an emergency condition, and on site service for emergency failures, and (b) replacement of the defective component within one week if repairs cannot be affected during the site visit. A five (5) day response time for on site service shall be required for non-emergency failures. Commencement of five day period shall begin upon notification of the condition being given to the Contractor. The SI shall provide the work for instrumentation and control systems repairs and replacements under the warranty. This warranty shall cover a period of one year from the date of substantial completion of the project as defined and authorized by the County.

3.05 INSTALLATION

A. The Contractor shall install the instrumentation and control systems and all appurtenances in accordance with the manufacturer's recommendations, and under the supervision of the SI.

B. Installation of the instrumentation and control systems shall proceed according to the Contractor's approved schedule, and shall be in accordance with construction sequencing requirements contained in the Contract Documents.

C. Routine preventative maintenance that is suggested or required by the manufacturer of the instrumentation and control systems components shall be performed by the SI until substantial completion of the project is granted to the Contractor.

END OF SECTION

**SECTION 13450**

**CONTROL PANELS AND CONTROLS**

PARAGRAPH INDEX

## SECTION 13450

## CONTROL PANELS AND CONTROLS

**PART 1 -** GENERAL

1.01 SUMMARY

A. The Contractor shall provide all labor, materials, and tools as required to furnish and install instrumentation, enclosures, electrical components, PLC and corresponding components, terminals and wires for the Pump Station Control Panel (PSCP), the Remote I/O Panel (RIO), and the Backup Pressure Control Panel (BCPC).

B. All components, terminals and wires shall be UL recognized or UL listed and the panel or enclosure shall be UL labeled. Panels and enclosures furnished by the Systems Integrator (SI) shall be shipped to the site with UL labels.

C. All instruments and devices within the control panels shall be properly factory wired to terminal blocks. Wiring layout within the cabinet shall be neat, orderly, and shall comply with accepted standard practices.

D. Connections from the terminal blocks to external instruments and devices and to other panels shall be as shown on the Contract Drawings.

1.02 SUBMITTALS

A. Submittals shall be developed and submitted in accordance with Section 01900.

B. Detailed submittals complying with the requirements specified herein shall be submitted for the PSCP, the RCP, the VTP, the RIO, and any other control panel proposed to be furnished by the Contractor for this project.

C. Submit catalog data for control panels, including enclosures, controls, control stations, indicating lights, network devices, antenna, antenna cable, PLCs, I/O cards and accessories, terminal blocks, circuit breakers, fuses, surge suppressors, light fixtures, receptacles, UPS, control relays, timing relays, switches, nameplates, legend plates, component labels, patch panels, power supplies, current isolators, current signal splitters, solid state controllers, wireways and miscellaneous devices to be installed in the control panel, regardless of whether or not the component or device is specified. Catalog data submitted shall be project specific. Submit catalog data on all software, including software licenses (subsequent to approval of software). Provide a bill of materials for each control panel, including enclosures, subpanels, and control panel components, including quantities, tag number or label, description, manufacturer, and complete model number for each device. Provide list of interior and exterior panel nameplates and component labels.

D. Submit shop drawings for control panels including enclosures, exterior and interior elevations, dimensions, field wiring terminals, terminal designations and network diagrams. Submit complete copy of PLC program with documentation for review prior to scheduling a Factory Acceptance Test for the particular control panel. Elevations of panels and subpanels shall be submitted as scaled drawings indicating scale, dimensions, and layouts of all equipment and components. Scaled drawings shall indicate placement and size of equipment to be mounted on the corresponding panel and subpanel. Panel wiring diagrams shall indicate wiring and terminal identification numbers, discrete and analog signal surge suppressors, interposing relays for discrete outputs, line voltage surge suppression, power supplies, fuses and grounding. Indicate circuits, including I/O circuits, and components individually. Typical diagrams for multiple circuits will not be accepted. Shop drawings for individual control panels shall be submitted as part of a complete control panel submittal to include the specific catalog data and bill of materials for components to be installed in the particular control panel.

E. Catalog data and shop drawings for control panels shall be made as individual submittals, or, where it is desired to combine submittals, provide separate sections for each control panel. Where components are common for multiple panels, catalog data sheets for such components shall be included in each control panel submittal or submittal section. Submittals referencing common data sheets or list of components will not be accepted.

F. Provide detailed load calculations for each UPD. Include load calculations separately for each control panel submittal. Calculations for UPS shall show that the UPS being provided meets the requirement to supply power to the connected load for a minimum of two (2) hours.

G. Submit O&M Manuals for all control panels; manuals shall include approved control panel shop drawings, list of recommended spare parts, complete software and program documentation for each software package and program included in the control panel, and software license information, sales information replacement of major components, and maintenance information. Submit individual O&M Manuals for each control panel.

H. Submit a written, detailed control panel Factory Acceptance Test (FAT) procedure that meets the minimum requirements as specified herein for the FAT. Submit written notification of intent to conduct the FAT for a particular control panel or panels a minimum of 14 calendar days from date of proposed test.

Loop Drawings - Submit loop drawings to include each individual instrument and PLC I/O circuit. Loop drawings shall be developed using AutoCAD, version 2004 or later, and shall comply with the latest version of ISA 5.1 standards. Loop drawings shall be developed for all instrumentation and control loops and control panels. Loop drawings shall be broken into segments for a) Field, b) Control Panels and c) SCADA system. Field portion of drawings shall indicate all process and instrumentation equipment connected to the instrumentation and control system, as well as local control panels and motor controllers. Loop drawings shall indicate point and instrument tag numbers, control stations and indicating lights, terminal

blocks with block and terminal numbering, wire numbers and wiring for all instrumentation and control wiring, and for 120 VAC and 24 VDC control power wiring. Loop drawings shall also indicate instrumentation cable shield terminations and ground conductors and terminations. Loop drawings shall indicate Verizon wireless communication connections. Loop drawings shall include a schedule for all instruments and control points with the following information:

1. Tag No.
2. Type of Instrument or Point
3. Manufacturer
4. Model No. (if applicable)
5. Serial No. (if applicable)
6. Engineering Range and Units (analog points)
7. Output Signals

I. Record Drawings

1. Prepare and submit comprehensive as-built record drawings for all the instrumentation, controls, control panels and control work performed for the project.
2. Record drawings shall include control wiring diagrams and loop drawings with terminal numbers and all control devices identified. Loop drawings shall be one loop per sheet. Sheets shall be 8½ x 11 inches or 11 x 17 inches in size.
3. Record drawings shall indicate sizes and locations of all equipment and their control locations.
4. Record drawings for control panels shall contain internal and external ladder and point to point wiring schematics, with identified terminal numbers, relays and other control devices. 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 letter "T" under the line number. Instrument logic diagrams and schematics shall be prepared using the latest versions of ISA 5.1, IEEE 315 and 315A, and NEMA standard symbols and identification letters.

   Documentation - Provide complete documentation both in electronic media and hard copy of all programs and configurations provided on the project. Provide copies of programs via USB drives, 8 GB minimum memory storage, for all programs provided on the project. Provide documentation

of PLC register mapping for all PLC data registers to allow easy access over the Ethernet network.

J. The County or City will assign all IP addresses for PLC, network and communications equipment.

1.03 SPARE PARTS

A. Provide all spare parts as recommended by manufacturer(s).

1.04 WARRANTY

A. Contractor shall provide warranty for PLC's, HMI, I/O cards and network switches installed in the control panel for a period of five years.

**PART 2 -** MATERIALS

2.01 MATERIALS

A. Wires within the control panels: All wiring shall be made in horizontal and vertical runs, and groups of wires to and from common points shall be made in PVC wire ways or neatly harnessed and adequately supported.

1. AC Circuits:
   a. Type MTW or TFFN color coded stranded copper.
   b. Rated for 600 Volts, 105 degrees C.
   c. Sized for current to be carried, but not less than No. 18 AWG.
2. DC Circuits:
   a. Type MTW or TFFN color coded stranded copper.
   b. Rated for 600 Volts, 105 degrees C.
   c. Sized for current to be carried, but not less than No. 18 AWG.
3. Special Signal Circuits:
   a. Manufacturer's standard cables or manufacturer's recommended cables.
4. Wire Identification:
   a. Wire IDs shall be numbered and tagged at each end of termination.
   b. Tags shall be legible with machine printed markings and numbers.
   c. Tags shall be on heat shrinkable irradiated polyolefin that will not smudge or fade when printed. Adhesive or taped on tags are not acceptable.

B. Control Panel Terminal Blocks: Terminal blocks shall be provided for all external connections, plus a sufficient number of spares to provide no less than twenty percent (20%) extra terminals of each type (analog and discrete).

1. No more than two wires shall be connected to any one terminal.

2. Splices shall not be permitted in control panels; all wiring shall be terminated at terminal blocks.

3. Electrical power, control and alarm wiring shall be terminated in terminal block assemblies separate from blocks used for analog signal wiring.

4. All terminals shall be TS 32 DIN rail mountable. End plates shall be provided to isolate different signal types.

5. Marking System:

   Mark terminal block and terminal strip numbers as shown on the approved control panel shop drawings and approved loop drawings.

6. General Purpose Terminal Blocks:

   a. Rated Voltage: 600 Volts.

   b. Rated Current: 25 Amps.

   c. Wire Sizes: #26 to #10 AWG.

   d. Width: 0.25 inch maximum.

   e. Color: Beige or grey.

   f. Manufacturer: Weidmuller, Type SAK 2.5, or approved equal.

7. Ground Terminal Blocks:

   a. Wire Sizes: #26 to #10 AWG.

   b. Width: 0.25 inch maximum.

   c. Color: Beige.

   d. Manufacturer: Weidmuller, Type SAK 2.5, or approved equal.

8. Grounding:

   a. Copper grounding lug for signal and shield ground connections shall be provided.

   b. Ground the ground bus at a common signal ground point in accordance with National Electrical Code requirements.

   c. Ground terminal block rails to ground bus.

   d. Provide grounding for each analog signal loop:

      1) DC power supply common.

      2) Group and connect shields at PLC/I/O rack and tie to common panel ground.

C. Control Relays

1. Relays shall be provided where shown on the Contract Drawings, and where required, for isolation or signal switching. Interposing relays shall be installed for all PLC discrete outputs. Interposing relays for discrete outputs shall be provided with 24 VDC coils. Provide interposing repeater relays for multiplying contacts from discrete field signals for energizing panel indicating lights and providing discrete inputs to PLC. Repeater relays shall be provided with 24 VDC coils.

2. Switching relays shall use dry circuit type and shall incur no interruption of 4-20mA loops during switching. Gold plated contacts shall be supplied for all circuits requiring 4 - 20mA switching.

3. Relays shall be blade plug in type socket with screw terminal interface and DIN 35 rail mounted.

4. Relays shall be as manufactured by IDEC, RH Series or approved equal.

5. Control Circuit Relays:

   a. Type: Compact "Midget" general purpose plug in.

   b. Contact Configuration: SPDT unless otherwise noted.

   c. Contact Rating: 10A @ 28VDC or 240VAC.

   d. Contact Material: Silver cadmium oxide.

   e. Coil Voltage: As required.

   f. Power Consumption: 0.8 Watts (DC).

   g. Mechanical Life Expectancy: 50,000,000 operations.

   h. Electrical Life Expectancy: 500,000 operations.

   i. Indicator Type: LED.

D. Timing Relays

1. Relays shall be provided where shown on the Contract Drawings, and where required for timed switching functions. Coil voltage shall be 120 VAC or 24 VDC as required or shown.

2. Relays shall be as manufactured by IDEC, or approved equal.

3. Relays shall be plug in type with mounting socket with DPDT contact rated 5A @240 VAC.

4. Relays shall be UL Listed, on delay or off delay as required or shown on the Contract Drawings.

E. Power Supplies

1. Provide as required and indicated in control panels for powering of instruments that require external DC power, including PLCs and related equipment, operator interface terminal (OIT), transmitters and

communications equipment. Provide separate 24 VDC power supply for wetting voltage for discrete inputs to PLC, for providing power to 24 VDC interposing relays for discrete outputs from PLC, and for providing power to interposing repeater relays for discrete input signals.

2. Power supplies shall convert 120VAC, 60Hz power to 24VDC power with sufficient voltage regulation and ripple control to assure that instruments being supplied are operating within their required input power tolerance.

3. Output over voltage and over current protective devices shall be inherent of power supplies to protect instruments from damage due to power supply failure and to protect the power supply from damage due to external failure.

4. Performance Specifications – 24 VDC power supplies:

   a. Input Voltage: 120 - 500VAC.

   b. Input Frequency Range: 47 - 63Hz.

   c. Input current rating at 120 VAC input: 4.4 A

   d. Input line integral fuse: 6.3 A

   e. Output voltage residual ripple peak-peak, maximum: 50 mV

   f. Output voltage spike, peak to peak maximum: 200 mV

   g. Rated output current: 10 A

   h. Short circuit protection: 12 A

   i. LED indicators: One yellow for “overload”; one red for “latching shutdown”; one green for “24 V OK”

   j. Operating ambient temperature: 0 to 70 degrees C.

   k. Maximum startup delay: 1 second

   l. Output voltage adjustment: 24-28.8 VDC via potentiometer

   m. Power supply mounting should be in such a way that the dissipated t does not affect other components within the panel layout.

   n. All DC loads within the panel shall be fused.

   o. Power supplies shall be Model 6AG1334-3BA10-7AA0 as manufactured by Siemens, or equal.

F. Surge/Transient Protection (Line Surge Protection)

1. Transient Voltage Surge Suppression (TVSS) shall be provided to protect the components of the control, monitoring and communication equipment panels against damage due to electrical transients induced by lightning and nearby electrical systems.

2. All incoming AC sources shall be protected by the Cutler Hammer AEGIS HW style surge protector, or equal.

G. Surge/Transient Protection (Current Loop Surge Protection)

1. All analog wiring and I/O for transmitters, receivers, and related devices shall be protected by a Joslyn Model 1820 28, or equal. These devices shall be mounted within the control or monitoring panel and they shall protect the PLC equipment from damage.

2. Performance Specifications:

   a. Supply Voltage, Line to Line: 28V typical.

   b. Supply Voltage Line to Ground: 28V maximum.

   c. Minimum Life: >1000 operations with 200A, 10x1000 microseconds.

   d. Peak Clamping Voltage: At 5000A 8x20 microseconds. Surge and voltage rate of rise of 100kV/microsecond shall be 55V.

   e. Operating Temperature Rating: 40 to +100 degrees C.

   f. Manufacturer and Type: Joslyn Electronic Systems, Model 1820 28; or approved equal.

3. All analog wiring for transmitters, receivers and related devices shall be protected by a Joslyn Model 1669 06, or equal. These devices shall be mounted at the field device to protect the transmitter from damage.

4. Performance Specifications:

   a. Supply Voltage, Line to Line: 28V typical, 52V maximum.

   b. Supply Voltage Line to Ground: 28V maximum.

   c. Resistance Added to Loop: 44 ohms maximum.

   d. DC Clamping Level, Line to Ground: 33V ±10%.

   e. Operating Temperature Range: 40 to +100 degrees C.

   f. Impulse Clamping Level, Line to Line: 70V maximum.

   g. Impulse Clamping Level, Line to Ground: 50V maximum.

   h. Surge Life: 1,000 minutes at 500A; 10x1000 microseconds.

   i. Surge Life: 50 minutes at 10kA; 8x20 microseconds.

   j. Housing: 304 stainless steel pipe, one half inch inside diameter with cap on one end and one half inch 14NPT threads on the other end.

   k. Manufacturer and Type: Joslyn Electronic Systems, Model 1669 06.

   Digital I/O Surge Supression - All digital I/O connected to wiring entering or exiting building shall be provided with surge protection inside the control panel at the location of the field wiring terminals to protect the PLC equipment against transients and surges from field wiring.

   Data Communications Surge Protection - Data communications surge protection devices will be furnished and installed by Verizon in the SCADA Communications Panel.

H. Isolators

1. Provide 4 – wire signal isolators (I/I) in control panels for 4 - 20mA loops where required to prevent ground loop or loading problems, or to repeat signals to multiple locations.
2. Isolators shall have an input power of 120 VAC or 24VDC and be DIN rail mount.
3. Accuracy shall be ±0.10% over ambient temperature range of 0 50 degrees C.
4. Isolators shall allow for field adjustments of input signal offset and span.
5. Isolators shall be as manufactured by AGM, or approved equal.

I. Enclosures

1. Provide enclosures as indicated in the Contract Documents. Enclosures shall be freestanding with supporting legs if shown, or wall mounted with NEMA 4X rating.
2. Enclosures shall have the following features:
   a. Stainless steel
   b. seams.
   c. Seamless foam in place door gasket.
   d. Stainless steel hinges and quick release latches.
   e. 316SS padlocking hasp.
   f. Interior finish shall be manufacturer's standard.
   g. Condensation protection using thermostat and condensation heater.
   h. Stainless steel subpanel where specified or indicated on the Contract Drawings.

J. Miscellaneous Panel Equipment

1. Panel Lights:
   a. Internal panel lights shall be provided for each control panel enclosure. Provide one fixture for each side of double door enclosures.
   b. Light shall be a manual switched, LED type lighting package.
   c. Light shall be mounted internally at the top front of the enclosure.
   d. Light shall have a stainless steel wire guard for bulb protection.
   e. Provide bulb with light fixture.
   f. Manufacturer: Hoffman or equal.
2. Outlets:

a. Provide breaker protected 120V, 15A, GFCI duplex receptacles as indicated on the Contract Drawings for each enclosure.

b. Receptacles shall be mounted to subpanel.

3. Operator/Indicators:

a. Switches and pilot lights shall be Allen Bradley Bulletin 800T, 120 VAC or 24 VDC as required or indicated on the Contract Drawings.

b. Switch contact quantities shall be provided as required by circuit design.

c. Switch contacts shall be rated 6A at 120VAC as a minimum for 120 VAC indicating lights.

d. Pilot lights shall be full voltage type as required by circuit design.

e. Engraved legend plates shall be furnished as shown on the Contract Drawings.

f. The NEMA rating for the operator/indicators shall be 4/13 watertight/oiltight.

g. Install front of panel mounted devices in local control panels between 3 feet 2 inches and 5 feet 6 inches above finished floor.

K. Equipment Mounting

a. Provide six inch minimum clearance construction

b. Sealed between conduit and tubing entrances and the closest wiring trough or terminal strip.

2. All equipment mounted within the enclosure shall be easily accessible for servicing.

L. Conduit Penetrations

1. Conduits shall only enter control panel enclosures from the bottom of the enclosure. A suitable opening shall be factory fabricated in the bottom of the enclosure for conduit entry. Holes cut with a saw, torch, etc., in the field, shall not be acceptable. Conduit entrances shall be towards the rear of the enclosure to provide a shelf area on the bottom of the enclosure. Myers type hubs shall be used on all conduits entering NEMA 4X boxes and cabinets.

M. Fiber optic cable patch panels - provide patch panels in enclosures receiving fiber optic cables. Panels shall be rack mounted. Provide dual grounding lug and strain relief for support of fiber optic cable.

N. Pump Station Control Panel (PSCP), and Pump Station No. 2 Remote I/O Panel (RIO)

1. Control panels shall include: PLC, I/O cards, 24 VDC power supplies, circuit breakers, fuses, and all necessary devices required for control and monitoring the PS and associated equipment and as indicated on the Contract Drawings. PSCP shall be furnished by the Systems Integrator.

Panel shall be UL Listed and bear the UL label. PLC, RIO and HMI shall be furnished as specified in Section 13460.

2. Provide required input/output cards for all I/O points indicated in the Contract Documents. Provide a minimum of 20% spare I/O points of each type of point. Provide wiring from spare I/O points to field wiring terminal blocks for all spare I/O points, and label as spares.

3. Provide PLC rack with sufficient space and slots to accommodate all active and spare I/O points, network communication cards, power supplies, and a minimum of two spare card slots for future I/O cards.

4. Provide plastic wireways to neatly arrange all wiring at the panel. Provide separate wireways for internal and external wiring. Do not mix in the same wireway analog signals with digital signals or power signals.

5. All I/O card wiring shall be via terminal blocks. Multi-level terminal blocks may be used, but a three-level arrangement shall not be exceeded. All wiring shall be grouped by I/O card.

6. All digital input (DI) signals to the PLC shall be wetted using 24 VDC power; power shall be provided from the TMP control circuit with 24 VDC power supply dedicated to digital I/O. Each discrete input channel shall be provided with a fused terminal. All controls and control equipment shall be powered at 24 VDC as indicated on the Contract Drawings, unless otherwise specified.

7. Digital output (DO) cards shall be of relay type.

8. Analog input (AI) cards shall be of isolated type. The cards shall be wired in such a way that each point may be used for two-wire instruments or four-wire instruments without requiring additional internal wiring modifications at the panel. AI cards shall be rated for 4-20ma input signals.

9. Wiring inside panel shall be sized accordingly to enable each terminal door to close completely. Minimum wire size permitted for digital signals shall be #14 AWG. Minimum wire size permitted for analog signals shall be #18 AWG. Conductors shall be of stranded type.

10. Wire markers shall be placed at each wire end for identification of connection terminals. Each terminal shall also be labeled at both ends. All markers shall be machine generated.

11. Each PLC card shall be wired to a terminal block. Each terminal block shall be marked at the beginning (at the end bracket) with the terminal block name.

12. Grounding wires shall consist of minimum #12 AWG wire with 600V insulation. Wiring color shall be either green or green with yellow stripe.

13. Furnish grounding bus and provide enclosure grounding connection with the panel.

14. Provide connections of the rails and ground terminals to the grounding bus.

15. Jumpers between shielded terminals can be made with individual conductors, if required.

16. Provide ground straps between the enclosure and the panel.

17. Provide drawing (print) pocket, medium size, enclosure manufacturer's standard construction, mounted on the interior of each access door.

18. In addition to wiring all I/O cards to terminal blocks, Contractor shall provide a spare block of terminals (not wired) for each card type (DI, DO, AI, ETH) for future use.

19. Provide 24 VDC power supplies for field instruments requiring loop power, and for the main control panel control circuit, repeater relays, interposing relays for discrete outputs from PLC, and wetting voltage for discrete inputs to PLC.

20. Provide fuses on secondary of all 24 VDC power supplies.

21. Provide surge suppressors inside of panel on each individual digital input, digital output and analog input into the PLC where wiring enters or exits the building.

22. Use the following Weidmuller terminal blocks, or equal.

    a. For general power and general use terminal blocks type WDU-4.

    b. For grounding distribution use terminal blocks use type WPE-4.

    c. For fused terminal blocks for distribution power use type WSI-6.

    d. For each DI or DO signals use a fused double terminal block type KDKS-1.

    e. For each AI signal use two fused terminal block type KDKS. AI signals shall be wired in such a way that allows connection of 2 wire or 4 wire instruments without any internal change to the panel wiring.

23. Use Weidmuller or equal prefabricated jumpers rather than jumpers made at the shop with cables.

24. Provide a UPS for the control power circuits in the Panels. UPS shall have the following features:

    a. Rated output of 1500 watts

    b. Nominal output voltage of 120 VAC with less than 5% distortion at full load

    c. Output frequency of 60 Hz nominal, plus or minus 3 Hz

    d. Crest factor up to 5:1, sine wave output

    e. Minimum of nine (9) NEMA 5-15R output connections

    f. Input voltage of 120 VAC, 60 Hz plus or minus 3 Hz

    g. Input connections NEMA L5-30P

h. Eight (8) foot power cord with plug.

i. Transfer time range 2-3 ms

j. Sealed lead-acid battery with suspended electrolyte – leak proof

k. Battery recharge time three (3) hours

l. LED status display with load and battery bar graphs

m. Audible alarms for "on battery power" and "low battery"

n. Surge rating 880 Joules

o. Full time filtering: 0.3% IEEE surge let-through

p. Ethernet port; capable of data communications using Modbus TCP over Ethernet; capable of transmitting the following data, as a minimum: UPS battery voltage, UPS on battery power, UPS battery low and UPS fail.

q. UPS shall also be provided with a minimum of two (2) digital outputs; one for "Trouble" and one for "Fail."

r. UPS shall be provided with integral bypass circuit for automatically bypassing the UPS battery power, and providing "pass through" 120 VAC power. The bypass circuit shall also be capable of being selected manually.

s. UPS and battery packs shall be provided with 19" wide rack mounting. Provide APC Smart-UPS,120 VAC.

t. Provide shelf or mounting supports in control panel to support the UPS.

25. Provide nameplates on interior of panel for all components and equipment. Labels shall be permanent and clearly visible.

26. Panel shall have front access doors each with lockable, 3 point latching handle, key lockable type for opening and securing of doors. Panel dimensions shall be minimum size indicated on the Contract Drawings, but of sufficient size to house all equipment and wiring as shown and required. Provide minimum of four (4) keys for panel doors.

27. Provide a concrete equipment pad to support each floor mounted panel. Size of pad shall be sufficient to support the panel with minimum clearance around panel as indicated on the Contract Drawings.

O. Industrial Switches (Ethernet Switch Managed), Layer 2 Ethernet, DIN Rail Mount:

1. General:
   a. This Specification is provided to indicate minimum quality of components provided.
   b. Full compliance with IEEE 802.3.
   c. Supports Ethernet/Fast Ethernet 10/100/1000BASE-TX,1000BASE-SX, 1000BASE-LX.

d. Provide network switching for up to 8 Ethernet ports within a single chassis, and 2 uplink ports. Expandable to meet port requirements shown and listed.

2. Ports:
   a. 10/100 BASE-TX: 8 ports RJ-45 ports in main chassis, with expansion modules as required to meet port requirements.
   b. Two dual-purpose uplink ports, each with one 10/100/1000BASETX port and one small form-factor pluggable (SFP) gigabit port.
3. Management: Web interface, SNMP v1/v2/v3, RMON I and II.
4. Authentication and Security:
   a. SSH Protocol V2.
   b. SNMP V3.
   c. Port security (MAC-based and IP-based).
   d. IEEE 802.1x Port Security.
   e. DHCP snooping.
5. Redundancy:
   a. IEEE 802.1d STP.
6. Performance:
   a. 16 Gbps switching fabric.
   b. Forwarding rate based on 64-byte packets: 6.5 Mpps.
7. Physical Characteristics:
   a. DIN rail mountable.
   b. Operating Temperature: 32 to 113 degrees F.
   c. Input Power: 24 V dc.
8. Approvals:
   a. UL 508.
   b. UL to UL 60950, Third Edition.
9. Expansion Module:
   a. Port Type: Fast Ethernet Fiber or 10/100BASE-TX Copper as required.
   b. Ports: 8 of type required.
   c. Manufacturer and Product: Cisco; IE-3000-8FM= and Cisco IE-3000-TM=.
10. 1000BASE-SX/LX GBIC Interface Converters:
   a. Fiber Port Type: Multimode fiber.
   b. Provide mode conditioning patch cords for legacy fiber as required.
   c. c. Standards: Compliant with IEEE 802.3z.
   d. Operating Temperature Range: 0 to 40 degrees C.
   e. Manufacturer and Product: Cisco; 1000BASE-SX and 1000BASE-LX GBIC.
11. Manufacturer and Product:
   a. Cisco; IE3000-8TC with expansion modules and GBICs as required.
   b. Or approved equal.

**PART 3 -** EXECUTION

3.01 FACTORY ACCEPTANCE TESTS

A. A. The Systems Integrator (SI) shall provide a Factory Acceptance Test (FAT) for the control panels. Tests shall be conducted in accordance with the approved FAT plans. Panels shall not be shipped to the site without the corresponding approved FAT and approved FAT report. SI shall schedule FAT at least two weeks (14 calendar days) in advance of conductance of such tests, and shall schedule such tests with the County and the Contractor in writing. No control panel will be accepted at the job site without prior shipping approval by the County.

B. Panels shall be tested using simulation digital input signals with power input, digital outputs with a bell, and simulated analog input signals, and shall include testing of all components.

C. A minimum of two County personnel shall be allowed to witness each FAT at the System Integrator's panel shop.

D. All control panels provided under this or any other Section of these Specifications, shall be made available to be inspected by the Engineer and the County personnel prior to shipment from the manufacturer's shop. The Contractor shall include as part of this Section a Factory Acceptance Test for the control panels.

E. The Contractor shall verify the preparedness of the control panels for inspection and shall coordinate arrangements for the inspections.

1. The Contractor shall notify the Engineer and the County at least 14 calendar days in advance of any inspection date. The Engineer/County will confirm personnel availability or will request alternate dates within 7 calendar days.

2. Representatives of both the Contractor and the Systems Integrator shall accompany the County personnel during the inspections.

3. The Contractor shall prepare an inspection report for each control panel indicating the results of the inspection and the disposition determined by the County personnel, either acceptance, conditional acceptance or rejection. (Note: acceptance of the panel for shipment does not constitute final acceptance of the equipment by the County.).

4. Before shipment, perform factory testing at the manufacturer's facility to verify that control and instrumentation systems and components are functioning properly and that they meet the functional and performance requirements of the Contract Documents and the approved submittals.

5. The Contractor shall submit information delineating the factory testing procedures that will be performed to verify that testing shall fulfill the requirements as specified herein. Submittal shall be made in advance of any scheduled testing and shall include dates of scheduled tests.

6. Factory testing shall include the following verifications and operational checks as a minimum:

a. Complete verification of all wiring, piping, and system components to confirm that the control and instrumentation assemblies as fabricated conform to the reviewed submittals.

b. Operational testing of individual system components to verify proper operation of stand-alone units. Test shall include but not be limited to:

    1) AC/DC power checks.

    2) Power fail/restart checks.

    3) Operational function checks.

    4) Calibration checks.

c. Integrated system operational testing with all system components and assemblies interconnected and complete simulation of external discrete and analog input and output signals to demonstrate and verify:

    1) Signal loop calibration.

    2) Proper communications between system components.

    3) Proper functioning of components as an integrated system.

    4) Satisfactory performance of applications software operational and functional requirements under all conditions of operation (equipment start-up and shutdown, steady-state, transient and loss of signal conditions, and power fail and restart occurrences).

    5) Performance of system software development, configuration, utility, diagnostic, and security programs and functions.

    6) Component and integrated system testing shall be performed under power with same characteristics as at the final point of application.

## 3.02 TRAINING

The Contractor and Systems Integrator shall provide training on the specific PLC program and associated local networks, instrumentation, controls and associated documentation, PLC I/O, PLC and panel hardware, and configuration. No manufacturer's training is required for PLC hardware, network hardware, PLC programming software, and Ethernet hardware. Training shall consist of a minimum of two 8 hour days of on site training of County and/or City personnel.

END OF SECTION

**SECTION 13460**

**PROGRAMMABLE LOGIC CONTROLLER AND HUMAN MACHINE INTERFACE**

PARAGRAPH INDEX

## SECTION 13460

## 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 Towson Pump Station (PS) PLCs, associated PLC rack, I/O and network cards, PLC software, Remote I/O (RIO), 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 Section 13465 - Control Strategies.

1.02 SUBMITTALS

A. Submit the following Shop Drawings in accordance with Section 01900:

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.

B. Submit Operation and Maintenance Manuals for the PLCs, OIT, and associated PLC equipment.

C. Submit manufacturers' certification that the PLCs have been installed in accordance with manufacturers' instructions and requirements.

1.03 QUALITY ASSURANCE

A. Substitutions for named equipment will not be permitted if "or equal" is not stated.

### 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 by the SI in writing against defects in materials, workmanship and installation for a period of at least five (5) years following final acceptance of the complete programmable controller system. The warranty shall cover both parts 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 SI responsible for the system.

2.03 SERVICE MANUALS

A. The SI 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 County 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.

p. Glossary of technical terms used in the Engineer's Manual.

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 SI'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, the RIO Panel, and the RCP PLC, and to the associated PS control system. Control systems shall also be interfaced to the City SCADA 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. Systems integration 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 PSCP, RIO AND RCP PLC CONTROL SYSTEM HARDWARE AND COMPONENTS

A. PLCs

1. The PLC and RIO control system shall be mounted in the respective control panels as shown on the Contract Drawings. The PLCs shall communicate with the existing City SCADA System via a new Verizon TLS service communications link between the PS and the City's Telemetry Control Center (TCC). A backup wireless communications system shall also be provided. The PSCP PLC and RIO shall monitor and control the PS and associated power and instrumentation equipment. The RCP PLC shall be dedicated to logging analog signals that are re-transmitted from the signal recorders.

B. 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 SI under the direction of the Contractor, 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 a MS Windows 7 operating system, minimum. 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 County. PLC programming software shall be one of the following:

a. Modicon Unity Pro by AEG/Schneider Automation

b. Or approved equal.

3. The SI shall utilize the PLC products of the following manufacturer:

a. Modicon/AEG Schneider Automation.

b. Or approved equal.

4. All PLC products shall be furnished by the same manufacturer.

5. The PLC processors shall be M580 series by Modicon, or approved equal. PLC shall be provided with 512K minimum user memory and RS-232 and RS-485 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 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.

7. The PLCs shall include a minimum of one communication port for access from a portable laptop PC for programming and maintenance.

8. Provide 24 VDC input/output modules. Combination input/output modules shall not to be utilized. All modules shall be provided with plug-in type connectors so that field wiring does not have to be removed to replace a module. 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 16 point, 24 VDC cards, with interposing relay for each point..

   c. Analog Inputs: Provide 4-20 mA DC, 250 ohm maximum impedance cards, 8 point.

   d. Analog Outputs: Provide 4-20 mA DC, 8 point, with integral power supply to power the output analog signals.

   e. Ethernet Modules: RJ-45 connection on Ethernet port.

9. PLC chassis shall be provided with a minimum of 12 slots, and larger if required.

10. The PLC I/O modules shall be provided with a minimum 20% of spare I/O's for each type of I/O provided.

11. 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.

12. Provide a minimum of two (2) spare slots in PLC rack for future expansion. Provide all spare slots with slot fillers.

C. Instrumentation Power Supplies

1. The SI 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.

2. All instrumentation and control equipment shall be operated on the 120 VAC supply power from the UPS.

D. Human Machine Interface (HMI)

1. OIT hardware shall be 19" Harmony GTU HMI part number "HMIDT952" by Schneider Electric, or approved equal.

2. Operating System: Windows 7 embedded.

3. Display: 16M Colors, TFT, 1366X788 Pixels

4. Supply Voltage: 24VDC

5. Operating Temperature: 0-55°C, IP 67 rated

6. CPU: x86, 1.33GHz

7. Memory: 2GB ram

8. Additional Storage: 32 GB CFast Card

9. High level of communication with all embedded dual interfaces:

   a. 2 serial ports, up to 4 USB host ports, and 2 Gigabit Ethernet ports (Multi-link, Webserver and FTP, E-mail, Remote services)

   b. Embedded wireless Ethernet function in Access point mode or Station mode

10. Removable storage units for operating system easy save/restore, HMI application, and user data (SD memory cards, CFast cards, and USB memory stick management)

11. UL certification Industrial Control Equipment (UL508 and CSA 22.2 No.142)

**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 SI 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 SI's facility prior to shipment to the job site to verify that all system components function properly and perform as specified. This FAT shall be witnessed by a County representative(s). The Contractor shall submit written notice of the test to County two weeks prior to the test date and shall submit information on testing procedures to County at least one month prior to the test date. The FAT shall include, but not be limited to, the following:

Test input/output devices to verify operability and calibration.

1. Test all programmable controls to verify proper operation, including power fail/reset check, diagnostic tests and memory tests.
2. Test all controller programming to verify operation as specified.
3. Test communications between the PLC and the UPS, and PLC and Verizon TLS Module when available. Test for transmission/reception, signal strength and synchronization errors. Verify proper functioning of communications network and immunity to electrical noise. Testing of communications between the network and the SCADA system shall be performed as part of the field testing.
4. Test all peripheral devices and power supplies for proper operation.

B. Provide all testing and testing submittals in the form of a "PLC Test Checklist." Submit completed checklist with dates of completion for each task.

C. Provide calibration of all analog and discrete I/O as part of the "PLC Test Checklist".

END OF SECTION

| | | | | | | | | | | 5/3/2021 |
|---|---|---|---|---|---|---|---|---|---|---|
| **DIVISION 13 – SPECIAL CONSTRUCTION** | | | | | | | | | | |
| | | | | | | | | | | |
| **SECTION 13460** | | | | | | | | | | |
| **PROGRAMMABLE LOGIC CONTROLLER AND OPERATOR INTERFACE TERMINAL** | | | | | | | | | | |
| **CONTROL SYSTEM INPUT/OUTPUT POINT LIST** | | | | | | | | | | |
| | | | | | | | | | | |
| **NOTES:** | | | | | | | | | | |
| 1. REFER TO DRAWING NO. I-1 OF CONTRACT DRAWINGS FOR ABBREVIATIONS | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | **FIELD** |
| **EQUIPMENT/** | **POINT** | **POINT** | **TAG NO.** | **POINT DESCRIPTION** | **FROM** | **TO** | | | **RANGE/** | **CONNECTION** |
| **LOCATION** | **TYPE** | **NO.** | | | | | **SET (1)** | **RESET (0)** | **UNITS** | **POINT** |
| | | | | | | | | | | |
| **HARD WIRED PLC AND RIO I/O POINTS** | | | | | | | | | | |
| | | | | | | | | | | |
| **PS NO. 2 RIO** | | | | | | | | | | |
| **DISCRETE INPUTS** | | | | | | | | | | |
| | | | | | | | | | | |
| BACKUP PRESSURE CONTROL PANEL (BPCP-2) | DI | DI-R1 | HS-A-530 | BACKUP PRESSURE CONTROL - PUMP C SELECTED | BPCP PS NO. 2 | RIO IN PS NO. 2 | ENABLED | DISABLED | | BPCP PS NO. 2 |
| BACKUP PRESSURE CONTROL PANEL (BPCP-2) | DI | DI-R2 | HS-B-530 | BACKUP PRESSURE CONTROL - PUMP D SELECTED | BPCP PS NO. 2 | RIO IN PS NO. 2 | ENABLED | DISABLED | | BPCP PS NO. 2 |
| BACKUP PRESSURE CONTROL PANEL (BPCP-2) | DI | DI-R3 | YN-A-530 | BACKUP PRESSURE CONTROL ENABLED | BPCP PS NO. 2 | RIO IN PS NO. 2 | ENABLED | DISABLED | | BPCP PS NO. 2 |
| BACKUP PRESSURE CONTROL PANEL (BPCP-2) | DI | DI-R4 | YN-B-530 | BACKUP PRESSURE CONTROL DISABLED | BPCP PS NO. 2 | RIO IN PS NO. 2 | ENABLED | DISABLED | | BPCP PS NO. 2 |
| BACKUP PRESSURE CONTROL PANEL (BPCP-2) | DI | DI-R5 | PAL-541 | PS NO. 2 DISCHARGE PRESSURE LOW | PSL-541/BPCP IN PS NO.2 | RIO IN PS NO. 2 | ALARM | -- | | BPCP PS NO. 2 |
| BACKUP PRESSURE CONTROL PANEL (BPCP-2) | DI | DI-R6 | MN-530 | BACKUP CONTROL ACTIVE | BPCP PS NO. 2 | RIO IN PS NO. 2 | ACTIVE | IN ACTIVE | | BPCP PS NO. 2 |
| EX. SURGE RELIEF VALVE 541A | DI | DI-R7 | ZNH-541A | PS NO. 2 DISCHARGE LINE SURGE | ZSH-541A | RIO IN PS NO. 2 | ALARM | -- | | ZSH-541A |
| EX. SURGE RELIEF VALVE 541B | DI | DI-R8 | ZNH-541B | PS NO. 2 DISCHARGE LINE SURGE | ZSH-541B | RIO IN PS NO. 2 | ALARM | -- | | ZSH-541B |
| EX. SURGE RELIEF VALVE 541C | DI | DI-R9 | ZNH-541C | PS NO. 2 DISCHARGE LINE SURGE | ZSH-541C | RIO IN PS NO. 2 | ALARM | -- | | ZSH-541C |
| UPS-3 IN RIO PANEL | DI | DI-R10 | HSN-500 | RIO CONTROL CIRCUIT ON MANUAL BYPASS OF UPS | HS-500 | RIO IN PS NO. 2 | BYPASS | UPS | | HS-500 IN RIO PANEL |
| | | | | | | | | | | |
| **DISCRETE OUTPUTS** | | | | | | | | | | |
| | | | | | | | | | | |
| None | | | | | | | | | | |
| | | | | | | | | | | |
| **ANALOG INPUTS** | | | | | | | | | | |
| | | | | | | | | | | |
| SUCTION PRESSURE TRANSMITTER | AI | AI-R1 | PI-540 | PS NO. 2 SUCTION HEADER PRESSURE | PIT-540 | RIO IN PS NO. 2 | - | - | 0-30 PSIG | PIT-540 |
| DISCHARGE PRESSURE TRANSMITTER | AI | AI-R2 | PI-541 | PS NO. 2 DISCHARGE HEADER PRESSURE | PIT-541 | RIO IN PS NO. 2 | - | - | 0-100 PSIG | PIT-541 |

**DIVISION 13 – SPECIAL CONSTRUCTION**

**SECTION 13460**

**PROGRAMMABLE LOGIC CONTROLLER AND OPERATOR INTERFACE TERMINAL**

**CONTROL SYSTEM INPUT/OUTPUT POINT LIST**

**NOTES:**

1. REFER TO DRAWING NO. I-1 OF CONTRACT DRAWINGS FOR ABBREVIATIONS

| EQUIPMENT/ LOCATION | POINT TYPE | POINT NO. | TAG NO. | POINT DESCRIPTION | FROM | TO | SET (1) | RESET (0) | RANGE/ UNITS | FIELD CONNECTION POINT |
|---|---|---|---|---|---|---|---|---|---|---|
| PS NO. 2 DISCHARGE FLOW METER | AI | AI-R3 | FI-542 | PS NO. 2 DISCHARGE FLOW | FIT-542 | RIO IN PS NO. 2 | - | - | 0-30 MGD | FIT-542 |
| **ANALOG OUTPUTS** | | | | | | | | | | |
| None | | | | | | | | | | |
| **PS NO. 3 PSCP PLC** | | | | | | | | | | |
| **DISCRETE INPUTS** | | | | | | | | | | |
| BACKUP PRESSURE CONTROL PANEL (BPCP-3) | DI | DI-1 | HS-A-630 | BACKUP PRESSURE CONTROL - PUMP E SELECTED | BPCP PS NO. 3 | PSCP | ENABLED | DISABLED | | BPCP PS NO. 3 |
| BACKUP PRESSURE CONTROL PANEL (BPCP-3) | DI | DI-2 | HS-B-630 | BACKUP PRESSURE CONTROL - PUMP F SELECTED | BPCP PS NO. 3 | PSCP | ENABLED | DISABLED | | BPCP PS NO. 3 |
| BACKUP PRESSURE CONTROL PANEL (BPCP-3) | DI | DI-3 | HS-C-630 | BACKUP PRESSURE CONTROL - PUMP G SELECTED | BPCP PS NO. 3 | PSCP | ENABLED | DISABLED | | BPCP PS NO. 3 |
| BACKUP PRESSURE CONTROL PANEL (BPCP-3) | DI | DI-4 | YN-A-630 | BACKUP PRESSURE CONTROL ENABLED | BPCP PS NO. 3 | PSCP | ENABLED | DISABLED | | BPCP PS NO. 3 |
| BACKUP PRESSURE CONTROL PANEL (BPCP-3) | DI | DI-5 | YN-B-630 | BACKUP PRESSURE CONTROL DISABLED | BPCP PS NO. 3 | PSCP | ENABLED | DISABLED | | BPCP PS NO. 3 |
| BACKUP PRESSURE CONTROL PANEL (BPCP-3) | DI | DI-6 | PAL-641 | PS NO. 3 DISCHARGE PRESSURE LOW | PSL-641/BPCP IN PS NO.2 | PSCP | ALARM | -- | | BPCP PS NO. 3 |
| BACKUP PRESSURE CONTROL PANEL (BPCP-3) | DI | DI-7 | MN-630 | BACKUP CONTROL ACTIVE | BPCP PS NO. 3 | PSCP | ACTIVE | IN ACTIVE | | BPCP PS NO. 3 |
| SURGE RELIEF VALVE 641A | DI | DI-8 | ZNH-641A | PS NO. 3 DISCHARGE LINE SURGE | ZSH-641A | PSCP | ALARM | -- | | ZSH-641A |
| SURGE RELIEF VALVE 641B | DI | DI-9 | ZNH-641B | PS NO. 3 DISCHARGE LINE SURGE | ZSH-641B | PSCP | ALARM | -- | | ZSH-641B |
| SURGE RELIEF VALVE 641C | DI | DI-10 | ZNH-641C | PS NO. 3 DISCHARGE LINE SURGE | ZSH-641C | PSCP | ALARM | -- | | ZSH-641C |
| EX. LOR SELECTOR SWITCH PUMP C STARTER | DI | DI-11 | HSN-630A | PUMP C MOTOR STARTER LOR IN "LOCAL" | EX. PUMP C MOTOR STARTER | PSCP | LOCAL | REMOTE | | EX. LOR SS IN MV MCC |
| LOR SELECTOR SWITCH PUMP D STARTER | DI | DI-12 | HSN-631A | PUMP D MOTOR STARTER LOR IN "LOCAL" | EX. PUMP D MOTOR STARTER | PSCP | LOCAL | REMOTE | | EX. LOR SS IN MV MCC |

| | | | | | | | | | | 5/3/2021 |
|---|---|---|---|---|---|---|---|---|---|---|
| **DIVISION 13 – SPECIAL CONSTRUCTION** | | | | | | | | | | |
| | | | | | | | | | | |
| **SECTION 13460** | | | | | | | | | | |
| **PROGRAMMABLE LOGIC CONTROLLER AND OPERATOR INTERFACE TERMINAL** | | | | | | | | | | |
| **CONTROL SYSTEM INPUT/OUTPUT POINT LIST** | | | | | | | | | | |
| | | | | | | | | | | |
| **NOTES:** | | | | | | | | | | |
| 1. REFER TO DRAWING NO. I-1 OF CONTRACT DRAWINGS FOR ABBREVIATIONS | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | **FIELD** |
| **EQUIPMENT/** | **POINT** | **POINT** | **TAG NO.** | **POINT DESCRIPTION** | **FROM** | **TO** | | | **RANGE/** | **CONNECTION** |
| **LOCATION** | **TYPE** | **NO.** | | | | | **SET (1)** | **RESET (0)** | **UNITS** | **POINT** |
| EX. LOR SELECTOR SWITCH PUMP E STARTER | DI | DI-13 | HSN-632A | PUMP E MOTOR STARTER LOR IN "LOCAL" | PUMP E MOTOR STARTER | PSCP | LOCAL | REMOTE | | EX. LOR SS IN MV MCC |
| EX. LOR SELECTOR SWITCH PUMP F STARTER | DI | DI-14 | HSN-633A | PUMP F MOTOR STARTER LOR IN "LOCAL" | PUMP F MOTOR STARTER | PSCP | LOCAL | REMOTE | | EX. LOR SS IN MV MCC |
| EX. LOR SELECTOR SWITCH PUMP G STARTER | DI | DI-15 | HSN-634A | PUMP G MOTOR STARTER LOR IN "LOCAL" | PUMP G MOTOR STARTER | PSCP | LOCAL | REMOTE | | EX. LOR SS IN MV MCC |
| EX. PUMP C MOTOR STARTER | DI | DI-16 | MN-630A | PUMP C RUNNING | EX. PUMP C MOTOR STARTER | PSCP | RUN | -- | | EX. SS IN MV MCC |
| EX. PUMP C MOTOR STARTER | DI | DI-17 | MN-630B | PUMP C STOPPED | EX. PUMP C MOTOR STARTER | PSCP | STOPPED | -- | | EX. SS IN MV MCC |
| EX. PUMP D MOTOR STARTER | DI | DI-18 | MN-631A | PUMP D RUNNING | EX. PUMP D MOTOR STARTER | PSCP | RUN | -- | | EX. SS IN MV MCC |
| EX. PUMP D MOTOR STARTER | DI | DI-19 | MN-631B | PUMP D STOPPED | PUMP D MOTOR STARTER | PSCP | STOPPED | -- | | EX. SS IN MV MCC |
| EX. PUMP E MOTOR STARTER | DI | DI-20 | MN-632A | PUMP E RUNNING | PUMP E MOTOR STARTER | PSCP | RUN | -- | | EX. SS IN MV MCC |
| EX. PUMP E MOTOR STARTER | DI | DI-21 | MN-632B | PUMP E STOPPED | PUMP E MOTOR STARTER | PSCP | STOPPED | -- | | EX. SS IN MV MCC |
| EX. PUMP F MOTOR STARTER | DI | DI-22 | MN-633A | PUMP F RUNNING | PUMP F MOTOR STARTER | PSCP | RUN | -- | | EX. SS IN MV MCC |
| EX. PUMP F MOTOR STARTER | DI | DI-23 | MN-633B | PUMP F STOPPED | PUMP F MOTOR STARTER | PSCP | STOPPED | -- | | EX. SS IN MV MCC |
| EX. PUMP G MOTOR STARTER | DI | DI-24 | MN-634A | PUMP G RUNNING | PUMP G MOTOR STARTER | PSCP | RUN | -- | | EX. SS IN MV MCC |
| EX. PUMP G MOTOR STARTER | DI | DI-25 | MN-634B | PUMP G STOPPED | PUMP G MOTOR STARTER | PSCP | STOPPED | -- | | EX. SS IN MV MCC |
| EX. PUMP C MOTOR STARTER | DI | DI-26 | UN-630 | PUMP C MOTOR STARTER 86 RELAY LOCKOUT | EX. UY-630 | PSCP | PUMP LOCKOUT | -- | | EX. SS IN MV MCC |
| EX. PUMP D MOTOR STARTER | DI | DI-27 | UN-631 | PUMP D MOTOR STARTER 86 RELAY LOCKOUT | EX. UY-631 | PSCP | PUMP LOCKOUT | -- | | EX. SS IN MV MCC |
| EX. PUMP E MOTOR STARTER | DI | DI-28 | UN-632 | PUMP E MOTOR STARTER 86 RELAY LOCKOUT | EX. UY-632 | PSCP | PUMP LOCKOUT | -- | | EX. SS IN MV MCC |
| EX. PUMP F MOTOR STARTER | DI | DI-29 | UN-633 | PUMP F MOTOR STARTER 86 RELAY LOCKOUT | EX. UY-633 | PSCP | PUMP LOCKOUT | -- | | EX. SS IN MV MCC |
| EX. PUMP G MOTOR STARTER | DI | DI-30 | UN-634 | PUMP G MOTOR STARTER 86 RELAY LOCKOUT | EX. UY-634 | PSCP | PUMP LOCKOUT | -- | | EX. SS IN MV MCC |
| EX. PUMP C MOTOR STARTER | DI | DI-31 | ZNO-630 | PUMP C DISCHARGE CONE VALVE OPEN | ZSC-630 | PSCP | VALVE OPEN | -- | | EX. SS IN MV MCC |
| EX. PUMP C MOTOR STARTER | DI | DI-32 | ZNC-630 | PUMP C DISCHARGE CONE VALVE CLOSED | ZSO-630 | PSCP | VALVE CLOSED | -- | | EX. SS IN MV MCC |
| EX. PUMP D MOTOR STARTER | DI | DI-33 | ZNO-631 | PUMP D DISCHARGE CONE VALVE OPEN | ZSC-631 | PSCP | VALVE OPEN | -- | | EX. SS IN MV MCC |

| | | | | | | | | | | 5/3/2021 |
|---|---|---|---|---|---|---|---|---|---|---|
| **DIVISION 13 – SPECIAL CONSTRUCTION** | | | | | | | | | | |
| | | | | | | | | | | |
| **SECTION 13460** | | | | | | | | | | |
| **PROGRAMMABLE LOGIC CONTROLLER AND OPERATOR INTERFACE TERMINAL** | | | | | | | | | | |
| **CONTROL SYSTEM INPUT/OUTPUT POINT LIST** | | | | | | | | | | |
| | | | | | | | | | | |
| **NOTES:** | | | | | | | | | | |
| 1. REFER TO DRAWING NO. I-1 OF CONTRACT DRAWINGS FOR ABBREVIATIONS | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | **FIELD** |
| **EQUIPMENT/** | **POINT** | **POINT** | **TAG NO.** | **POINT DESCRIPTION** | **FROM** | **TO** | | | **RANGE/** | **CONNECTION** |
| **LOCATION** | **TYPE** | **NO.** | | | | | **SET (1)** | **RESET (0)** | **UNITS** | **POINT** |
| EX. PUMP D MOTOR STARTER | DI | DI-34 | ZNC-631 | PUMP D DISCHARGE CONE VALVE CLOSED | ZSC-631 | PSCP | VALVE CLOSED | -- | | EX. SS IN MV MCC |
| EX. PUMP E MOTOR STARTER | DI | DI-35 | ZNO-632 | PUMP E DISCHARGE CONE VALVE OPEN | EX. ZSO-632 | PSCP | VALVE OPEN | -- | | EX. SS IN MV MCC |
| EX. PUMP E MOTOR STARTER | DI | DI-36 | ZNC-632 | PUMP E DISCHARGE CONE VALVE CLOSED | EX. ZSC-632 | PSCP | VALVE CLOSED | -- | | EX. SS IN MV MCC |
| EX. PUMP F MOTOR STARTER | DI | DI-37 | ZNO-633 | PUMP F DISCHARGE CONE VALVE OPEN | EX. ZSO-633 | PSCP | VALVE OPEN | -- | | EX. SS IN MV MCC |
| EX. PUMP F MOTOR STARTER | DI | DI-38 | ZNC-633 | PUMP F DISCHARGE CONE VALVE CLOSED | EX. ZSC-633 | PSCP | VALVE CLOSED | -- | | EX. SS IN MV MCC |
| EX. PUMP G MOTOR STARTER | DI | DI-39 | ZNO-634 | PUMP G DISCHARGE CONE VALVE OPEN | ZSO-634 | PSCP | VALVE OPEN | -- | | EX. SS IN MV MCC |
| EX. PUMP G MOTOR STARTER | DI | DI-40 | ZNC-634 | PUMP G DISCHARGE CONE VALVE CLOSED | ZSC-634 | PSCP | VALVE CLOSED | -- | | EX. SS IN MV MCC |
| EX. RESERVOIR EAST INFLUENT VALVE | DI | DI-41 | ZNO-695 | RESERVOIR EAST INFLUENT VALVE OPEN STATUS | EX. LIMIT SWITCH ON VALVE | PSCP | VALVE OPEN | -- | | NEW PSCP (VIA TB) |
| EX. RESERVOIR EAST INFLUENT VALVE | DI | DI-42 | ZNC-695 | RESERVOIR EAST INFLUENT VALVE CLOSED STATUS | EX. LIMIT SWITCH ON VALVE | PSCP | VALVE CLOSED | -- | | NEW PSCP (VIA TB) |
| EX. LOR SELECTOR SWITCH IN VCP | DI | DI-43 | HSN-695A | RESERVOIR EAST INFLUENT VALVE LOR SWITCH IN HAND POSITION | EX. VCP | PSCP | IN REMOTE | -- | | NEW PSCP (VIA TB) |
| EX. PNL-PLC SELECTOR SWITCH IN VCP | DI | DI-44 | HSN-695B | RESERVOIR EAST INFLUENT VALVE PNL-PLC SWITCH IN PLC POSITION | EX. VCP | PSCP | IN PLC | -- | | NEW PSCP (VIA TB) |
| EX. RESERVOIR WEST INFLUENT VALVE | DI | DI-45 | ZNO-696 | RESERVOIR WEST INFLUENT VALVE OPEN STATUS | EX. LIMIT SWITCH ON VALVE | PSCP | VALVE OPEN | -- | | NEW PSCP (VIA TB) |
| EX. RESERVOIR WEST INFLUENT VALVE | DI | DI-46 | ZNC-696 | RESERVOIR WEST INFLUENT VALVE CLOSED STATUS | EX. LIMIT SWITCH ON VALVE | PSCP | VALVE CLOSED | -- | | NEW PSCP (VIA TB) |
| EX. LOR SELECTOR SWITCH IN VCP | DI | DI-47 | HSN-696A | RESERVOIR WEST INFLUENT VALVE LOR SWITCH IN REMOTE POSITION | EX. VCP | PSCP | IN REMOTE | -- | | NEW PSCP (VIA TB) |
| EX. PNL-PLC SELECTOR SWITCH IN VCP | DI | DI-48 | HSN-696B | RESERVOIR WEST INFLUENT VALVE PNL-PLC SWITCH IN PLC POSITION | EX. VCP | PSCP | IN PLC | -- | | NEW PSCP (VIA TB) |
| EX. RESERVOIR EAST EFFLUENT VALVE | DI | DI-49 | ZNO-697 | RESERVOIR EAST EFFLUENT VALVE OPEN STATUS | EX. LIMIT SWITCH ON VALVE | PSCP | VALVE OPEN | -- | | NEW PSCP (VIA TB) |
| EX. RESERVOIR EAST EFFLUENT VALVE | DI | DI-50 | ZNC-697 | RESERVOIR EAST EFFLUENT VALVE CLOSED STATUS | EX. LIMIT SWITCH ON VALVE | PSCP | VALVE CLOSED | -- | | NEW PSCP (VIA TB) |

| | | | | | | | | | | 5/3/2021 |
|---|---|---|---|---|---|---|---|---|---|---|
| **DIVISION 13 – SPECIAL CONSTRUCTION** | | | | | | | | | | |
| | | | | | | | | | | |
| **SECTION 13460** | | | | | | | | | | |
| **PROGRAMMABLE LOGIC CONTROLLER AND OPERATOR INTERFACE TERMINAL** | | | | | | | | | | |
| **CONTROL SYSTEM INPUT/OUTPUT POINT LIST** | | | | | | | | | | |
| | | | | | | | | | | |
| **NOTES:** | | | | | | | | | | |
| 1. REFER TO DRAWING NO. I-1 OF CONTRACT DRAWINGS FOR ABBREVIATIONS | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | **FIELD** |
| **EQUIPMENT/** | **POINT** | **POINT** | **TAG NO.** | **POINT DESCRIPTION** | **FROM** | **TO** | | | **RANGE/** | **CONNECTION** |
| **LOCATION** | **TYPE** | **NO.** | | | | | **SET (1)** | **RESET (0)** | **UNITS** | **POINT** |
| EX. LOR SELECTOR SWITCH IN VCP | DI | DI-51 | HN-697A | RESERVOIR EAST EFFLUENT VALVE LOR SWITCH IN REMOTE POSITION | EX. VCP | PSCP | IN REMOTE | -- | | NEW PSCP (VIA TB) |
| EX. PNL-PLC SELECTOR EX. SWITCH IN VCP | DI | DI-52 | HN-697B | RESERVOIR EAST EFFLUENT VALVE PNL-PLC SWITCH IN PLC POSITION | EX. VCP | PSCP | IN PLC | -- | | NEW PSCP (VIA TB) |
| EX. RESERVOIR WEST EFFLUENT VALVE | DI | DI-53 | ZNO-698 | RESERVOIR WEST EFFLUENT VALVE OPEN STATUS | EX. LIMIT SWITCH ON VALVE | PSCP | VALVE OPEN | -- | | NEW PSCP (VIA TB) |
| EX. RESERVOIR WEST EFFLUENT VALVE | DI | DI-54 | ZNC-698 | RESERVOIR WEST EFFLUENT VALVE CLOSED STATUS | EX. LIMIT SWITCH ON VALVE | PSCP | VALVE CLOSED | -- | | NEW PSCP (VIA TB) |
| EX. LOR SELECTOR SWITCH IN VCP | DI | DI-55 | HSN-698A | RESERVOIR WEST EFFLUENT VALVE LOR SWITCH IN REMOTE POSITION | EX. VCP | PSCP | IN REMOTE | -- | | NEW PSCP (VIA TB) |
| EX. PNL-PLC SELECTOR SWITCH IN VCP | DI | DI-56 | HSN-698B | RESERVOIR WEST EFFLUENT VALVE PNL-PLC SWITCH IN PLC POSITION | EX. VCP | PSCP | IN PLC | -- | | NEW PSCP (VIA TB) |
| EX. RESERVOIR BUTTERFLY VALVE | DI | DI-57 | ZNO-699 | RESERVOIR BUTTERFLY VALVE OPEN STATUS | EX. LIMIT SWITCH ON VALVE | PSCP | VALVE OPEN | -- | | NEW PSCP (VIA TB) |
| EX. RESERVOIR BUTTERFLY VALVE | DI | DI-58 | ZNC-699 | RESERVOIR BUTTERFLY VALVE CLOSED STATUS | EX. LIMIT SWITCH ON VALVE | PSCP | VALVE CLOSED | -- | | NEW PSCP (VIA TB) |
| EX. LOR SELECTOR SWITCH IN VCP | DI | DI-59 | HSN-699A | RESERVOIR BUTTERFLY VALVE LOR SWITCH IN REMOTE POSITION | EX. VCP | PSCP | IN REMOTE | -- | | NEW PSCP (VIA TB) |
| EX. PNL-PLC SELECTOR SWITCH IN VCP | DI | DI-60 | HSN-699B | RESERVOIR BUTTERFLY VALVE PNL-PLC SWITCH IN PLC POSITION | EX. VCP | PSCP | IN PLC | -- | | NEW PSCP (VIA TB) |
| EX. INFL. CHL. VAULT | DI | DI-61 | XA-645A | INFL. CHL. VAULT SODIUM HYPO. LEAK | EX. XSH-645A | PSCP | ALARM | -- | | NEW PSCP (VIA TB) |
| EX. INFL. CHL. VAULT | DI | DI-62 | LSH-645A | INFL. CHL. VAULT FLOOD | EX. LSHH-645A | PSCP | ALARM | -- | | NEW PSCP (VIA TB) |
| EX. EFFL. CHL. VAULT | DI | DI-63 | XA-645B | EFFL. CHL. VAULT SODIUM HYPO. LEAK | EX. XSH-645B | PSCP | ALARM | -- | | NEW PSCP (VIA TB) |
| EX. EFFL. CHL. VAULT | DI | DI-64 | LSH-645B | EFFL. CHL. VAULT FLOOD | EX. LSHH-645B | PSCP | ALARM | -- | | NEW PSCP (VIA TB) |
| EX. INFL. WEST VAULT | DI | DI-65 | LAHH-681 | INFL. WEST VAULT FLOOD | EX. LSHH-681 | PSCP | ALARM | -- | | NEW PSCP (VIA TB) |

| | | | | | | | | | | 5/3/2021 |
|---|---|---|---|---|---|---|---|---|---|---|
| **DIVISION 13 – SPECIAL CONSTRUCTION** | | | | | | | | | | |
| | | | | | | | | | | |
| **SECTION 13460** | | | | | | | | | | |
| **PROGRAMMABLE LOGIC CONTROLLER AND OPERATOR INTERFACE TERMINAL** | | | | | | | | | | |
| **CONTROL SYSTEM INPUT/OUTPUT POINT LIST** | | | | | | | | | | |
| | | | | | | | | | | |
| **NOTES:** | | | | | | | | | | |
| 1. REFER TO DRAWING NO. I-1 OF CONTRACT DRAWINGS FOR ABBREVIATIONS | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | **FIELD** |
| **EQUIPMENT/** | **POINT** | **POINT** | **TAG NO.** | **POINT DESCRIPTION** | **FROM** | **TO** | | | **RANGE/** | **CONNECTION** |
| **LOCATION** | **TYPE** | **NO.** | | | | | **SET (1)** | **RESET (0)** | **UNITS** | **POINT** |
| EX. INFL. EAST VAULT | DI | DI-66 | LAHH-682 | INFL. EAST VAULT FLOOD | EX. LSHH-682 | PSCP | ALARM | -- | | NEW PSCP (VIA TB) |
| EX. EFFL. WEST VAULT | DI | DI-67 | LAHH-683 | EFFL. WEST VAULT FLOOD | EX. LSHH-683 | PSCP | ALARM | -- | | NEW PSCP (VIA TB) |
| EX. EFFL. EAST VAULT | DI | DI-68 | LAHH-684 | EFFL. EAST VAULT FLOOD | EX. LSHH-684 | PSCP | ALARM | -- | | NEW PSCP (VIA TB) |
| EX. WEST RESERVOIR | DI | DI-69 | LAHH-650B | WEST RESERVOIR OVERFLOW | EX. LSHH-650B | PSCP | ALARM | -- | | NEW PSCP (VIA TB) |
| EX. WEST RESERVOIR | DI | DI-70 | ZAH-650B | WEST RESERVOIR FLAP GATE ALARM | EX. ZSH-650B | PSCP | ALARM | -- | | NEW PSCP (VIA TB) |
| EX. EAST RESERVOIR | DI | DI-71 | LAHH-650A | EAST RESERVOIR OVERFLOW | EX. LSHH-650A | PSCP | ALARM | -- | | NEW PSCP (VIA TB) |
| EX. EAST RESERVOIR | DI | DI-72 | ZAH-650A | EAST RESERVOIR FLAP GATE ALARM | EX. ZSH-650A | PSCP | ALARM | -- | | NEW PSCP (VIA TB) |
| EX. UNDRN. VAULT | DI | DI-73 | LAHH-687 | UNDERDRAIN VAULT FLOOD | EX. LSHH-687 | PSCP | ALARM | -- | | NEW PSCP (VIA TB) |
| EX. BTFLY VALVE VAULT | DI | DI-74 | LAHH-685 | BUTTERFLY VALVE VAULT FLOOD | EX. LSHH-685 | PSCP | ALARM | -- | | NEW PSCP (VIA TB) |
| EX. 2.4 KV MCC | DI | DI-75 | IAH-701 | 2.4 KV MCC BUS A GROUND FAULT | EX. GF RELAY BUS A | PSCP | ALARM | -- | | NEW PSCP (VIA TB) |
| EX. 2.4 KV MCC | DI | DI-76 | IAH-702 | 2.4 KV MCC BUS B GROUND FAULT | EX. GF RELAY BUS B | PSCP | ALARM | -- | | NEW PSCP (VIA TB) |
| PSCP | DI | DI-77 | HSN-600A | RTU CONTROL ENABLED - DISABLED | HS-600A | PSCP | ENABLED | DISABLED | | HS-600A IN PSCP |
| PSCP | DI | DI-78 | HSN-600B | AUXILLIARY CONTROL ACTIVE - DISABLED | HS-600B | PSCP | ACTIVE | DISABLED | | HS-600B IN PSCP |
| UPS-1 IN PSCP | DI | DI-79 | HSN-600C | PSCP CONTROL CIRCUIT ON MANUAL BYPASS OF UPS | HS-600C | PSCP | BYPASS | UPS | | HS-600C IN PSCP |
| UPS-2 IN RCP | DI | DI-80 | HSN-700 | RCP CONTROL CIRCUIT ON MANUAL BYPASS OF UPS | HS-700 | PSCP | BYPASS | UPS | | HS-700 IN RCP |
| UPS-4 IN VTP | DI | DI-81 | HSN-800 | VTP CONTROL CIRCUIT ON MANUAL BYPASS OF UPS | HS-800 | PSCP | BYPASS | UPS | | HS-800 IN VTP |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| **DISCRETE OUTPUTS** | | | | | | | | | | |
| | | | | | | | | | | |
| SURGE ALARM | DO | DO-1 | ZAT-541 | PS NO. 2 DISCHARGE LINE SURGE ALARM | PSCP PLC | EX. VCP AP | ALARM | -- | | PSCP PLC |
| SURGE ALARM | DO | DO-2 | ZAT-641 | PS NO. 3 DISCHARGE LINE SURGE ALARM | PSCP PLC | EX. VCP AP | ALARM | -- | | PSCP PLC |

**DIVISION 13 – SPECIAL CONSTRUCTION**

**SECTION 13460**

**PROGRAMMABLE LOGIC CONTROLLER AND OPERATOR INTERFACE TERMINAL**

**CONTROL SYSTEM INPUT/OUTPUT POINT LIST**

**NOTES:**

1. REFER TO DRAWING NO. I-1 OF CONTRACT DRAWINGS FOR ABBREVIATIONS

| EQUIPMENT/ LOCATION | POINT TYPE | POINT NO. | TAG NO. | POINT DESCRIPTION | FROM | TO | SET (1) | RESET (0) | RANGE/ UNITS | FIELD CONNECTION POINT |
|---|---|---|---|---|---|---|---|---|---|---|
| PUMP C START CIRCUIT IN PSCP | DO | DO-3 | MC-630A | PUMP C START | PSCP PLC | PUMP C START CIRCUIT IN PSCP | PUMP START | -- | | PSCP PLC |
| PUMP C STOP CIRCUIT IN PSCP | DO | DO-4 | MC-630B | PUMP C STOP | PSCP PLC | PUMP C STOP CIRCUIT IN PSCP | PUMP STOP | -- | | PSCP PLC |
| PUMP D START CIRCUIT IN PSCP | DO | DO-5 | MC-631A | PUMP D START | PSCP PLC | PUMP D START CIRCUIT IN PSCP | PUMP START | -- | | PSCP PLC |
| PUMP D STOP CIRCUIT IN PSCP | DO | DO-6 | MC-631B | PUMP D STOP | PSCP PLC | PUMP D STOP CIRCUIT IN PSCP | -- | PUMP STOP | | PSCP PLC |
| PUMP E START CIRCUIT IN PSCP | DO | DO-7 | MC-632A | PUMP E START | PSCP PLC | PUMP E START CIRCUIT IN PSCP | -- | PUMP START | | PSCP PLC |
| PUMP E STOP CIRCUIT IN PSCP | DO | DO-8 | MC-632B | PUMP E STOP | PSCP PLC | PUMP E STOP CIRCUIT IN PSCP | -- | PUMP STOP | | PSCP PLC |
| PUMP F START CIRCUIT IN PSCP | DO | DO-9 | MC-633A | PUMP F START | PSCP PLC | PUMP F START CIRCUIT IN PSCP | -- | PUMP START | | PSCP PLC |
| PUMP F STOP CIRCUIT IN PSCP | DO | DO-10 | MC-633B | PUMP F STOP | PSCP PLC | PUMP F STOP CIRCUIT IN PSCP | -- | PUMP STOP | | PSCP PLC |
| PUMP G START CIRCUIT IN PSCP | DO | DO-11 | MC-634A | PUMP G START | PSCP PLC | PUMP G START CIRCUIT IN PSCP | -- | PUMP START | | PSCP PLC |
| PUMP G STOP CIRCUIT IN PSCP | DO | DO-12 | MC-634B | PUMP G STOP | PSCP PLC | PUMP G STOP CIRCUIT IN PSCP | -- | PUMP STOP | | PSCP PLC |
| PLC STATUS ALARM | DO | DO-13 | XA-001 | PLC ALARM | PSCP PLC | PLC ALARM | -- | ALARM | | PSCP PLC |
| **ANALOG INPUTS** | | | | | | | | | | |
| SUCTION PRESSURE TRANSMITTER | AI | AI-1 | PI-640 | PS NO. 3 SUCTION HEADER PRESSURE | PIT-640 | PSCP PLC | | | 0-30 PSIG | PIT-640 |
| DISCHARGE PRESSURE TRANSMITTER | AI | AI-2 | PI-641 | PS NO. 3 DISCHARGE HEADER PRESSURE | PIT-641 | PSCP PLC | | | 0-100 PSIG | PIT-641 |
| PS NO. 3 48" VENTURI DISCHARGE FLOW METER | AI | AI-3 | FI-642A | PS NO. 3 48" VENTURI DISCHARGE FLOW | FIT-642A | PSCP PLC | | | 0-27 MGD | FIT-642A |
| PS NO. 3 30" MAGNETIC DISCHARGE FLOW METER | AI | AI-4 | FI-642B | PS NO. 3 30" MAGNETIC DISCHARGE FLOW | FIT-642B | PSCP PLC | | | 0-50 MGD | FIT-642B |

| | | | | | | | | | | 5/3/2021 |
|---|---|---|---|---|---|---|---|---|---|---|
| **DIVISION 13 – SPECIAL CONSTRUCTION** | | | | | | | | | | |
| | | | | | | | | | | |
| **SECTION 13460** | | | | | | | | | | |
| **PROGRAMMABLE LOGIC CONTROLLER AND OPERATOR INTERFACE TERMINAL** | | | | | | | | | | |
| **CONTROL SYSTEM INPUT/OUTPUT POINT LIST** | | | | | | | | | | |
| | | | | | | | | | | |
| **NOTES:** | | | | | | | | | | |
| 1. REFER TO DRAWING NO. I-1 OF CONTRACT DRAWINGS FOR ABBREVIATIONS | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | **FIELD** |
| **EQUIPMENT/** | **POINT** | **POINT** | **TAG NO.** | **POINT DESCRIPTION** | **FROM** | **TO** | | | **RANGE/** | **CONNECTION** |
| **LOCATION** | **TYPE** | **NO.** | | | | | **SET (1)** | **RESET (0)** | **UNITS** | **POINT** |
| EX. PS NO. 3 42" VENTURI BYPASS FLOW METER | AI | AI-5 | FI-643 | PS NO. 3 42" VENTURI PS BYPASS FLOW | FIT-643 | PSCP PLC | | | 0-50 MGD | FIT-643 |
| EX. PS SUCTION FLOW METER | AI | AI-6 | FI-644 | PS 42" SUCTION FLOW | EX. FIT-644 | PSCP PLC | | | 0-50 MGD | NEW PSCP (VIA TB) |
| UNDERGROUND VAULT - EX. 36" MAGNETIC FLOW METER | AI | AI-7 | FI-645A | TOWSON RESERVOIR BASIN INFLUENT FLOW - 36" MAGNETIC FLOW METER | EX. FIT-645A | PSCP PLC | | | 0-50 MGD | NEW PSCP (VIA TB) |
| EX. TOWSON RESERVOIR EAST - HYDRAULIC LEVEL SENSOR | AI | AI-8 | LI-650A | TOWSON RESERVOIR EAST LEVEL | EX. LIT-650A | PSCP PLC | | | 498-517 FT | NEW PSCP (VIA TB) |
| EX. TOWSON RESERVOIR WEST - HYDRAULIC LEVEL SENSOR | AI | AI-9 | LI-650B | TOWSON RESERVOIR WEST LEVEL | EX. LIT-650B | PSCP PLC | | | 498-517 FT | NEW PSCP (VIA TB) |
| UNDERGROUND VAULT - EX. FLOW METER | AI | AI-10 | FI-645B | TOWSON RESERVOIR BASIN EFFLUENT FLOW | EX. FIT-645B | PSCP PLC | | | 0-40 MGD | NEW PSCP (VIA TB) |
| | | | | | | | | | | |
| | | | | | | | | | | |
| **ANALOG OUTPUTS** | | | | | | | | | | |
| | | | | | | | | | | |
| EX. MAYS CHAPEL BASIN A LIT-670A | AO | AO-1 | LI-670A | MAYS CHAPEL BASIN A LEVEL | PSCP PLC | CHART RECORDER | | | 580-605 FT | PSCP PLC |
| EX. MAYS CHAPEL BASIN B LIT-670B | AO | AO-2 | LI-670B | MAYS CHAPEL BASIN B LEVEL | PSCP PLC | CHART RECORDER | | | 580-605 FT | PSCP PLC |
| EX. MAYS CHAPEL BASIN C LIT-670C | AO | AO-3 | LI-670C | MAYS CHAPEL BASIN C LEVEL | PSCP PLC | CHART RECORDER | | | 580-605 FT | PSCP PLC |
| EX. MAYS CHAPEL BASIN D LIT-670D | AO | AO-4 | LI-670D | MAYS CHAPEL BASIN D LEVEL | PSCP PLC | CHART RECORDER | | | 580-605 FT | PSCP PLC |
| EX. STRATFORD TANK LIT-672 | AO | AO-5 | LI-672 | STRATFORD TANK LEVEL | PSCP PLC | CHART RECORDER | | | 580-605 FT | PSCP PLC |
| EX. CUB HILL TANK LIT-673 | AO | AO-6 | LI-673 | CUB HILL TANK LEVEL | PSCP PLC | CHART RECORDER | | | 580-605 FT | PSCP PLC |
| CALCULATED FLOW SUM | AO | AO-7 | FI-648A | TOWSON PS NO. 3 TOTAL DISCHARGE FLOW | PSCP PLC | CHART RECORDER | | | 0-100 MGD | PSCP PLC |
| CALCULATED FLOW SUM | AO | AO-8 | FI-648B | TOWSON PS NOS. 2 AND 3 TOTAL DISCHARGE FLOW | PSCP PLC | CHART RECORDER | | | 0-130 MGD | PSCP PLC |
| | | | | | | | | | | |
| | | | | | | | | | | |
| **PS NO. 3 PSCP PLC** | | | | | | | | | | |
| **NETWORKED I/O** | | | | | | | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | 5/3/2021 |
| **DIVISION 13 – SPECIAL CONSTRUCTION** | | | | | | | | | | |
| | | | | | | | | | | |
| **SECTION 13460** | | | | | | | | | | |
| **PROGRAMMABLE LOGIC CONTROLLER AND OPERATOR INTERFACE TERMINAL** | | | | | | | | | | |
| **CONTROL SYSTEM INPUT/OUTPUT POINT LIST** | | | | | | | | | | |
| | | | | | | | | | | |
| **NOTES:** | | | | | | | | | | |
| 1. REFER TO DRAWING NO. I-1 OF CONTRACT DRAWINGS FOR ABBREVIATIONS | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | **FIELD** |
| **EQUIPMENT/** | **POINT** | **POINT** | **TAG NO.** | **POINT DESCRIPTION** | **FROM** | **TO** | | | **RANGE/** | **CONNECTION** |
| **LOCATION** | **TYPE** | **NO.** | | | | | **SET (1)** | **RESET (0)** | **UNITS** | **POINT** |
| | | | | | | | | | | |
| **PSCP UPS** | | | | | | | | | | |
| | | | | | | | | | | |
| UPS-1 | DI | DI-N1 | XN-710A | UPS-1 ON NORMAL POWER | UPS-1 | PSCP PLC | NORMAL | -- | | UPS-1 ETH |
| UPS-1 | DI | DI-N2 | XN-701B | UPS-1 ON BATTERY POWER | UPS-1 | PSCP PLC | BATTERY | -- | | UPS-1 ETH |
| UPS-1 | DI | DI-N3 | XN-701C | UPS-1 TROUBLE | UPS-1 | PSCP PLC | TROUBLE | -- | | UPS-1 ETH |
| UPS-1 | DI | DI-N4 | XA-701 | UPS-1 BATTERY LOW | UPS-1 | PSCP PLC | ALARM | -- | | UPS-1 ETH |
| UPS-1 | DI | DI-N5 | XF-701 | UPS-1 FAIL | UPS-1 | PSCP PLC | FAIL | -- | | UPS-1 ETH |
| | | | | | | | | | | |
| | | | | | | | | | | |
| **PS NO. 2 RIO UPS** | | | | | | | | | | |
| | | | | | | | | | | |
| UPS-3 | DI | DI-N11 | XN-703A | UPS-3 ON NORMAL POWER | UPS-3 | PSCP | NORMAL | -- | | UPS-3 ETH |
| UPS-3 | DI | DI-N12 | XN-703B | UPS-3 ON BATTERY POWER | UPS-3 | PSCP | BATTERY | -- | | UPS-3 ETH |
| UPS-3 | DI | DI-N13 | XN-703C | UPS-3 TROUBLE | UPS-3 | PSCP | TROUBLE | -- | | UPS-3 ETH |
| UPS-3 | DI | DI-N14 | XA-703 | UPS-3 BATTERY LOW | UPS-3 | PSCP | ALARM | -- | | UPS-3 ETH |
| UPS-3 | DI | DI-N86 | XF-703 | UPS-3 FAIL | UPS-3 | PSCP | FAIL | -- | | UPS-3 ETH |
| | | | | | | | | | | |
| **VTP UPS** | | | | | | | | | | |
| | | | | | | | | | | |
| UPS-4 | DI | DI-N15 | XN-704A | UPS-4 ON NORMAL POWER | UPS-4 | PSCP | NORMAL | -- | | UPS-4 ETH |

**DIVISION 13 – SPECIAL CONSTRUCTION**

**SECTION 13460**

**PROGRAMMABLE LOGIC CONTROLLER AND OPERATOR INTERFACE TERMINAL**

**CONTROL SYSTEM INPUT/OUTPUT POINT LIST**

**NOTES:**

1. REFER TO DRAWING NO. I-1 OF CONTRACT DRAWINGS FOR ABBREVIATIONS

| EQUIPMENT/ LOCATION | POINT TYPE | POINT NO. | TAG NO. | POINT DESCRIPTION | FROM | TO | SET (1) | RESET (0) | RANGE/ UNITS | FIELD CONNECTION POINT |
|---|---|---|---|---|---|---|---|---|---|---|
| UPS-4 | DI | DI-N16 | XN-704B | UPS-4 ON BATTERY POWER | UPS-4 | PSCP | BATTERY | -- | | UPS-4 ETH |
| UPS-4 | DI | DI-N17 | XN-704C | UPS-4 TROUBLE | UPS-4 | PSCP | TROUBLE | -- | | UPS-4 ETH |
| UPS-4 | DI | DI-N18 | XA-704 | UPS-4 BATTERY LOW | UPS-4 | PSCP | ALARM | -- | | UPS-4 ETH |
| UPS-4 | DI | DI-N19 | XF-704 | UPS-4 FAIL | UPS-4 | PSCP | FAIL | -- | | UPS-4 ETH |
| | | | | | | | | | | |
| **EX. MV MCC MOTOR STARTERS (COMMUNICATION FROM MULTILIN RELAY)** | | | | | | | | | | |
| | | | | | | | | | | |
| PUMP C BEARING RTD (TE-630A) | COMM. | AI-N1 | TI-630A | PUMP C OUTBOARD BEARING TEMPERATURE | PUMP C BEARING RTD | PSCP | COMM. | | 0-250 DEG F | RTD VIA EX. MV MCC RELAY |
| PUMP C BEARING RTD (TE-630B) | COMM. | AI-N2 | TI-630B | PUMP C INBOARD BEARING TEMPERATURE | PUMP C BEARING RTD | PSCP | | | 0-250 DEG F | RTD VIA EX. MV MCC RELAY |
| PUMP C MOTOR BEARING RTD (TE-630C) | COMM. | AI-N3 | TI-630C | PUMP C MOTOR OUTBOARD BEARING TEMPERATURE | PUMP C MOTOR BEARING RTD | PSCP | | | 0-250 DEG F | RTD VIA EX. MV MCC RELAY |
| PUMP C MOTOR BEARING RTD (TE-630D) | COMM. | AI-N4 | TI-630D | PUMP C MOTOR OUTBOARD BEARING TEMPERATURE | PUMP C MOTOR BEARING RTD | PSCP | | | 0-250 DEG F | RTD VIA EX. MV MCC RELAY |
| PUMP C MOTOR WINDING (TE-630E) | COMM. | AI-N5 | TI-630E | PUMP C MOTOR WINDING RTD - PHASE A | PUMP C MOTOR WINDING RTD | PSCP | | | 0-250 DEG F | RTD VIA EX. MV MCC RELAY |
| PUMP C MOTOR WINDING (TE-630F) | COMM. | AI-N6 | TI-630F | PUMP C MOTOR WINDING RTD - PHASE A | PUMP C MOTOR WINDING RTD | PSCP | | | 0-250 DEG F | RTD VIA EX. MV MCC RELAY |
| PUMP C MOTOR WINDING (TE-630G) | COMM. | AI-N7 | TI-630G | PUMP C MOTOR WINDING RTD - PHASE B | PUMP C MOTOR WINDING RTD | PSCP | | | 0-250 DEG F | RTD VIA EX. MV MCC RELAY |
| PUMP C MOTOR WINDING (TE-630H) | COMM. | AI-N8 | TI-630H | PUMP C MOTOR WINDING RTD - PHASE B | PUMP C MOTOR WINDING RTD | PSCP | | | 0-250 DEG F | RTD VIA EX. MV MCC RELAY |
| PUMP C MOTOR WINDING (TE-630I) | COMM. | AI-N9 | TI-630I | PUMP C MOTOR WINDING RTD - PHASE C | PUMP C MOTOR WINDING RTD | PSCP | | | 0-250 DEG F | RTD VIA EX. MV MCC RELAY |
| PUMP C MOTOR WINDING (TE-630J) | COMM. | AI-N10 | TI-630J | PUMP C MOTOR WINDING RTD - PHASE C | PUMP C MOTOR WINDING RTD | PSCP | | | 0-250 DEG F | RTD VIA EX. MV MCC RELAY |
| EX. MV MCC RELAY | COMM. | AI-N11 | EI-630 | PUMP C MOTOR - THREE PHASE VOLTAGE | EX. MV MCC RELAY | PSCP | | | 0-3000 VAC | EX. MV MCC RELAY |
| EX. MV MCC RELAY | COMM. | AI-N12 | II-630 | PUMP C MOTOR - THREE PHASE CURRENT | EX. MV MCC RELAY | PSCP | | | 0-100 AMPERES | EX. MV MCC RELAY |

**DIVISION 13 – SPECIAL CONSTRUCTION**

**SECTION 13460**

**PROGRAMMABLE LOGIC CONTROLLER AND OPERATOR INTERFACE TERMINAL**

**CONTROL SYSTEM INPUT/OUTPUT POINT LIST**

**NOTES:**

1. REFER TO DRAWING NO. I-1 OF CONTRACT DRAWINGS FOR ABBREVIATIONS

| EQUIPMENT/ LOCATION | POINT TYPE | POINT NO. | TAG NO. | POINT DESCRIPTION | FROM | TO | SET (1) | RESET (0) | RANGE/ UNITS | FIELD CONNECTION POINT |
|---|---|---|---|---|---|---|---|---|---|---|
| EX. MV MCC RELAY | COMM. | AI-N13 | JI-630 | PUMP C MOTOR POWER | EX. MV MCC RELAY | PSCP | | | 0-250 KW | EX. MV MCC RELAY |
| EX. MV MCC RELAY | COMM. | AI-N14 | XI-630 | PUMP C MOTOR KVAR | EX. MV MCC RELAY | PSCP | | | | EX. MV MCC RELAY |
| EX. MV MCC RELAY | COMM. | AI-N15 | XQI-630 | PUMP C MOTOR ENERGY | EX. MV MCC RELAY | PSCP | | | 0-100000 KWH | EX. MV MCC RELAY |
| EX. MV MCC RELAY | COMM. | AI-N16 | XRI-630 | PUMP C MOTOR POWER FACTOR | EX. MV MCC RELAY | PSCP | | | 0-1.3 | EX. MV MCC RELAY |
| EX. MV MCC RELAY | COMM. | DI-N21 | TAH-630A | PUMP C BEARING TEMPERATURE HIGH | EX. MV MCC RELAY | PSCP | ALARM | -- | | EX. MV MCC RELAY |
| EX. MV MCC RELAY | COMM. | DI-N22 | TAH-630B | PUMP C MOTOR BEARING TEMPERATURE HIGH | EX. MV MCC RELAY | PSCP | ALARM | -- | | EX. MV MCC RELAY |
| EX. MV MCC RELAY | COMM. | DI-N23 | TAH-630C | PUMP C MOTOR WINDING TEMPERATURE HIGH | EX. MV MCC RELAY | PSCP | ALARM | -- | | EX. MV MCC RELAY |
| PUMP D BEARING RTD (TE-631A) | COMM. | AI-N17 | TI-631A | PUMP D OUTBOARD BEARING TEMPERATURE | PUMP D BEARING RTD | PSCP | | | 0-250 DEG F | RTD VIA 'EX. MV MCC RELAY |
| PUMP D BEARING RTD (TE-631B) | COMM. | AI-N18 | TI-631B | PUMP D INBOARD BEARING TEMPERATURE | PUMP D BEARING RTD | PSCP | | | 0-250 DEG F | RTD VIA 'EX. MV MCC RELAY |
| PUMP D MOTOR BEARING RTD (TE-631C) | COMM. | AI-N19 | TI-631C | PUMP D MOTOR OUTBOARD BEARING TEMPERATURE | PUMP D MOTOR BEARING RTD | PSCP | | | 0-250 DEG F | RTD VIA 'EX. MV MCC RELAY |
| PUMP D MOTOR BEARING RTD (TE-631D) | COMM. | AI-N20 | TI-631D | PUMP D MOTOR OUTBOARD BEARING TEMPERATURE | PUMP D MOTOR BEARING RTD | PSCP | | | 0-250 DEG F | RTD VIA 'EX. MV MCC RELAY |
| PUMP D MOTOR WINDING (TE-631E) | COMM. | AI-N21 | TI-631E | PUMP D MOTOR WINDING RTD - PHASE A | PUMP D MOTOR WINDING RTD | PSCP | | | 0-250 DEG F | RTD VIA 'EX. MV MCC RELAY |
| PUMP D MOTOR WINDING (TE-631F) | COMM. | AI-N22 | TI-631F | PUMP D MOTOR WINDING RTD - PHASE A | PUMP D MOTOR WINDING RTD | PSCP | | | 0-250 DEG F | RTD VIA 'EX. MV MCC RELAY |
| PUMP D MOTOR WINDING (TE-631G) | COMM. | AI-N23 | TI-631G | PUMP D MOTOR WINDING RTD - PHASE B | PUMP D MOTOR WINDING RTD | PSCP | | | 0-250 DEG F | RTD VIA 'EX. MV MCC RELAY |
| PUMP D MOTOR WINDING (TE-631H) | COMM. | AI-N24 | TI-631H | PUMP D MOTOR WINDING RTD - PHASE B | PUMP D MOTOR WINDING RTD | PSCP | | | 0-250 DEG F | RTD VIA 'EX. MV MCC RELAY |
| PUMP D MOTOR WINDING (TE-631I) | COMM. | AI-N25 | TI-631I | PUMP D MOTOR WINDING RTD - PHASE C | PUMP D MOTOR WINDING RTD | PSCP | | | 0-250 DEG F | RTD VIA 'EX. MV MCC RELAY |
| PUMP D MOTOR WINDING (TE-631J) | COMM. | AI-N26 | TI-631J | PUMP D MOTOR WINDING RTD - PHASE C | PUMP D MOTOR WINDING RTD | PSCP | | | 0-250 DEG F | RTD VIA 'EX. MV MCC RELAY |
| EX. MV MCC RELAY | COMM. | AI-N27 | EI-631 | PUMP D MOTOR - THREE PHASE VOLTAGE | EX. MV MCC RELAY | PSCP | | | 0-3000 VAC | EX. MV MCC RELAY |
| EX. MV MCC RELAY | COMM. | AI-N28 | II-631 | PUMP D MOTOR - THREE PHASE CURRENT | EX. MV MCC RELAY | PSCP | | | 0-100 AMPERES | EX. MV MCC RELAY |

| | | | | | | | | | | 5/3/2021 |
|---|---|---|---|---|---|---|---|---|---|---|
| **DIVISION 13 – SPECIAL CONSTRUCTION** | | | | | | | | | | |
| | | | | | | | | | | |
| **SECTION 13460** | | | | | | | | | | |
| **PROGRAMMABLE LOGIC CONTROLLER AND OPERATOR INTERFACE TERMINAL** | | | | | | | | | | |
| **CONTROL SYSTEM INPUT/OUTPUT POINT LIST** | | | | | | | | | | |
| | | | | | | | | | | |
| **NOTES:** | | | | | | | | | | |
| 1. REFER TO DRAWING NO. I-1 OF CONTRACT DRAWINGS FOR ABBREVIATIONS | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | **FIELD** |
| **EQUIPMENT/** | **POINT** | **POINT** | **TAG NO.** | **POINT DESCRIPTION** | **FROM** | **TO** | | | **RANGE/** | **CONNECTION** |
| **LOCATION** | **TYPE** | **NO.** | | | | | **SET (1)** | **RESET (0)** | **UNITS** | **POINT** |
| EX. MV MCC RELAY | COMM. | AI-N29 | JI-631 | PUMP D MOTOR POWER | EX. MV MCC RELAY | PSCP | | | 0-250 KW | EX. MV MCC RELAY |
| EX. MV MCC RELAY | COMM. | AI-N30 | XI-631 | PUMP D MOTOR KVAR | EX. MV MCC RELAY | PSCP | | | | EX. MV MCC RELAY |
| EX. MV MCC RELAY | COMM. | AI-N31 | XQI-631 | PUMP D MOTOR ENERGY | EX. MV MCC RELAY | PSCP | | | 0-100000 KWH | EX. MV MCC RELAY |
| EX. MV MCC RELAY | COMM. | AI-N32 | XRI-631 | PUMP D MOTOR POWER FACTOR | EX. MV MCC RELAY | PSCP | | | 0-1.3 | EX. MV MCC RELAY |
| EX. MV MCC RELAY | COMM. | DI-N24 | TAH-631A | PUMP D BEARING TEMPERATURE HIGH | EX. MV MCC RELAY | PSCP | ALARM | -- | | EX. MV MCC RELAY |
| EX. MV MCC RELAY | COMM. | DI-N25 | TAH-631B | PUMP D MOTOR BEARING TEMPERATURE HIGH | EX. MV MCC RELAY | PSCP | ALARM | -- | | EX. MV MCC RELAY |
| EX. MV MCC RELAY | COMM. | DI-N26 | TAH-631C | PUMP D MOTOR WINDING TEMPERATURE HIGH | EX. MV MCC RELAY | PSCP | ALARM | -- | | EX. MV MCC RELAY |
| PUMP E BEARING RTD (TE-632A) | COMM. | AI-N33 | TI-632A | PUMP E OUTBOARD BEARING TEMPERATURE | PUMP E BEARING RTD | PSCP | | | 0-250 DEG F | RTD VIA 'EX. MV MCC RELAY |
| PUMP E BEARING RTD (TE-632B) | COMM. | AI-N34 | TI-632B | PUMP E INBOARD BEARING TEMPERATURE | PUMP E BEARING RTD | PSCP | | | 0-250 DEG F | RTD VIA 'EX. MV MCC RELAY |
| PUMP E MOTOR BEARING RTD (TE-632C) | COMM. | AI-N35 | TI-632C | PUMP E MOTOR OUTBOARD BEARING TEMPERATURE | PUMP E MOTOR BEARING RTD | PSCP | | | 0-250 DEG F | RTD VIA 'EX. MV MCC RELAY |
| PUMP E MOTOR BEARING RTD (TE-632D) | COMM. | AI-N36 | TI-632D | PUMP E MOTOR OUTBOARD BEARING TEMPERATURE | PUMP E MOTOR BEARING RTD | PSCP | | | 0-250 DEG F | RTD VIA 'EX. MV MCC RELAY |
| PUMP E MOTOR WINDING (TE-632E) | COMM. | AI-N37 | TI-632E | PUMP E MOTOR WINDING RTD - PHASE A | PUMP E MOTOR WINDING RTD | PSCP | | | 0-250 DEG F | RTD VIA 'EX. MV MCC RELAY |
| PUMP E MOTOR WINDING (TE-632F) | COMM. | AI-N38 | TI-632F | PUMP E MOTOR WINDING RTD - PHASE A | PUMP E MOTOR WINDING RTD | PSCP | | | 0-250 DEG F | RTD VIA 'EX. MV MCC RELAY |
| PUMP E MOTOR WINDING (TE-632G) | COMM. | AI-N39 | TI-632G | PUMP E MOTOR WINDING RTD - PHASE B | PUMP E MOTOR WINDING RTD | PSCP | | | 0-250 DEG F | RTD VIA 'EX. MV MCC RELAY |
| PUMP E MOTOR WINDING (TE-632H) | COMM. | AI-N40 | TI-632H | PUMP E MOTOR WINDING RTD - PHASE B | PUMP E MOTOR WINDING RTD | PSCP | | | 0-250 DEG F | RTD VIA 'EX. MV MCC RELAY |
| PUMP E MOTOR WINDING (TE-632I) | COMM. | AI-N41 | TI-632I | PUMP E MOTOR WINDING RTD - PHASE C | PUMP E MOTOR WINDING RTD | PSCP | | | 0-250 DEG F | RTD VIA 'EX. MV MCC RELAY |
| PUMP E MOTOR WINDING (TE-632J) | COMM. | AI-N42 | TI-632J | PUMP E MOTOR WINDING RTD - PHASE C | PUMP E MOTOR WINDING RTD | PSCP | | | 0-250 DEG F | RTD VIA 'EX. MV MCC RELAY |
| EX. MV MCC RELAY | COMM. | AI-N43 | EI-632 | PUMP E MOTOR - THREE PHASE VOLTAGE | EX. MV MCC RELAY | PSCP | | | 0-3000 VAC | EX. MV MCC RELAY |
| EX. MV MCC RELAY | COMM. | AI-N44 | II-632 | PUMP E MOTOR - THREE PHASE CURRENT | EX. MV MCC RELAY | PSCP | | | 0-125 AMPERES | EX. MV MCC RELAY |

| | | | | | | | | | | 5/3/2021 |
|---|---|---|---|---|---|---|---|---|---|---|
| **DIVISION 13 – SPECIAL CONSTRUCTION** | | | | | | | | | | |
| | | | | | | | | | | |
| **SECTION 13460** | | | | | | | | | | |
| **PROGRAMMABLE LOGIC CONTROLLER AND OPERATOR INTERFACE TERMINAL** | | | | | | | | | | |
| **CONTROL SYSTEM INPUT/OUTPUT POINT LIST** | | | | | | | | | | |
| | | | | | | | | | | |
| **NOTES:** | | | | | | | | | | |
| 1. REFER TO DRAWING NO. I-1 OF CONTRACT DRAWINGS FOR ABBREVIATIONS | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | **FIELD** |
| **EQUIPMENT/** | **POINT** | **POINT** | **TAG NO.** | **POINT DESCRIPTION** | **FROM** | **TO** | | | **RANGE/** | **CONNECTION** |
| **LOCATION** | **TYPE** | **NO.** | | | | | **SET (1)** | **RESET (0)** | **UNITS** | **POINT** |
| EX. MV MCC RELAY | COMM. | AI-N45 | JI-632 | PUMP E MOTOR POWER | EX. MV MCC RELAY | PSCP | | | 0-350 KW | EX. MV MCC RELAY |
| EX. MV MCC RELAY | COMM. | AI-N46 | XI-632 | PUMP E MOTOR KVAR | EX. MV MCC RELAY | PSCP | | | | EX. MV MCC RELAY |
| EX. MV MCC RELAY | COMM. | AI-N47 | XQI-632 | PUMP E MOTOR ENERGY | EX. MV MCC RELAY | PSCP | | | 0-100000 KWH | EX. MV MCC RELAY |
| EX. MV MCC RELAY | COMM. | AI-N48 | XRI-632 | PUMP E MOTOR POWER FACTOR | EX. MV MCC RELAY | PSCP | | | 0-1.3 | EX. MV MCC RELAY |
| EX. MV MCC RELAY | COMM. | DI-N27 | TAH-632A | PUMP E BEARING TEMPERATURE HIGH | EX. MV MCC RELAY | PSCP | ALARM | -- | | EX. MV MCC RELAY |
| EX. MV MCC RELAY | COMM. | DI-N28 | TAH-632B | PUMP E MOTOR BEARING TEMPERATURE HIGH | EX. MV MCC RELAY | PSCP | ALARM | -- | | EX. MV MCC RELAY |
| EX. MV MCC RELAY | COMM. | DI-N29 | TAH-632C | PUMP E MOTOR WINDING TEMPERATURE HIGH | EX. MV MCC RELAY | PSCP | ALARM | -- | | EX. MV MCC RELAY |
| PUMP F BEARING RTD (TE-633A) | COMM. | AI-N49 | TI-633A | PUMP F OUTBOARD BEARING TEMPERATURE | PUMP F BEARING RTD | PSCP | | | 0-250 DEG F | RTD VIA 'EX. MV MCC RELAY |
| PUMP F BEARING RTD (TE-633B) | COMM. | AI-N50 | TI-633B | PUMP F INBOARD BEARING TEMPERATURE | PUMP F BEARING RTD | PSCP | | | 0-250 DEG F | RTD VIA 'EX. MV MCC RELAY |
| PUMP F MOTOR BEARING RTD (TE-633C) | COMM. | AI-N51 | TI-633C | PUMP F MOTOR OUTBOARD BEARING TEMPERATURE | PUMP F MOTOR BEARING RTD | PSCP | | | 0-250 DEG F | RTD VIA 'EX. MV MCC RELAY |
| PUMP F MOTOR BEARING RTD (TE-633D) | COMM. | AI-N52 | TI-633D | PUMP F MOTOR OUTBOARD BEARING TEMPERATURE | PUMP F MOTOR BEARING RTD | PSCP | | | 0-250 DEG F | RTD VIA 'EX. MV MCC RELAY |
| PUMP F MOTOR WINDING (TE-633E) | COMM. | AI-N53 | TI-633E | PUMP F MOTOR WINDING RTD - PHASE A | PUMP F MOTOR WINDING RTD | PSCP | | | 0-250 DEG F | RTD VIA 'EX. MV MCC RELAY |
| PUMP F MOTOR WINDING (TE-633F) | COMM. | AI-N54 | TI-633F | PUMP F MOTOR WINDING RTD - PHASE A | PUMP F MOTOR WINDING RTD | PSCP | | | 0-250 DEG F | RTD VIA 'EX. MV MCC RELAY |
| PUMP F MOTOR WINDING (TE-633G) | COMM. | AI-N55 | TI-633G | PUMP F MOTOR WINDING RTD - PHASE B | PUMP F MOTOR WINDING RTD | PSCP | | | 0-250 DEG F | RTD VIA 'EX. MV MCC RELAY |
| PUMP F MOTOR WINDING (TE-633H) | COMM. | AI-N56 | TI-633H | PUMP F MOTOR WINDING RTD - PHASE B | PUMP F MOTOR WINDING RTD | PSCP | | | 0-250 DEG F | RTD VIA 'EX. MV MCC RELAY |
| PUMP F MOTOR WINDING (TE-633I) | COMM. | AI-N57 | TI-633I | PUMP F MOTOR WINDING RTD - PHASE C | PUMP F MOTOR WINDING RTD | PSCP | | | 0-250 DEG F | RTD VIA 'EX. MV MCC RELAY |
| PUMP F MOTOR WINDING (TE-633J) | COMM. | AI-N58 | TI-633J | PUMP F MOTOR WINDING RTD - PHASE C | PUMP F MOTOR WINDING RTD | PSCP | | | 0-250 DEG F | RTD VIA 'EX. MV MCC RELAY |
| EX. MV MCC RELAY | COMM. | AI-N59 | EI-633 | PUMP F MOTOR - THREE PHASE VOLTAGE | EX. MV MCC RELAY | PSCP | | | 0-3000 VAC | EX. MV MCC RELAY |
| EX. MV MCC RELAY | COMM. | AI-N60 | II-633 | PUMP F MOTOR - THREE PHASE CURRENT | EX. MV MCC RELAY | PSCP | | | 0-125 AMPERES | EX. MV MCC RELAY |

**DIVISION 13 – SPECIAL CONSTRUCTION**

**SECTION 13460**

**PROGRAMMABLE LOGIC CONTROLLER AND OPERATOR INTERFACE TERMINAL**

**CONTROL SYSTEM INPUT/OUTPUT POINT LIST**

**NOTES:**

1. REFER TO DRAWING NO. I-1 OF CONTRACT DRAWINGS FOR ABBREVIATIONS

| EQUIPMENT/ LOCATION | POINT TYPE | POINT NO. | TAG NO. | POINT DESCRIPTION | FROM | TO | SET (1) | RESET (0) | RANGE/ UNITS | FIELD CONNECTION POINT |
|---|---|---|---|---|---|---|---|---|---|---|
| EX. MV MCC RELAY | COMM. | AI-N61 | JI-633 | PUMP F MOTOR POWER | EX. MV MCC RELAY | PSCP | | | 0-350 KW | EX. MV MCC RELAY |
| EX. MV MCC RELAY | COMM. | AI-N62 | XI-633 | PUMP F MOTOR KVAR | EX. MV MCC RELAY | PSCP | | | | EX. MV MCC RELAY |
| EX. MV MCC RELAY | COMM. | AI-N63 | XQI-633 | PUMP F MOTOR ENERGY | EX. MV MCC RELAY | PSCP | | | 0-100000 KWH | EX. MV MCC RELAY |
| EX. MV MCC RELAY | COMM. | AI-N64 | XRI-633 | PUMP F MOTOR POWER FACTOR | EX. MV MCC RELAY | PSCP | | | 0-1.3 | EX. MV MCC RELAY |
| EX. MV MCC RELAY | COMM. | DI-N30 | TAH-633A | PUMP F BEARING TEMPERATURE HIGH | EX. MV MCC RELAY | PSCP | ALARM | -- | | EX. MV MCC RELAY |
| EX. MV MCC RELAY | COMM. | DI-N31 | TAH-633B | PUMP F MOTOR BEARING TEMPERATURE HIGH | EX. MV MCC RELAY | PSCP | ALARM | -- | | EX. MV MCC RELAY |
| EX. MV MCC RELAY | COMM. | DI-N32 | TAH-633C | PUMP F MOTOR WINDING TEMPERATURE HIGH | EX. MV MCC RELAY | PSCP | ALARM | -- | | EX. MV MCC RELAY |
| PUMP G BEARING RTD (TE-634A) | COMM. | AI-N65 | TI-634A | PUMP G OUTBOARD BEARING TEMPERATURE | PUMP G BEARING RTD | PSCP | | | 0-250 DEG F | EX. MV MCC RELAY |
| PUMP G BEARING RTD (TE-634B) | COMM. | AI-N66 | TI-634B | PUMP G INBOARD BEARING TEMPERATURE | PUMP G BEARING RTD | PSCP | | | 0-250 DEG F | EX. MV MCC RELAY |
| PUMP G MOTOR BEARING RTD (TE-634C) | COMM. | AI-N67 | TI-634C | PUMP G MOTOR OUTBOARD BEARING TEMPERATURE | PUMP G MOTOR BEARING RTD | PSCP | | | 0-250 DEG F | EX. MV MCC RELAY |
| PUMP G MOTOR BEARING RTD (TE-634D) | COMM. | AI-N68 | TI-634D | PUMP G MOTOR OUTBOARD BEARING TEMPERATURE | PUMP G MOTOR BEARING RTD | PSCP | | | 0-250 DEG F | EX. MV MCC RELAY |
| PUMP G MOTOR WINDING (TE-634E) | COMM. | AI-N69 | TI-634E | PUMP G MOTOR WINDING RTD - PHASE A | PUMP G MOTOR WINDING RTD | PSCP | | | 0-250 DEG F | EX. MV MCC RELAY |
| PUMP G MOTOR WINDING (TE-634F) | COMM. | AI-N70 | TI-634F | PUMP G MOTOR WINDING RTD - PHASE A | PUMP G MOTOR WINDING RTD | PSCP | | | 0-250 DEG F | EX. MV MCC RELAY |
| PUMP G MOTOR WINDING (TE-634G) | COMM. | AI-N71 | TI-634G | PUMP G MOTOR WINDING RTD - PHASE B | PUMP G MOTOR WINDING RTD | PSCP | | | 0-250 DEG F | EX. MV MCC RELAY |
| PUMP G MOTOR WINDING (TE-634H) | COMM. | AI-N72 | TI-634H | PUMP G MOTOR WINDING RTD - PHASE B | PUMP G MOTOR WINDING RTD | PSCP | | | 0-250 DEG F | EX. MV MCC RELAY |
| PUMP G MOTOR WINDING (TE-634I) | COMM. | AI-N73 | TI-634I | PUMP G MOTOR WINDING RTD - PHASE C | PUMP G MOTOR WINDING RTD | PSCP | | | 0-250 DEG F | EX. MV MCC RELAY |
| PUMP G MOTOR WINDING (TE-634J) | COMM. | AI-N74 | TI-634J | PUMP G MOTOR WINDING RTD - PHASE C | PUMP G MOTOR WINDING RTD | PSCP | | | 0-250 DEG F | EX. MV MCC RELAY |
| EX. MV MCC RELAY | COMM. | AI-N75 | EI-634 | PUMP G MOTOR - THREE PHASE VOLTAGE | EX. MV MCC RELAY | PSCP | | | 0-3000 VAC | EX. MV MCC RELAY |
| EX. MV MCC RELAY | COMM. | AI-N76 | II-634 | PUMP G MOTOR - THREE PHASE CURRENT | EX. MV MCC RELAY | PSCP | | | 0-150 AMPERES | EX. MV MCC RELAY |

**DIVISION 13 – SPECIAL CONSTRUCTION**

**SECTION 13460**

**PROGRAMMABLE LOGIC CONTROLLER AND OPERATOR INTERFACE TERMINAL**

**CONTROL SYSTEM INPUT/OUTPUT POINT LIST**

**NOTES:**

1. REFER TO DRAWING NO. I-1 OF CONTRACT DRAWINGS FOR ABBREVIATIONS

| EQUIPMENT/ LOCATION | POINT TYPE | POINT NO. | TAG NO. | POINT DESCRIPTION | FROM | TO | SET (1) | RESET (0) | RANGE/ UNITS | FIELD CONNECTION POINT |
|---|---|---|---|---|---|---|---|---|---|---|
| EX. MV MCC RELAY | COMM. | AI-N77 | JI-634 | PUMP G MOTOR POWER | EX. MV MCC RELAY | PSCP | | | 0-500 KW | EX. MV MCC RELAY |
| EX. MV MCC RELAY | COMM. | AI-N78 | XI-634 | PUMP G MOTOR KVAR | EX. MV MCC RELAY | PSCP | | | | EX. MV MCC RELAY |
| EX. MV MCC RELAY | COMM. | AI-N79 | XQI-634 | PUMP G MOTOR ENERGY | EX. MV MCC RELAY | PSCP | | | 0-100000 KWH | EX. MV MCC RELAY |
| EX. MV MCC RELAY | COMM. | AI-N80 | XRI-634 | PUMP G MOTOR POWER FACTOR | EX. MV MCC RELAY | PSCP | | | 0-1.3 | EX. MV MCC RELAY |
| EX. MV MCC RELAY | COMM. | DI-N33 | TAH-634A | PUMP G BEARING TEMPERATURE HIGH | EX. MV MCC RELAY | PSCP | ALARM | -- | | EX. MV MCC RELAY |
| EX. MV MCC RELAY | COMM. | DI-N34 | TAH-634B | PUMP G MOTOR BEARING TEMPERATURE HIGH | EX. MV MCC RELAY | PSCP | ALARM | -- | | EX. MV MCC RELAY |
| EX. MV MCC RELAY | COMM. | DI-N35 | TAH-634C | PUMP G MOTOR WINDING TEMPERATURE HIGH | EX. MV MCC RELAY | PSCP | ALARM | -- | | EX. MV MCC RELAY |
| **EX. DIESEL TANK CONTROLLER** | | | | | | | | | | |
| EX. FUEL TANK | DI | DI-N36 | LAL-100 | GENERATOR DIESEL FUEL TANK LEVEL LOW | EX. LSL-100 | PSCP | ALARM | NORMAL | | EX. FIBER NETWORK FROM GENERATOR |
| EX. FUEL TANK | DI | DI-N37 | LALL-100 | GENERATOR DIESEL FUEL TANK LEVEL LOW LOW - CRITICAL | EX. LSLL-100 | PSCP | ALARM | NORMAL | | EX. FIBER NETWORK FROM GENERATOR |
| EX. FUEL TANK | DI | DI-N38 | LAH-100 | GENERATOR DIESEL FUIEL TANK HIGH LEVEL | EX. LSH-100 | PSCP | ALARM | NORMAL | | EX. FIBER NETWORK FROM GENERATOR |
| EX. FUEL TANK | DI | DI-N39 | XA-100 | GENERATOR FUEL TANK LEAK | EX. XAS-100 | PSCP | ALARM | NORMAL | | EX. FIBER NETWORK FROM GENERATOR |
| EX. FUEL TANK | DI | DI-N40 | XN-100 | GENERATOR FUEL TANK CONTROLLER NORMAL | EX. XN-100 | PSCP | NORMAL | -- | | EX. FIBER NETWORK FROM GENERATOR |
| EX. FUEL TANK | DI | DI-N41 | XF-100 | GENERATOR FUEL TANK CONTROLLER FAIL | EX. XAF-100 | PSCP | FAIL | -- | | EX. FIBER NETWORK FROM GENERATOR |
| **FUEL PUR. SYSTEM CONTROLLER** | | | | | | | | | | |

| | | | | | | | | | | 5/3/2021 |
|---|---|---|---|---|---|---|---|---|---|---|
| **DIVISION 13 – SPECIAL CONSTRUCTION** | | | | | | | | | | |
| | | | | | | | | | | |
| **SECTION 13460** | | | | | | | | | | |
| **PROGRAMMABLE LOGIC CONTROLLER AND OPERATOR INTERFACE TERMINAL** | | | | | | | | | | |
| **CONTROL SYSTEM INPUT/OUTPUT POINT LIST** | | | | | | | | | | |
| | | | | | | | | | | |
| **NOTES:** | | | | | | | | | | |
| 1. REFER TO DRAWING NO. I-1 OF CONTRACT DRAWINGS FOR ABBREVIATIONS | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | **FIELD** |
| **EQUIPMENT/** | **POINT** | **POINT** | **TAG NO.** | **POINT DESCRIPTION** | **FROM** | **TO** | | | **RANGE/** | **CONNECTION** |
| **LOCATION** | **TYPE** | **NO.** | | | | | **SET (1)** | **RESET (0)** | **UNITS** | **POINT** |
| EX. FUEL PURIF. SYSTEM | DI | DI-N42 | LAH-110 | WASTE DRUM FULL | EX. LSH-110 | PSCP | ALARM | -- | | EX. FIBER NETWORK FROM GENERATOR |
| EX. FUEL PURIF. SYSTEM | DI | DI-N43 | XF-110 | TANK CONTROLLER NO. 1 FAIL | EX. CONTROLLER NO. 1 | PSCP | ALARM | -- | | EX. FIBER NETWORK FROM GENERATOR |
| EX. FUEL PURIF. SYSTEM | DI | DI-N44 | XA-110 | CHANGE FUEL FILTER NO. 1 | EX. CONTROLLER NO. 1 | PSCP | ALARM | -- | | EX. FIBER NETWORK FROM GENERATOR |
| EX. FUEL PURIF. SYSTEM | DI | DI-N45 | LAL-115 | FILTRATION TANK LEVEL LOW | EX. LSL-115 | PSCP | ALARM | -- | | EX. FIBER NETWORK FROM GENERATOR |
| EX. FUEL PURIF. SYSTEM | DI | DI-N46 | LAH-115 | FILTRATION TANK LEVEL HIGH | EX. LSH-115 | PSCP | ALARM | -- | | EX. FIBER NETWORK FROM GENERATOR |
| EX. FUEL PURIF. SYSTEM | DI | DI-N47 | XF-115 | TANK CONTROLLER NO. 2 FAIL | EX. CONTROLLER NO. 2 | PSCP | ALARM | -- | | EX. FIBER NETWORK FROM GENERATOR |
| | | | | | | | | | | |
| **EMERG. GEN. CNTL. PNL.** | | | | | | | | | | |
| | | | | | | | | | | |
| EX. GENERATOR CP | DI | DI-N48 | XF-120 | GENERATOR FAULT | EX. GENERATOR CP | PSCP | ALARM | -- | | EX. FIBER NETWORK FROM GENERATOR |
| EX. GENERATOR CP | DI | DI-N49 | XD-120 | GENERATOR FAIL TO START | EX. GENERATOR CP | PSCP | ALARM | -- | | EX. FIBER NETWORK FROM GENERATOR |
| EX. GENERATOR CP | DI | DI-N50 | EA-120 | BATTERY VOLTAGE LOW | EX. GENERATOR CP | PSCP | ALARM | -- | | EX. FIBER NETWORK FROM GENERATOR |
| EX. GENERATOR CP | DI | DI-N51 | XAL-120 | GENERATOR COOLANT LOW | EX. GENERATOR CP | PSCP | ALARM | -- | | EX. FIBER NETWORK FROM GENERATOR |
| EX. GENERATOR CP | DI | DI-N52 | XN-120 | GENERATOR RUN | EX. GENERATOR CP | PSCP | RUN | -- | | EX. FIBER NETWORK FROM GENERATOR |
| EX. GENERATOR CP | AI | AI-N81 | EI-120 | GENERATOR 3 PHASE VOLTAGE | EX. GENERATOR CP | PSCP | | | 0-3000 VAC | EX. FIBER NETWORK FROM GENERATOR |
| EX. GENERATOR CP | AI | AI-N82 | II-120 | GENERATOR 3 PHASE CURRENT | EX. GENERATOR CP | PSCP | | | 0-500 AMPERES | EX. FIBER NETWORK FROM GENERATOR |
| EX. GENERATOR CP | AI | AI-N83 | JI-120A | GENERATOR POWER | EX. GENERATOR CP | PSCP | | | 0-1800 KW | EX. FIBER NETWORK FROM GENERATOR |
| EX. GENERATOR CP | AI | AI-N84 | JI-120B | GENERATOR KVA | EX. GENERATOR CP | PSCP | | | 0-2250 KVA | EX. FIBER NETWORK FROM GENERATOR |
| | | | | | | | | | | |

| | | | | | | | | | | 5/3/2021 |
|---|---|---|---|---|---|---|---|---|---|---|
| **DIVISION 13 – SPECIAL CONSTRUCTION** | | | | | | | | | | |
| | | | | | | | | | | |
| **SECTION 13460** | | | | | | | | | | |
| **PROGRAMMABLE LOGIC CONTROLLER AND OPERATOR INTERFACE TERMINAL** | | | | | | | | | | |
| **CONTROL SYSTEM INPUT/OUTPUT POINT LIST** | | | | | | | | | | |
| | | | | | | | | | | |
| **NOTES:** | | | | | | | | | | |
| 1. REFER TO DRAWING NO. I-1 OF CONTRACT DRAWINGS FOR ABBREVIATIONS | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | **FIELD** |
| **EQUIPMENT/** | **POINT** | **POINT** | **TAG NO.** | **POINT DESCRIPTION** | **FROM** | **TO** | | | **RANGE/** | **CONNECTION** |
| **LOCATION** | **TYPE** | **NO.** | | | | | **SET (1)** | **RESET (0)** | **UNITS** | **POINT** |
| **GAS DETECTOR AND EYE WASH UNIT** | | | | | | | | | | |
| EX. GAS DETECTOR CP | DI | DI-N53 | AAH-130 | CARBON MONOXIDE LEVEL HIGH | EX. GAS DETECTOR CP | PSCP | ALARM | -- | | EX. FIBER NETWORK FROM GENERATOR |
| EX. GAS DETECTOR CP | DI | DI-N54 | XN-130 | GAS DETECTOR CONTROLLER NORMAL | EX. GAS DETECTOR CP | PSCP | NORMAL | -- | | EX. FIBER NETWORK FROM GENERATOR |
| EX. GAS DETECTOR CP | DI | DI-N55 | XF-130 | GAS DETECTOR CONTROLLER FAIL | EX. GAS DETECTOR CP | PSCP | ALARM | -- | | EX. FIBER NETWORK FROM GENERATOR |
| EX. EYE WASH UNIT NEAR FUEL TANK | DI | DI-N56 | YA-140 | EYE WASH ALARM | EX. EYE WASH UNIT | PSCP | ALARM | -- | | EX. FIBER NETWORK FROM GENERATOR |
| | | | | | | | | | | |
| **EX. 2.4 KV SWITCHGEAR** | | | | | | | | | | |
| | | | | | | | | | | |
| EX. SWITCHGEAR/SR489 | AI | AI-N85 | EI-200 | 2.4 KV SWITCHGEAR 3 PHASE VOLTAGE | EX. 2.4 KV SWITCHGEAR SR489 | PSCP | | | 0-3000 VAC | EX. FIBER NETWORK FROM SWITHCGEAR |
| EX. SWITCHGEAR/SR489 | AI | AI-N86 | II-200 | 2.4 KV SWITCHGEAR 3 PHASE CURRENT | EX. 2.4 KV SWITCHGEAR SR489 | PSCP | | | 0-1200 AMPERES | EX. FIBER NETWORK FROM SWITHCGEAR |
| EX. SWITCHGEAR/SR489 | AI | AI-N87 | JI-200 | 2.4 KV SWITCHGEAR POWER | EX. 2.4 KV SWITCHGEAR SR489 | PSCP | | | 0-1800 KW | EX. FIBER NETWORK FROM SWITHCGEAR |
| EX. SWITCHGEAR/SR489 CONTLR. | DI | DI-N57 | XN-200 | 2.4 KV SWITCHGEAR SR489 CONTROLLER NORMAL | EX. 2.4 KV SG SR489 CONTROLLER | PSCP | NORMAL | -- | | EX. FIBER NETWORK FROM SWITHCGEAR |
| EX. SWITCHGEAR/SR489 CONTLR. | DI | DI-N58 | XF-200 | 2.4 KV SWITCHGEAR SR489 CONTROLLER FAIL | EX. 2.4 KV SG SR489 CONTROLLER | PSCP | ALARM | -- | | EX. FIBER NETWORK FROM SWITHCGEAR |
| EX. SWITCHGEAR/SR850 RELAY 1 | DI | DI-N59 | XN-201 | 2.4 KV SG - SR850 LOAD BANK FEEDER RELAY CONTLR. NORMAL | EX. 2.4 KV SG SR850 NO. 1 CONTROLLER | PSCP | NORMAL | -- | | EX. FIBER NETWORK FROM SWITHCGEAR |
| EX. SWITCHGEAR/SR850 RELAY 1 | DI | DI-N60 | XA-201 | 2.4 KV SG - SR850 LOAD BANK FEEDER RELAY CONTLR. FAIL | EX. 2.4 KV SG SR850 NO. 1 CONTROLLER | PSCP | ALARM | -- | | EX. FIBER NETWORK FROM SWITHCGEAR |
| EX. SWITCHGEAR/SR850 RELAY 2 | DI | DI-N61 | XN-202 | 2.4 KV SG - SR850 MCC FEEDER RELAY CONTLR. NORMAL | EX. 2.4 KV SG SR850 NO. 12 CONTROLLER | PSCP | NORMAL | -- | | EX. FIBER NETWORK FROM SWITHCGEAR |

| | | | | | | | | | | 5/3/2021 |
|---|---|---|---|---|---|---|---|---|---|---|
| **DIVISION 13 – SPECIAL CONSTRUCTION** | | | | | | | | | | |
| | | | | | | | | | | |
| **SECTION 13460** | | | | | | | | | | |
| **PROGRAMMABLE LOGIC CONTROLLER AND OPERATOR INTERFACE TERMINAL** | | | | | | | | | | |
| **CONTROL SYSTEM INPUT/OUTPUT POINT LIST** | | | | | | | | | | |
| | | | | | | | | | | |
| **NOTES:** | | | | | | | | | | |
| 1. REFER TO DRAWING NO. I-1 OF CONTRACT DRAWINGS FOR ABBREVIATIONS | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | **FIELD** |
| **EQUIPMENT/** | **POINT** | **POINT** | **TAG NO.** | **POINT DESCRIPTION** | **FROM** | **TO** | | | **RANGE/** | **CONNECTION** |
| **LOCATION** | **TYPE** | **NO.** | | | | | **SET (1)** | **RESET (0)** | **UNITS** | **POINT** |
| EX. SWITCHGEAR/SR850 RELAY 2 | DI | DI-N62 | XA-202 | 2.4 KV SG - SR850 MCC FEEDER RELAY CONTLR. NORMAL | EX. 2.4 KV SG SR850 NO. 12 CONTROLLER | PSCP | ALARM | -- | | EX. FIBER NETWORK FROM SWITHCGEAR |
| EX. SWITCHGEAR CB 52G | DI | DI-N63 | ZNC-203 | 2.4 KV SG - CB 52G CLOSED | EX. 2.4 KV SG - CB 52G | PSCP | CLOSED | -- | | EX. FIBER NETWORK FROM SWITHCGEAR |
| EX. SWITCHGEAR CB 52G | DI | DI-N64 | ZNO-203 | 2.4 KV SG - CB 52G OPEN | EX. 2.4 KV SG - CB 52G | PSCP | OPEN | -- | | EX. FIBER NETWORK FROM SWITHCGEAR |
| EX. SWITCHGEAR CB 52G | DI | DI-N65 | ZF-203 | 2.4 KV SG CB 52G FAULT | EX. 2.4 KV SG - CB 52G | PSCP | FAULT | -- | | EX. FIBER NETWORK FROM SWITHCGEAR |
| EX. SWITCHGEAR CB 52M | DI | DI-N66 | ZNC-204 | 2.4 KV SG CB 52M CLOSED | EX. 2.4 KV SG - CB 52M | PSCP | CLOSED | -- | | EX. FIBER NETWORK FROM SWITHCGEAR |
| EX. SWITCHGEAR CB 52M | DI | DI-N67 | ZNO-204 | 2.4 KV SG CB 52M OPEN | EX. 2.4 KV SG - CB 52M | PSCP | OPEN | -- | | EX. FIBER NETWORK FROM SWITHCGEAR |
| EX. SWITCHGEAR CB 52M | DI | DI-N68 | ZF-204 | 2.4 KV SG CB 52M FAULT | EX. 2.4 KV SG - CB 52M | PSCP | FAULT | -- | | EX. FIBER NETWORK FROM SWITHCGEAR |
| EX. SWITCHGEAR CB 52L | DI | DI-N69 | ZNC-205 | 2.4 KV SG CB 52L CLOSED | EX. 2.4 KV SG - CB 52L | PSCP | CLOSED | -- | | EX. FIBER NETWORK FROM SWITHCGEAR |
| EX. SWITCHGEAR CB 52L | DI | DI-N70 | ZNO-205 | 2.4 KV SG CB 52L OPEN | EX. 2.4 KV SG - CB 52L | PSCP | OPEN | -- | | EX. NETWORK AT VCP |
| EX. SWITCHGEAR CB 52L | DI | DI-N71 | ZF-205 | 2.4 KV SG CB 52L FAULT | EX. 2.4 KV SG - CB 52L | PSCP | FAULT | -- | | EX. NETWORK AT VCP |
| | | | | | | | | | | |
| **EX. TRANSF. ALARM CNTL. CABINETS** | | | | | | | | | | |
| | | | | | | | | | | |
| EX. TRANSF. CC A-1 | DI | DI-N72 | TAH-210 | 33 KV - 2.4 KV TRANSFORMER NO. 1 WINDING TEMPERATURE HIGH | | PSCP | ALARM | -- | | EX. FIBER NETWORK FROM SWITHCGEAR |
| EX. TRANSF. CC A-2 | DI | DI-N73 | TAH-220 | 33 KV - 2.4 KV TRANSFORMER NO. 2 WINDING TEMPERATURE HIGH | | PSCP | ALARM | -- | | EX. FIBER NETWORK FROM SWITHCGEAR |
| | | | | | | | | | | |
| **EX. 33 KV SWITCHGEAR** | | | | | | | | | | |
| | | | | | | | | | | |

**DIVISION 13 – SPECIAL CONSTRUCTION**

**SECTION 13460**

**PROGRAMMABLE LOGIC CONTROLLER AND OPERATOR INTERFACE TERMINAL**

**CONTROL SYSTEM INPUT/OUTPUT POINT LIST**

**NOTES:**

1. REFER TO DRAWING NO. I-1 OF CONTRACT DRAWINGS FOR ABBREVIATIONS

| EQUIPMENT/ LOCATION | POINT TYPE | POINT NO. | TAG NO. | POINT DESCRIPTION | FROM | TO | SET (1) | RESET (0) | RANGE/ UNITS | FIELD CONNECTION POINT |
|---|---|---|---|---|---|---|---|---|---|---|
| EX. 33 KV SG SR850 RELAY NO. 1 | AI | AI-N88 | EI-230 | 33 KV SG SR850 RELAY NO. 1 - 3 PHASE VOLTAGE | EX. 33 KV SR850 RELAY NO. 1 | PSCP | | | 0-35000 VAC | EX. FIBER NETWORK FROM SWITHCGEAR |
| EX. 33 KV SG SR850 RELAY NO. 1 | AI | AI-N89 | II-230 | 33 KV SG SR850 RELAY NO. 1 - 3 PHASE CURRENT | EX. 33 KV SR850 RELAY NO. 1 | PSCP | | | 0-600 AMPERES | EX. FIBER NETWORK FROM SWITHCGEAR |
| EX. 33 KV SG SR850 RELAY NO. 1 | AI | AI-N90 | JI-230 | 33 KV SG SR850 RELAY NO. 1 - POWER | EX. 33 KV SR850 RELAY NO. 1 | PSCP | | | 0-2500 KW | EX. FIBER NETWORK FROM SWITHCGEAR |
| EX. 33 KV SG SR850 RELAY NO. 1 CONTLR. | DI | DI-N74 | XN-230 | 33 KV SR850 RELAY NO. 1 CONTROLLER NORMAL | EX. 33 KV SR850 RELAY NO. 1 RELAY CONTLR. | PSCP | NORMAL | -- | | EX. FIBER NETWORK FROM SWITHCGEAR |
| EX. 33 KV SG SR850 RELAY NO. 1 CONTLR. | DI | DI-N75 | XF-230A | 33KV SR850 RELAY NO. 1 CONTROLLER FAIL | EX. 33 KV SR850 RELAY NO. 1 RELAY CONTLR. | PSCP | ALARM | -- | | EX. FIBER NETWORK FROM SWITHCGEAR |
| EX. 33 KV SG - LS1 | DI | DI-N76 | ZNC-230 | 33 KV SG - LS1 - SWITCH CLOSED | EX. 33 KV LS1 | PSCP | CLOSED | -- | | EX. FIBER NETWORK FROM SWITHCGEAR |
| EX. 33 KV SG - LS1 | DI | DI-N77 | ZNO-230 | 33 KV SG - LS1 - SWITCH OPEN | EX. 33 KV LS1 | PSCP | OPEN | -- | | EX. FIBER NETWORK FROM SWITHCGEAR |
| EX. 33 KV SG - LS1 | DI | DI-N78 | XF-230B | 33 KV SG - LS1 - FAULT | EX. 33 KV LS1 | PSCP | ALARM | -- | | EX. FIBER NETWORK FROM SWITHCGEAR |
| EX. 33 KV SG - LS1 | DI | DI-N79 | EN-230 | 33 KV SG - LS1 - VOLTAGE AVAILABLE | EX. 33 KV LS1 | PSCP | AVAILABLE | -- | | EX. FIBER NETWORK FROM SWITHCGEAR |
| EX. 33 KV SG SR850 RELAY NO. 2 | AI | DI-N80 | EI-240 | 33 KV SG SR850 RELAY NO. 2 - 3 PHASE VOLTAGE | EX. 33 KV SR850 RELAY NO. 2 | PSCP | | | 0-35000 VAC | EX. FIBER NETWORK FROM SWITHCGEAR |
| EX. 33 KV SG SR850 RELAY NO. 2 | AI | AI-N91 | II-240 | 33 KV SG SR850 RELAY NO. 2 - 3 PHASE CURRENT | EX. 33 KV SR850 RELAY NO. 2 | PSCP | | | 0-600 AMPERES | EX. FIBER NETWORK FROM SWITHCGEAR |
| EX. 33 KV SG SR850 RELAY NO. 2 | AI | AI-N92 | JI-240 | 33 KV SG SR850 RELAY NO. 2 - POWER | EX. 33 KV SR850 RELAY NO. 2 | PSCP | | | 0-2500 KW | EX. FIBER NETWORK FROM SWITHCGEAR |
| EX. 33 KV SG SR850 RELAY NO. 12 CONTLR. | DI | DI-N81 | XN-240 | 33 KV SR850 RELAY NO. 2 CONTROLLER NORMAL | EX. 33 KV SR850 RELAY NO. 12RELAY CONTLR. | PSCP | NORMAL | -- | | EX. FIBER NETWORK FROM SWITHCGEAR |
| EX. 33 KV SG SR850 RELAY NO. 2 CONTLR. | DI | DI-N82 | XF-240A | 33KV SR850 RELAY NO. 2 CONTROLLER FAIL | EX. 33 KV SR850 RELAY NO. 2 RELAY CONTLR. | PSCP | ALARM | -- | | EX. FIBER NETWORK FROM SWITHCGEAR |
| EX. 33 KV SG - LS2 | DI | DI-N83 | ZNC-240 | 33 KV SG - LS2 - SWITCH CLOSED | EX. 33 KV LS2 | PSCP | CLOSED | -- | | EX. FIBER NETWORK FROM SWITHCGEAR |
| EX. 33 KV SG - LS2 | DI | DI-N84 | ZNO-240 | 33 KV SG - LS2 - SWITCH OPEN | EX. 33 KV LS2 | PSCP | OPEN | -- | | EX. FIBER NETWORK FROM SWITHCGEAR |
| EX. 33 KV SG - LS2 | DI | DI-N85 | XF-240B | 33 KV SG - LS2 - FAULT | EX. 33 KV LS2 | PSCP | ALARM | -- | | EX. FIBER NETWORK FROM SWITHCGEAR |
| EX. 33 KV SG - TS1 | DI | DI-N86 | ZNC-250 | 33 KV SG - TS1 - SWITCH CLOSED | EX. 33 KV TS1 | PSCP | CLOSED | -- | | EX. FIBER NETWORK FROM SWITHCGEAR |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | 5/3/2021 |
| **DIVISION 13 – SPECIAL CONSTRUCTION** | | | | | | | | | | |
| | | | | | | | | | | |
| **SECTION 13460** | | | | | | | | | | |
| **PROGRAMMABLE LOGIC CONTROLLER AND OPERATOR INTERFACE TERMINAL** | | | | | | | | | | |
| **CONTROL SYSTEM INPUT/OUTPUT POINT LIST** | | | | | | | | | | |
| | | | | | | | | | | |
| **NOTES:** | | | | | | | | | | |
| 1. REFER TO DRAWING NO. I-1 OF CONTRACT DRAWINGS FOR ABBREVIATIONS | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | **FIELD** |
| **EQUIPMENT/** | **POINT** | **POINT** | **TAG NO.** | **POINT DESCRIPTION** | **FROM** | **TO** | | | **RANGE/** | **CONNECTION** |
| **LOCATION** | **TYPE** | **NO.** | | | | | **SET (1)** | **RESET (0)** | **UNITS** | **POINT** |
| EX. 33 KV SG - TS1 | DI | DI-N87 | ZNO-250 | 33 KV SG - TS1 - SWITCH OPEN | EX. 33 KV TS1 | PSCP | OPEN | -- | | EX. FIBER NETWORK FROM SWITHCGEAR |
| EX. 33 KV SG - TS2 | DI | DI-N88 | ZNC-260 | 33 KV SG - TS2 - SWITCH CLOSED | EX. 33 KV TS2 | PSCP | CLOSED | -- | | EX. FIBER NETWORK FROM SWITHCGEAR |
| EX. 33 KV SG - TS2 | DI | DI-N89 | ZNO-260 | 33 KV SG - TS2 - SWITCH OPEN | EX. 33 KV TS2 | PSCP | OPEN | -- | | EX. FIBER NETWORK FROM SWITHCGEAR |
| EX. 33 KV SG SOURCE TRANSFER CNTLR. | DI | DI-N90 | XN-270 | 33 KV SG - SOURCE TRANSFER CONTROLLER NORMAL | EX. 33 KV STC | PSCP | NORMAL | -- | | EX. FIBER NETWORK FROM SWITHCGEAR |
| EX. 33 KV SG SOURCE TRANSFER CNTLR. | DI | DI-N91 | XF-270 | 33 KV SG - SOURCE TRANSFER CONTROLLER FAIL | EX. 33 KV STC | PSCP | ALARM | -- | | EX. FIBER NETWORK FROM SWITHCGEAR |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | 5/3/2021 |
| **DIVISION 13 – SPECIAL CONSTRUCTION** | | | | | | | | | | |
| | | | | | | | | | | |
| **SECTION 13460** | | | | | | | | | | |
| **PROGRAMMABLE LOGIC CONTROLLER AND OPERATOR INTERFACE TERMINAL** | | | | | | | | | | |
| **CONTROL SYSTEM INPUT/OUTPUT POINT LIST** | | | | | | | | | | |
| | | | | | | | | | | |
| **NOTES:** | | | | | | | | | | |
| 1. REFER TO DRAWING NO. I-1 OF CONTRACT DRAWINGS FOR ABBREVIATIONS | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | **FIELD** |
| **EQUIPMENT/** | **POINT** | **POINT** | **TAG NO.** | **POINT DESCRIPTION** | **FROM** | **TO** | | | **RANGE/** | **CONNECTION** |
| **LOCATION** | **TYPE** | **NO.** | | | | | **SET (1)** | **RESET (0)** | **UNITS** | **POINT** |
| **RCP PLC** | | | | | | | | | | |
| **DISCRETE INPUTS** | | | | | | | | | | |
| | | | | | | | | | | |
| None | | | | | | | | | | |
| | | | | | | | | | | |
| **DISCRETE OUTPUTS** | | | | | | | | | | |
| | | | | | | | | | | |
| None | | | | | | | | | | |
| | | | | | | | | | | |
| **ANALOG INPUTS** | | | | | | | | | | |
| | | | | | | | | | | |
| MAYS CHAPEL BASIN A LIT-670A | AI | AI-1 | LI-670A | MAYS CHAPEL BASIN A LEVEL | TCC | PSCP PLC TO HMI | | | | HMI - CHART RECORDER POINT |
| MAYS CHAPEL BASIN B LIT-670B | AI | AI-2 | LI-670B | MAYS CHAPEL BASIN B LEVEL | TCC | PSCP PLC TO HMI | | | | HMI - CHART RECORDER POINT |
| MAYS CHAPEL BASIN C LIT-670C | AI | AI-3 | LI-670C | MAYS CHAPEL BASIN C LEVEL | TCC | PSCP PLC TO HMI | | | | HMI - CHART RECORDER POINT |
| MAYS CHAPEL BASIN D LIT-670D | AI | AI-4 | LI-670D | MAYS CHAPEL BASIN D LEVEL | TCC | PSCP PLC TO HMI | | | | HMI - CHART RECORDER POINT |
| STRATFORD TANK LIT-672 | AI | AI-5 | LI-672 | STRATFORD TANK LEVEL | TCC | PSCP PLC TO HMI | | | | HMI - CHART RECORDER POINT |
| CUB HILL TANK LIT-673 | AI | AI-6 | LI-673 | CUB HILL TANK LEVEL | TCC | PSCP PLC TO HMI | | | | HMI - CHART RECORDER POINT |
| **ANALOG OUTPUTS** | | | | | | | | | | |
| | | | | | | | | | | |
| None | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

**SECTION 13465**

**CONTROL STRATEGIES**

PARAGRAPH INDEX

## SECTION 13465

## CONTROL STRATEGIES

**PART 1 -** GENERAL

1.01 SUMMARY

A. Scope:

1. This section includes the minimum requirements for configuration and programming of the PLCs and HMI for the Towson Pump Station (PS). The Systems Integrator (SI) shall be responsible for performing all work described herein, including coordination, submittals, programming and related tasks.

2. This section also includes requirements for submitting complete, detailed PLC program register documentation to the County for their use in their SCADA system. Programming is limited to that which is required for the PS PLC and HMI programs, and to allow interface with the City's water SCADA system.

3. The City will perform all programming and database editing required for their graphic display screens and associated operator workstation programs and database at their Telemetry Control Center (TCC).

4. The SI shall turn over copies of the PLC and HMI software and licenses to the County when work is complete.

5. The work described herein shall be performed by the Systems Integrator, whose services shall be obtained by the Contractor per the requirements of Section 13410. The Systems Integrator shall consult the PLC Input/Output Point List contained in Section 13460 for reference and addressing when developing the PLC programs.

B. Definitions and Abbreviations. The following definitions and abbreviations are used in this specification section:

| | |
|---|---|
| AI | Analog Input to PLC |
| AO | Analog Output from PLC |
| DI | Discrete Input to PLC |
| DO | Discrete Output from PLC |
| DTA | Data Transfer Area |
| FAT | Factory Acceptance Test |
| HMI | Human Machine Interface |
| I/O | Input/Output |
| KV | Kilo-volt |
| LOR | Local – Off – Remote |

| | |
|---|---|
| MA | Milliamperes |
| MCC | Motor Control Center |
| MV | Medium Voltage |
| OIT | Operator Interface Terminal |
| P&IDs | Process and Instrumentation Diagrams for the facilities and equipment to be monitored and controlled |
| PLC | Programmable Logic Controller (PSCP PLC) |
| PS | Towson Pump Stations |
| PSCP | Pump Station Control Panel |
| RIO | Remote I/O (Pump Station No. 2) |
| RTD | Resistance Temperature Detector |
| SAT | Site Acceptance Test |
| SCADA | Supervisory Control And Data Acquisition (term used exclusively to refer to the existing City Water Distribution Department SCADA system) |
| SI | Systems Integrator |
| TCC | Telemetry Control Center (at Ashburton WFP) |
| UPS | Uninterruptible Power Supply |
| VCP | Valve Control Panel |
| WFP | Water Filtration Plant |

C. Equipment and Tagging Information

Refer to the P&IDs on the Contract Drawings and the I/O list in Section 13460 for description and tagging of equipment and I/O.

D. Coordination

1. Coordinate the assignment of all I/O points, logical register assignments and communication addresses as required for the project. The SI shall configure all modules, Ethernet cards, Ethernet switches, controllers and devices as necessary to complete the functions required of the control system, and shall coordinate with the requirements and capabilities of networked equipment such as UPSs, Verizon wireless transceiver, and serial/network communication devices as indicated on the Contract Drawings.

2. The County will furnish to the Contractor IP addresses for all network interface devices such as PLCs, Ethernet switches, controllers, HMI, UPSs and other such network connected devices.

3. Input and output points shall be coordinated with the equipment manufacturers and suppliers of the PLC monitored and controlled equipment. Provide control and monitoring signals for communication and

UPS equipment as recommended by the manufacturers and as specified in the Contract Documents.

4. Coordinate the types and ranges of the input and output signals with equipment supplied. Provide input and output modules for the PLCs and remote I/O that are compatible with field devices. Provide interposing relays to add/multiply relay contacts, isolate voltages and as required for the operation of the control system as described in the Contract Documents.

5. Programming of the PSCP, HMI and RIO PS no. 2 shall satisfy the monitoring and control requirements specified herein.

1.02 SUBMITTALS

A. Input / Output List:

1. The SI shall submit a detailed description of the control system and the PLC programs.

2. Submit a final accurate as-built copy of the I/O list to the Engineer before final inspection and acceptance. Include approved final I/O list with the final PSCP and PS No.2 RIO and Operations and Maintenance Manuals for this project. Final I/O list shall include modifications, additions and deletions made during construction.

B. Logical Register Assignment List

1. Submit a list of logical register assignments to be used in the PLC programs logic. Submit electronic copy of this list in Microsoft Excel format. The list shall include the continuous register blocks that will be assigned and utilized for each different and unique programming function such as I/O points, counters, timers, math functions, holding registers, control set points, logical bits, and Data Transfer Area (DTA) memory map. Provide scaling information for logical registers. During testing of the control system, a backup electronic copy of the PLC programs shall be given to the County at the end of each working day any time a change is made to the program.

2. The Logical Register Assignment List shall be coordinated with and followed in the development of the PLC programming logic. Changes and modifications to the Logical Register Assignment List shall be completed as necessary for changing conditions or program modifications.

3. Provide separate, distinct read and write areas in the PLC programs and memory exclusively for access by the SCADA system, with well-defined and documented registers included in the Logical Register Assignment List. All discrete and analog input and output data (hardwired and networked), HMI commands and set points, SCADA commands and set points, and PLC calculated values shall be automatically copied and stored in this area of the program.

4. A separate and distinct DTA shall be provided in the PLC for accessing chart recorder related data by a local PC to download data directly from the PLC at the PS.

5. Submit a final accurate as-built copy of the Logical Register Assignment List to the Engineer before final inspection and acceptance. Include approved final list with the Operations and Maintenance Manuals for this project. Copy shall be submitted to the County a minimum of two months prior to commencement of the SAT for the instrumentation and control system.

C. PLC Programs

1. Submit a printed and electronic copy of the logic program for each of the PLCs. All data points, ladder rungs and function blocks shall be completely documented describing each unique point and address and the function of each rung or function block. Printed copies shall be on 8 ½" x 11" paper and bound. Electronic copies shall be on flash drive in the format of the programming language.

2. Submit a printed cross reference report with the PLC logic.

3. Complete, documented program shall be submitted to the County for review and comment at least 4 weeks prior to the scheduled FAT.

D. HMI Program

1. Submit PLC/SCADA address mapping layout.

2. Submit colored hard copy and electronic copies of the HMI program for review, in format similar to that required for the PLC programs.

3. Submit copies of drafts of graphic displays for review at least 4 weeks prior to scheduled FAT.

4. A copy of the final HMI program shall be included with final Operations and Maintenance Manuals for project.

1.03 CONTROL DESCRIPTIONS

A. GENERAL (PSCP PLC AND PSCP HMI)

1. Provide "out of range" alarms for all analog signals that are at least plus 5% of the maximum value of 20 ma, or minus 5% of minimum value of 4 ma. Alarms shall be generated by the PLC where the analog signals are analog inputs. Where analog signals are inputs to both PLCs, alarms shall be generated by both PLCs.

2. Provide "loss of signal" alarm for analog signals, both hard wired and networked, upon sensing loss of analog value. Alarms shall be generated by the PLC where the analog signals are analog inputs. Where analog signals are inputs to both PLCs, alarms shall be generated by both PLCs.

3. Provide communication alarm in PSCP PLC for loss of communication with SCADA system, and with any device on the network, existing or new, on

either an Ethernet portion or serial portion of network. Provide display on HMI with description of device that PLC has lost communication with.

4. Where the specifications contained herein do not require specific adjustable time delays on the HMI for discrete alarms, a standard one second time delay shall be hard coded into the PLC for such alarms.

5. Color scheme of graphic displays on HMI shall, in general, match the color scheme of the existing HMI graphic displays.

B. PSCP PLC and HMI

1. The existing PLC program residing in the PLC located in the existing PLC Panel shall be copied and updated to the new PLC software. All existing logic and monitoring functions shall be retained except for modifications described herein. Existing I/O shall be re-addressed to correspond to the new wiring locations on the new I/O cards.

2. The existing HMI program residing in the existing PLC Panel HMI shall be copied and updated to the new HMI software. All displays and functions shall be retained except for modifications described herein. The list of displays shall be updated with descriptions of new displays.

3. The SI shall coordinate with the City and Verizon to determine how the communication fail-over from Verizon wireless takes place. The HMI shall display which communication mode is being utilized to transmit and receive data, and an alarm shall be generated by the PLC when the communication mode changes from one to another. A separate alarm shall be generated when both communication modes are lost. An adjustable time delay shall be provided on the HMI for this second alarm – loss of both communication modes.

4. The PLC shall monitor power loss at the PS, and shall cease all pump start commands once power loss is registered, and initiate stop commands for all pumps. When power to the PS is restored, pumps may be started via the PLC. The PLC shall generate and alarm upon power loss, and shall also generate a “power restored” alarm that shall automatically reset after power has been restored continuously for 30 seconds.

5. There shall be a minimum of 10 seconds between pump starts via the PLC regardless of when start commands are initiated.

6. New I/O shall be integrated into the monitoring, display and control of the pumps and the PS equipment. Existing I/O that is not currently integrated into the existing PLC program and HMI program shall also be integrated into the new PLC and HMI programs. Integration shall include monitoring and control associated with all I/O indicated on the I/O list, as well as PLC generated I/O. Integration shall include, but not be limited to, the following:

   a. "Local" status of existing LOR selector switches located in the existing MV MCC for each of the five (5) pumps.

b. Monitoring and display of protective relay values from the protective relays located in the existing MV MCC. This shall include monitoring of RTD winding and bearing temperature values, motor volts, current, real power and KVA as indicated in the I/O list. Provide high temperature warning alarms generated by the PLC from each temperature signal corresponding to each RTD for each pump and motor. Warning alarms generated by PLC shall be displayed on the HMI, but shall not shut down the corresponding pump.

c. Monitoring of the surge relief valve limit switches. When a surge occurs on any one of the three surge relief valves in a group (there are two groups of surge relief valves; one for each of PS No. 2 and PS No. 3), an alarm shall be generated in the PLC, and any corresponding pump in PS No. 2 or PS No. 3 will not be allowed to start via the PLC until the surge alarm is reset at the HMI. Pumps C and D will not be allowed to start after a surge in the discharge line of PS No. 2, and Pumps E, F and G shall not be allowed to start after a surge in the discharge line of PS No. 3. Pumps that are operating when a surge occurs shall be allowed to continue operating. Provide "Surge Reset" icons on the HMI for resetting of surges for PS No. 2 and PS No. 3. A surge counter for each set of surge relief valves shall be provided in the PLC, and counter values with reset icons shall be displayed on the HMI. Surge alarm outputs shall be transmitted to the existing VCP for alarm indication on the existing annunciator panel.

d. New flow meter signal value shall be displayed for the new flow meter for PS No. 3.

e. Provide new calculated values for flow as follows:

    1) PS No. 3 Total Flow – sum of the two discharge flow signals from PS No. 3

    2) PS Total Flow – sum of the discharge flow from PS No. 2 and PS No. 3 Total Flow

    Each of these values shall be displayed on the HMI.

f. Modify and add to existing displays to incorporate new piping, flow meter and surge relief valves that are being added under this project.

g. For existing and new alarms, provide a new alarm display screen with "Reset" pushbutton icons for the two PS surge alarms only. Surge alarms shall flash on display until they are reset, and shall remain on display until the alarm condition ceases. All other alarms shall remain on display until the alarm condition ceases.

h. Provide the capability for trending of all analog signals in the HMI that are analog inputs to the PLC, including hard wired and analog signals. Analog values shall be capable of being trended for a minimum of 60 minutes before overwriting of stored values begins.

i. All alarm points shall be automatically transmitted to SCADA (TCC) by the PLC.

j. Each pressure, flow, level analog signal shall be provided with warning alarm set points for minimum and maximum values in the PLC. These alarm set points shall be adjustable via the HMI.

k. Each RTD temperature point and pump motor current point shall be provided with warning alarm set points for maximum temperature and current values in the PLC. These alarm set points shall be adjustable via the HMI.

l. The PLC shall generate an alarm when a pump is called to run via the PLC, and the PLC does not receive a pump run status signal within a certain period of time. This time period shall be adjustable via the HMI. When such an alarm is generated, the pump start command shall cease and a pump stop command shall be transmitted by the PLC to the control circuit.

m. Adjustable time delay set points shall be provided on the HMI for the following types of alarms:

    1) Loss of communications with device on network

    2) Analog signal out of range

    3) Loss of analog signal

n. Provide sufficient labor for programming of PLC and HMI within the lump sum bid to allow the addition of 20 discrete I/O and 20 analog I/O to the monitoring and display functions of the PLC and HMI. Such monitoring and display shall be as directed by the County.

o. Provide analog and discrete outputs as required by the I/O list for pump start and stop commands, surge alarms, and as indicated on the Contract Drawings. Pump start and stop commands shall coordinate with the pump control sequence as indicated in the wiring diagram indicated on the Contract Drawings. Discrete outputs shall be maintained unless otherwise directed by the County or indicated in the Contract Documents.

p. Along with “Fully Open” and “Fully Closed” cone valve position status, the PLC shall recognize when neither status is achieved, and provide a signal for display on the HMI for cone valve in “mid travel.”

q. Provide discrete output with periodic timer for watchdog alarm relay reset.

r. Provide pump run time totalizers in PLC for each pump, with reset icons on HMI – include display of date current totalization began

s. Provide circuit breaker status displays on HMI for all MCC and switchgear circuit breakers being monitored.

t. Provide generator run time totalizer in PLC with reset icon on HMI – include display of date current totalization began.

C. HMI GRAPHIC DISPLAY SCREENS

Provide color graphic display screens as follows:

1. Main Menu with List of Screens
2. Network Architecture Screen (monitoring of health of all networked devices, including PLC, Ethernet switches, RIO panel, serial communication devices and transceivers, UPSs, communication modules, and networked control panels and relays)
3. UPS Monitoring – display all values associated with all four UPSs, UPS alarms, and status of UPS bypass control circuit
4. Towson PS & Reservoir – Overall piping schematic; include flow meter vaults and signals, reservoir levels, surge vaults, valve status and alarms. Display both PS discharge flow values, suction and bypass flow values, and PS suction and discharge pressures.
5. Towson PS No. 2 with sub-screens for pumps. Main screen shall include pump status, pump suction and discharge pressure, PS discharge flow, control mode, cone valve status, status of backup pressure control, RTU control and auxiliary pump control, and alarms associated with pumps. Sub-screens shall have pump control mode, pump status, cone valve status, all Multilin monitoring information for specific pump, alarms associated with specific pump and motor, including emergency stop pushbutton activation, backup pressure control enabled, etc. Display pump run time total.
6. Towson PS No. 3 – same as for PS No. 2, with both discharge flow values and total discharge flow value.
7. Reservoir Screen 1 (valve status, level, vault and valve status and alarms)
8. Reservoir Screen 2 (same as above – if required due to screen space limitations)
9. Towson PS and Reservoir Values (display reservoir levels, PS pressures and PS discharge and site flows, and alarms)
10. Reservoir and Tank Values (display Towson reservoir levels, Cub Hill Tank level and Stratford basin levels)
11. Analog Alarm Timer Adjustments (adjustable 0-60s each)
12. Analog Value Alarm Set Points (minimums and maximums)
13. List of Alarms – all alarms associated with PS and reservoir site, discrete and analog
14. PS No. 3 MV MCC basic one line, including status of Multilins with sub-screens for each Multilin monitoring relay and each main feeder monitoring relay. Display circuit breaker status.

15. Emergency Generator System – Display generator status and run time total. Provide sub-screen for detailed data on generator from generator control panel

16. Fuel Storage and Gas Detector

17. 2.4 KV Switchgear basic one line – Display circuit breaker status. Provide sub-screens for each monitoring relay

18. 33 KV Switchgear and Transformer – basic one line – Display circuit breaker status. Provide sub-screens for each monitoring relay

19. A minimum of two analog value trending screens with up to five trended signals per screen, with a time range of up to 60 minutes capable of being displayed on the HMI screen.

20. Two additional screens to be created at the direction of County

1.04 PROGRAMMING ALLOWANCE

A. The SI shall provide 80 hours of programming for the PLCs and/or HMI graphic displays in addition to the requirements specified elsewhere in this section. The 80 hours shall be part of the lump sum bid; no additional funds will be paid to satisfy any claims for said work. Work shall be limited to PLC and/or OIT programming and documentation and related tasks. The 80 hours shall be used entirely at the discretion of the County, and this shall only be done with a written, detailed description of the service or task requested, the expected expenditure of hours, and written authorization to utilize the hours. The County shall reserve the right to use all or any part of the 80 hour allowance for this project.

**PART 2 -** PRODUCTS

(Not Used)

**PART 3 -** EXECUTION

(Not Used)

END OF SECTION

**SECTION 13490**

**PROCESS FIELD INSTRUMENTATION**

PARAGRAPH INDEX

## SECTION 13490

## PROCESS FIELD INSTRUMENTATION

## PART 1 - GENERAL

1.01 SUMMARY

This section describes the requirements for furnishing, installing, and placing into operation field-mounted and panel-mounted instrumentation. Related sections include:

A. DIVISION 13 – SPECIAL CONSTRUCTION

B. DIVISION 16 – ELECTRICAL

1.02 REFERENCES

A. Work covered by this Section shall comply with all relevant portions of the following standards and specifications

1. American Petroleum Institute (API):
2. American Society for Testing and Materials (ASTM):
3. Instrument Society of America (ISA)
4. International Standards Organization (ISO)
5. National Electrical Manufacturers Association (NEMA)
6. Underwriters Laboratories, Inc.

1.03 SUBMITTALS

A. Submit shop drawings in accordance with Section 01900. Include the following information for each instrument, in the shop drawings:

1. Tag number and description.
2. Data sheets and catalog literature. Provide data sheets as shown in ISA-S20-1981. For instruments not included in S20, submit data sheets using a format similar to those shown.
3. Mounting details, including all dimensions, installation methods, elevations and sections.
4. Range, size, weight, outline and dimension drawings, materials of construction, enclosure classification.
5. Description of any integral instrument controls.

6. Methods and materials required for installation. Include power and signal connection details with complete wiring diagrams.

7. List of recommended spare parts.

8. List of optional accessories.

B. Submit Operation and Maintenance Manuals in accordance with Section 01900. Include the following information in the Operations and Maintenance manuals for each instrument specified in this section.

1. Operations and maintenance manuals for each instrument.

2. Specific arrangement and dimension drawings for the installation of each instrument. Include locations of each instrument or device.

3. Installation certifications.

4. Calibration certification for each instrument.

5. Field Calibration/Performance Test Data sheets.

6. Tag data to be included on instrument tag.

C. Submit Manufacturer's Certificates in accordance with Section 01900.

D. Exceptions to the specifications or drawings shall be clearly defined by the Contractor. Failure to clearly indicate exceptions shall be basis for rejection of the submittal.

1.04 SYSTEM DESCRIPTION

A. All instrumentation 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 shall be compatible with the functions required for the pump station controls.

B. All necessary fuses and cables required for instrumentation equipment shall be provided with the equipment.

C. Provide instruments that operate on 24 VDC power, except where specifically noted. Provide instruments which return automatically to accurate measurement upon restoration of power after a power failure.

D. Provide and install transmitter power supplies in local panels or enclosures as required.

E. Provide two wire instrument transmitters which produce isolated 4-20 mA DC analog signals. Follow ISA-S50.1, Compatibility of Analog Signals for Electronic Industrial Process Instruments. All analog transmitter and

controller outputs shall be capable of driving into at least 800 ohms unless otherwise specified.

F. Provide alarm and status points with an isolated contact rated at 5A, 120 VAC. The contact will be closed when the normal, non-alarm condition to be sensed is true.

G. Provide instruments complete with mounting hardware, floor stands, wall brackets, or instrument racks, and mounting hardware as required for a complete installation.

H. Local indicators shall provide direct readings utilizing the same range, scale and units as that reported via the station control system. Instruments selected shall have ranges and indications appropriate to the process.

1.05 QUALITY ASSURANCE

A. Provide only new, standard, first-grade materials throughout, conforming to standards established by Underwriters Laboratories (UL), Inc. Electrical Testing Laboratories (ETL) and National Electrical Manufacturers Association (NEMA) and so marked or labeled.

B. Provide material and equipment in accordance with applicable codes and standards, except as modified by the specifications.

C. Use single source manufacturer for each instrument type. Use the same manufacturer for different instrument types whenever possible.

D. Coordinate instrumentation to assure proper interface and system integration. Provide signal equipment, to include, but not to be limited to, transducers, signal converters and power supplies. Coordinate the various subcontractors, equipment suppliers, and manufacturers.

1.06 DELIVERY, STORAGE AND HANDLING

A. Have each manufacturer or supplier package instrumentation to protect against shipping damage, dust, moisture, and atmospheric contaminants. Include a shipping label which contains the following information:

1. Tag number and description.

2. Instructions for unloading, transporting, storing and handling at the site.

B. Receive instrumentation at the site. Inspect instrumentation for damage in shipment. Return all damaged instrumentation to the manufacturer for replacement at no cost to the County.

C. Do not store instrumentation out-of-doors. Provide dry, permanent storage facilities and pay storage cost as needed.

## PART 2 - MATERIALS

### 2.01 ELECTROMAGNETIC FLOWMETERS

A. Magnetic flowmeters (magmeter) shall be provided as indicated in the Drawings. Flow reading provided by any meter shall be within +/- 1% of actual flow based upon magmeter mounting location as shown on the Drawings.

B. Magnetic flowmeter shall utilize pulsed DC technology. Meter shall be comprised of magnetic meter flow tube, remote, wall-mounted converter and interconnecting cables. Velocity of the water passing through the meter shall generate DC voltage. Magnitude of the generated voltage shall be proportional to the average flow velocity across the pipe section.

C. The magnetic flowmeter shall have the following characteristics at a minimum:

1. Flowtube Materials of Construction
   a. Liner: Polyurethane
   b. Electrodes: Hastelloy C
   c. Process Flanges: Carbon Steel
   d. Grounding Rings: Stainless Steel 316L
   e. Housing: Fabricated Steel, Painted
   f. Tube: Lined Stainless Steel 304
2. Flowtube Service
   a. Finished (Potable) water
   b. -20 °C to +60 °C ambient temperature
   c. Liner shall withstand 3 psia vacuum at 30 to 100 deg F
   d. NEMA 6P
3. Flowtube Sizes and Range

   PUMPING STATION NO. 2
   a. 20-inch, flanged
   b. 0 - 20,860 GPM (0-30 MGD) operating range

PUMPING STATION NO. 3

a. 30-inch, flanged

b. 0 - 20,860 GPM (0–30 MGD) operating range

4. Converter Unit (Flow Transmitter)

a. Remote, wall mount capability

b. Flow rate indicator - Flow rate display in MGD, GPM

c. Flowrate transmitter - Analog output, 4-20 mA through 0-700 ohm load

d. 120 VAC, 60 Hz single phase power

e. Matched with flowtube, complete with minimum 100 feet of manufacturer supplied connecting cable

5. Maintenance

Electrode replacement shall not require removal of the meter from the pipeline.

6. Grounding Rings

316 SS on Inlet and Outlet side, in accordance with manufacturer's recommendations for cement lined ductile iron pipe installation.

7. Magnetic flowmeters shall be warranted against defective workmanship for a period of five years from the date of final acceptance.

8. Make and Model Number:

Endress + Hauser (E+H) Promag W 400, or approved equal

## 2.02 PRESSURE TRANSMITTERS

A. General

1. Function

a. Measure differential or gauge pressure.

b. Transmit electrical signal proportional to either differential pressure or square root of differential pressure, as applicable.

2. Type:

a. Electronic variable capacitance or silicon strain gauge.

b. Two-wire transmitter; "smart electronics".

c. Loop powered.

d. Parts: Transmitter, process connections, mounting brackets, and accessories.

e. Parts: Differential pressure transmitter only: 5-valve manifold

B. Performance:

1. Range: As noted.

2. Select transmitter's factory upper range limit (URL) such that upper boundary of noted range is as close as possible to 80 percent of factory URL, but does not exceed it.

3. Accuracy: Plus or minus 0.10 percent of span, unless otherwise noted.

4. Ambient Operating Temperature: Minus 40° F to plus 175° F, with integral meter.

5. Process Operating Temperature: Minus 40° F to plus 250° F.

6. Humidity: 0% to 100% relative humidity.

7. Hazardous Location Certifications: Not Required.

C. Features:

1. Linear or square-root output, user-configurable.

2. Factory preconfigure for square root output if transmitter tagged as "FT" or "FIT".

3. Adjustable damping.

4. LCD indicator, unless otherwise noted.

5. Display in either percent or engineering units, field configurable.

6. Wetted Metallic Parts: Type 316 stainless steel, unless otherwise noted.

7. Includes drain/vent valves; process flanges and adapters, and process isolating diaphragm.

8. Wetted O-Rings: Glass-filled TFE, graphite-filled PTFE, or Viton, unless otherwise noted.

9. Bolts and Nuts (if required): Type 316 stainless steel, unless otherwise noted.

10. Fill Fluid: Silicone, unless otherwise noted.

D. Process Connections

1. Line Size: 1/2 inch.

2. Connection Type: FNPT.

3. Direct (Finished / Potable Water).

E. Signal Interface:

1. 4 to 20 mA dc output with digital signal based on HART protocol, unless otherwise noted below.

2. Nominal Maximum Loop Resistance with External 24V dc Power Supply: 550 ohms.

F. Enclosure:

1. Type: NEMA 4X.

2. Materials: Coated aluminum, unless otherwise noted.

3. Bracket and Accessories: Stainless steel; suitable for mounting transmitter to panel or 2-inch pipe.

G. Manifold:

1. Five-valve integral manifold for flow application only.

a. Includes one equalization, two isolation valves, and two vent/test valves.

b. Type 316 stainless steel construction, Teflon packing.

c. End connections 1/2-inch FNPT.

H. Manufacturers and Products:

1. Transmitters:

a. Rosemount Model 3051C (differential pressure),

b. Rosemount Model 3051T (gauge pressure).

c. SMAR Model LD400

2. 5-valve Manifold (differential pressure transmitters only):

a. Anderson Greenwood Model MC5P.

## 2.03 PRESSURE SWITCHES

A. Pump Check Service, (i.e. pump discharge cone valve operation):

1. Pressure switches shall be provided on Pump C, D and G discharge lines as indicated in the Drawings. Pressure switches shall be copper bellows type with a minimum rated pressure of 300 psig for pump discharge service. Switches shall have an adjustable deadband and be in a NEMA 4 housing. Switches shall have 1/4-inch N.P.T. internal thread connections and be suitable for 120 VAC, 60 Hertz, single phase service. Switches shall close on increasing pressure.

2. Switches shall be the 836T series of Allen Bradley, or equal.

3. Pressure settings shall be as shown on the Drawings.

B. Emergency Pressure Control Panel Service:

1. Pressure switches shall be provided to on Station No.2 and Station No. 3 suction and discharge as indicated in the Drawings for input to each Station's Emergency Pressure Control Panel. Pressure switches shall consist of a factory assembled switch unit and transducer unit. The switch unit shall incorporate an alternating fulcrum balance plate to actuate a Double Pole Single Throw (DPST) snap action switch. Contact rating shall be 15 Amperes for 125 VAC service. Switches shall have a single stage adjustable deadband and be enclosed in a NEMA 4 rated aluminum housing. The transducer unit shall incorporate a diaphragm/piston type pressure sensor. Process connection shall be brass with 1/4-inch NPT internal threads. Diaphragm shall be of Buna-N construction.

2. Pressure switches shall be the ASCO Tri-Point S-Series, or equal.

3. Pressure settings shall be as shown on the Drawings

## 2.04 PRESSURE GAUGES

Pressure gauges shall be installed on the pump suction and discharge piping as shown on the Drawings. Pressure gauges shall have ranges as shown on the Drawings. Gauge dial size shall be 4-1/2-inches with a solid front and phenol black case. The bourdon tube shall be Grade A, phosphor bronze. The stem connection shall be 1/4-inch. Pressure gauges shall be the Duragage Type 1279 as manufactured by Ashcroft, or equal. All pressure gauges shall be provided with a snubber or similar integral surge dampening device.

## 2.05 IN-LINE SURGE DAMPENERS

Provide an in-line surge dampener on all pressure instrumentation connections. The dampener shall be constructed of brass or stainless steel with a maximum rated pressure of at least 1000 psi. Dampener shall have male or female threaded NPT connections. Amount of dampening shall be adjustable, with up to five different levels of dampening. Elastomeric bladder based dampening devices are not acceptable. The dampener shall be the model 50-1106B, as manufactured by Ashcroft, or equal.

## 2.06 SPARE PARTS

A. Pressure Switches – Two (2) - Pump Check Service type

B. Pressure gauges – two (2)

C. In-line Surge Dampener – two (2)

## PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine the Drawings and the site for placement and connections of instrumentation. The Contractor shall coordinate with the equipment supplier to resolve any clearance or connection problems before the equipment is received on site.

B. Secure and utilize instrument mounting details from the manufacturer or supplier for installation purposes.

3.02 INSTALLATION

A. Provide labor, materials, tools, equipment, supplies and services and auxiliary devices including, but not limited to, bracket and mounting hardware to install the instrumentation.

B. Provide fused electrical disconnects locally at all instruments requiring 120 VAC power.

C. Unless specifically shown, do not mount direct reading or electrical transmitters on process piping. Mount on instrument racks or stands or in enclosures mounted on walls.

D. Install all instrumentation and auxiliary devices so that they are accessible for maintenance. Provide space between instruments and other equipment and piping for ease of removal and servicing. Generally, install instrumentation to be accessible from floor level or grade.

E. Follow additional installation specification as specified in the individual instrument sections.

F. Provide unions, couplings, shut off valves and adapters for process piping to field instrumentation interface, as shown on instrument mounting detail drawings.

G. Minimize process interruptions during installation, removal, or replacement of instruments and devices. Any operating interruptions shall be at the convenience of operations personnel.

3.03 FIELD QUALITY CONTROL

A. Provide instrument manufacturer's services for installation assistance, field calibration, startup and training. Provide manufacturers certificate for transmitters and electromagnetic flowmeters, stating that installation is in accordance with manufacturers recommended practice.

B. If indicated in Division 1, provide site training describing maintenance, calibration, troubleshooting, repair and replacement for each instrument. The site training shall be provided by a technician employed directly by the instrument manufacturer. Contractor personnel shall not provide this training. Two (2) four hour training sessions shall be provided for each instrument on non-consecutive days. Each session shall accommodate up to six instrumentation technicians.

C. Remove the shipping stickers, paint splatters, dirt, grease and other contaminants to restore the instrumentation to a clean and like new condition prior to final acceptance.

3.04 DEMONSTRATION

A. Prepare instrumentation installation, certification and calibration certification sheets for each instrument. Use these sheets for documenting installation, testing and calibration.

B. For each installation certification sheet, include the following information:

1. Project name.
2. Tag number and description.
3. Manufacturer.
4. Model and serial number.
5. Date, time and person who performed mechanical installation verification.
6. Date, time and person who performed electrical installation verification including wiring terminations.
7. Space for comments.
8. Space for sign off and date.

C. For each calibration certification sheet, include the following information.

1. Project name.
2. Tag number and description.
3. Manufacturer.
4. Model and serial number.

5. Date, time and person who performed calibration.

6. Calibration data to include:

   a. Input, output, and error at 0 percent, and 100 percent of span for analog instruments.

   b. Switch setting, contact action, and deadband, if applicable, for discrete elements.

   c. Space for comments.

   d. Space for sign off and date.

D. Conduct a performance test for each installed instrument. Furnish special tools, calibration equipment and labor to perform the tests. Demonstrate that the instrument performs as specified. Test analog devices at 0, 25, 50, 75, and 100 percent of scale.

E. For each analog instrument performance test, prepare a performance test sheet and include the following information:

1. Project name.

2. Tag number and description.

3. Manufacturer.

4. Model and serial number.

5. Date, time and person who performed test.

6. Test date to include output and error at each test point.

END OF SECTION

**SECTION 15010**

**GENERAL MECHANICAL REQUIREMENTS**

PARAGRAPH INDEX

## SECTION 15010

## GENERAL MECHANICAL REQUIREMENTS

## PART 1 - GENERAL

1.01 DESCRIPTION

The provisions of this Section of the Specifications are intended to govern the quality of design, fabrication, workmanship, operation, etc., of all materials, equipment and appurtenances to be furnished and installed under the various sections that include mechanical equipment as part of the specified items.

1.02 SHOP DRAWINGS

Shop drawings, including dimensioned drawings, descriptive literature, performance data, electrical characteristics, and, in general, all information necessary to prove compliance with the specifications, shall be submitted as required in Section 01900, for all shop drawings indicated in the individual Technical Specifications.

1.03 OPERATION AND MAINTENANCE MANUALS

The Contractor shall provide manufacturer's operation and maintenance manuals in accordance with Section 01900, and as required in the individual Technical Specifications.

1.04 TRAINING

See Section 01900 for training requirements for any mechanical equipment.

1.05 STANDARDS

Where standards, codes or specifications are referred to, the reference is to particular standards, codes or specifications together with all the latest amendments and errata applicable at the time that the bids are taken. These are listed below:

| Acronym | Organization |
|---|---|
| AMCA | Air Moving and Conditioning Association, Inc. |
| ASTM | American Society of Testing and Materials |
| ASME | American Society of Mechanical Engineers |
| ANSI | American National Standards Institute |
| ASHRAE | American Society of Heating, Refrigerating and Air Conditioning Engineers |
| AWS | American Welding Society |
| AWWA | American Water Works Association |
| CFR | Code of Federal Regulations |
| Federal | Federal Government Specifications |
| HI | Hydraulics Institute |

| Acronym | Organization |
|---|---|
| IEEE | Institute of Electrical & Electronics Engineers |
| NEMA | National Electrical Manufacturer's Association |
| NFPA | National Fire Protection Association |
| OSHA | Occupational Safety and Health Act |
| NSF | NSF International |

1.06 GENERAL DESIGN OF EQUIPMENT AND MACHINERY

A. All equipment and machinery furnished under this Contract shall be of the latest and most improved design suitable for the service of which it is to be used. All equipment and machinery shall be designed and constructed to operate efficiently, continuously and quietly under the specified requirements with a minimum of labor, power, maintenance, renewals and repairs.

B. The design and construction of all equipment and machinery shall be such as to permit operation with minimum noise, wear and vibration (maximum overall peak velocity of 0.1 inches per second (ips) unless otherwise specified), when properly installed.

C. Ample room for erecting, repairs, inspecting and adjusting all equipment and machinery shall be provided. The design, construction and installation of all equipment and machinery shall conform to and comply with the latest safety codes and regulations.

D. The design and construction of the several units shall be such that they shall present a uniform appearance and the arrangement shall be such that their operation shall be in harmony in every respect. Whenever possible, fittings and fixtures of the same make and model shall be used for the several units and their connections. All equipment of identical type and service shall be the product of the same manufacturer.

E. All equipment selected shall be of such size and general arrangement to suit the space in which it is to be installed.

F. The various parts of the equipment and machinery shall be of plain shape and good lines, especially designed and constructed for strength and durability. Casting shall be design and constructed to cool uniformly without shrinking strains and shall have good sized fillets at all re-entrant corners. Sudden change of section shall be avoided.

G. Whenever possible, parts of each unit shall be made to gauge, be a duplicate, of and be interchangeable with the same parts of other machines of the same size and kind.

H. The workmanship shall be of the highest class throughout.

I. All assemblies shall be completely shop fabricated and structural steel parts shall be shop erected. Assemblies and structural steel parts shall be match

marked before being disassembled for shipment. Parts shall be shipped assembled in as large a unit as possible to minimize field reassembly. All parts shall be amply proportioned for all stresses which may occur during operation, and for any additional stresses which may occur during fabrication and erection.

J. Unless otherwise specified, welding shall be in accordance with the latest standard specifications for "Gas Tight Welding" of the American Welding Society.

K. Unless otherwise specified, galvanizing shall be hot-dipped, in accordance with the latest standard specifications for "Zinc Coating", ASTM A123.

1.07 MANUFACTURER'S CERTIFICATES

Where noted, the Contractor shall furnish Manufacturer's Certificates for installed equipment in accordance with the requirements of Section 01900, as required in the Specifications. Contractor shall include provisions for authorized factory personnel to witness installation and startup of mechanical equipment as needed for certification purposes.

1.08 TEMPORARY STORAGE OF EQUIPMENT

For all mechanical equipment to be installed, the Contractor shall provide for all measures required or recommended by the equipment manufacturer related to storing said equipment. This includes measures such as but not limited to providing: temporary power, temporary heat, lubrication and manual rotation of rotating equipment shafts or of the equipment itself.

**PART 2 - MATERIALS**

2.01 GENERAL

A. Unless otherwise specified, materials shall be in accordance with the following latest Standard Specifications of ASTM:

| Material | ASTM Std, |
|---|---|
| Structural Steel | A-36 |
| Welded Steel Pipe | A-53 |
| Iron Castings | A-48 |
| Babbitt | B-23 |
| Bronze Castings | B-30 |
| Bronze (Manganese) | B-138 |
| Bronze (Silicone) | B-98 |
| Steel Bolts | A-307 |
| Hot Dip Zinc Coating | A-123 |

B. All materials shall, if required, be tested and shall fulfill all requirements specified. Physical tests may be made by the County. The Contractor, at his own expense, shall furnish test pieces and samples in the number, shape, size

and finish required by the Engineer. All broken material shall become the property of the Contractor, unless requested in writing by the County. The failure of test specimens to fully conform to the requirements of the specifications shall be sufficient cause for rejection of the whole melt or stock from which samples were obtained.

C. Iron castings shall be smooth, clean, and free from scale, lumps, blisters and other defects. No plugging, welding or filling will be allowed except as noted in the specifications.

D. The alloy grade number of all babbitt shall be that bearing alloy of a composition recommended by the manufacturer of the equipment or machinery for the service required, subject to the approval of the Engineer.

E. All bronze shall be made of new material and shall be free from objectionable imperfections. If the materials show signs of improper mixing when being machined, the castings will be rejected.

2.02 MATERIALS IN CONTACT WITH FINISHED (POTABLE) WATER

A. Components manufactured from bronze or brass alloys with have a high zinc content, (> 6% composition), shall not be utilized where the component is in regular or continuous contact with potable water. This provision is to prevent a process called ‘dezincification’ which weakens components over time.

B. Components, component surfaces or coatings over component surfaces, as applicable, in regular or continuous contact with potable water shall be certified or listed as NSF 61, shall have documentation included with its shop drawing submittal that the material has been tested and meets this standard.

C. Pipe, pipe fittings, plumbing fittings and plumbing fixtures shall be “lead-free” as per the Safe Water Drinking g Act (SDWA), where such products shall meet a weighted average lead content of no greater than 0.25 percent as indicated in the SDWA.

2.03 JOURNALS, BEARINGS AND KEYS

A. Journals and bearing surfaces shall be of sufficient size and properly proportioned for the least wear and to avoid heating under all conditions, and where necessary, provisions shall be made for easy removal and for proper adjustments. Journals shall be suitable boxes which, where necessary, shall be lined with babbitt metal hammered into grooves and bored in place. If bearings are of the ball bearing type, both inner and outer races as well as the balls shall be heat treated steel to resist wear. The balls shall be of ample size to carry the maximum loads with a large factor of safety to prevent flaking, spalling, or crushing. The balls shall be properly spaced and held in position by rugged continuous spacing or retainer rings.

B. Pins and keys shall be properly proportioned. Keys, nuts and all other parts which might otherwise work loose shall be secured with approved locking devices.

2.04 LUBRICATION

A. All bearings, except those specifically requiring oil or water lubrication, shall be pressure grease lubricated. All lubrication points shall be readily accessible, away from locations dangerous to workmen.

B. Pressure grease lubrication fittings shall be the "Alemite" type as made by the Stewart Warner Corporation, or equal. The pattern of the fitting shall be selected for accessibility in lubricating and shall meet the approval of the Engineer. Housings of grease lubricated bearings shall be automatically exhausted to atmosphere to prevent excessive greasing.

C. The Contractor shall furnish three Alemite Hydraulic guns, or equal.

D. The Contractor shall furnish lubrication charts or schedules for each piece of equipment or machinery. The charts or schedules shall designate each point of lubrication, the type of lubricant to be applied and the frequency of lubrication. Charts and schedules shall be submitted to the Engineer in quadruplicate, bound in folios, with each chart or schedule protected by a transparent plastic envelope.

E. For each piece of equipment installed, the Contractor shall furnish a six month supply of each type of lubricant, unless specified otherwise.

F. A typewritten list shall be furnished with the lubricants, designating the specific lubricant to be used for each piece of equipment. This is in addition to the required operating and maintenance manuals which will also contain lubrication requirements.

2.05 MOTORS AND CONTROLS - GENERAL

Motors and controls shall conform to the latest requirements of IEEE and NEMA, and where applicable, shall be UL listed. All Electric motors supplied shall be in accordance with the following unless as otherwise specified in the various driven equipment specification sections or on the Drawings:

A. Minimum motor sizes are specified with the driven equipment. Motor starting and control equipment is specified either with the motor which is controlled or in an electrical specification section. The Contractor is advised to consult all specification sections to determine responsibility for motors and controls.

B. Motors shall be designed, built and tested and perform in accordance with the latest revision of NEMA Standard MG-1. Motors shall be suitable for use under the conditions and with the equipment to which applied, and designed for operation on the electrical systems specified or indicated.

C. Motor capacities shall be such that the horsepower rating and the rated full-load current will not be exceeded while operating under the specified operating conditions. Under no condition shall the motor current exceed that indicated on the nameplate.

D. Motor sizes noted in the individual equipment specifications are minimum requirements only. It is the responsibility of the equipment manufacturers and of the Contractor to furnish motors, electrical circuits and equipment of ample capacity to operate the equipment without overload, without exceeding the rated full-load current, or overheating at full-load capacity under the most severe operating service of this equipment. Motors shall have sufficient torque to accelerate the total $WR^2$ of the driven equipment to operating speed.

E. Motors shall be continuous duty type and shall operate quietly at all speeds and loads.

F. Motors shall be designed for operation on 60 hertz power service. Motors up to 1/3 horsepower capacity shall be single phase. Motors ½ horsepower and larger shall be 3-phase.

G. Motors shall be mounted so that the motor can be removed without removing the entire driven unit.

H. Single phase motors smaller than 1/20 horsepower shall be ball or sleeve bearing, drip-proof, totally enclosed or explosion proof, as specified, 115 volts, permanent split capacitor or shaded pole type. These motors shall not be used for general power purposes and shall only be provided as built-in components of such mechanical equipment as fans, unit heaters, humidifiers and damper controllers.

I. Single phase motors 1/20 horsepower and larger shall be ball bearing, drip-proof, totally enclosed or explosion proof, as specified, with Class A or B insulation, as standard with the motor manufacturers; 115, 115/230, 200 or 230 volts, permanent split capacitor, or repulsion start-induction run type.

J. Except as otherwise specified in the various specification sections, 3 phase motors shall meet the requirements of this paragraph. Motors shall be NEMA Design B, squirrel cage induction type. Insulation shall be Class F and motor shall be rated at no greater than 50°C rise for open motors and 65°C rise for closed motors, both above ambient temperature of 40°C. At 40°C ambient temperature explosion proof and totally enclosed motors shall have a 1.00 service factor and drip-proof motors shall have a service factor of 1.15 or higher. Motors specified for operation at 480 volts shall be nameplated 460 volts.

K. Unless otherwise specified, all motors supplied shall be new, manufactured after December 17, 2010.

L. Motor Performance and Operating Efficiency

1. Reference is made to:

   a. Energy Independence and Security Act (EISA) of 2007

   b. 10 CFR 431 – Department of Energy - Energy Efficiency Program For Certain Commercial And Industrial Equipment –

2. EISA and 10 CFR 431.25 require the following types of electric motors, (defined as General Purpose – Subtype 1 as per 10 CFR 431.12), to be premium efficient, with nominal full load efficiencies as defined by NEMA MG-1 Table 12-12:

   a. Single Speed, Squirrel Cage Induction Motor, 60 Hz, 3-phase, low voltage (230V or 460V), Continuous Duty with 2, 4 or 6 poles; 1 Hp to 200 Hp, NEMA Design A or B, NEMA T-frame, foot mounted, with open, enclosed, or explosionproof enclosure

3. EISA and 10 CFR 431.25 require the following types of electric motors, (defined as General Purpose – Subtype 2 as per 10 CFR 431.12), to be EPAct efficient, with nominal full load efficiencies as defined by NEMA MG-1 Table 12-11:

   a. Single Speed, Squirrel Cage Induction Motor, 60 Hz, 3-phase, low voltage (< 600V), Continuous Duty with 2, 4, 6 or 8 poles, 1 Hp to 200 Hp, NEMA Design C, NEMA U-frame, footless, close coupled or vertical solid shaft with normal thrust

4. The following types of motors do not fall under the above EISA and 10 CFR 231 efficiency requirements. These types of motors shall have efficiencies to motor manufacturer's standards, unless otherwise specified:

   a. Single Phase

   b. Two digit NEMA Frames (i.e. 48- and 56- )

   c. Medium Voltage Rated

   d. NEMA Design D Motors with High Slip

   e. Less than 1 Hp capacity

   f. Invertor Duty Motors with optimized windings for adjustable speed drive usage only (i.e. cannot be utilized with RVSS or Across-The-Line type motor starters)

   g. Submersible Motors

   h. DC Motors

   i. Customized OEM mounting (i.e. integral gear motor or brake motor)

j. Multiple Speed motors

5. For Motors >200 Hp, see the applicable technical specification section.

2.06 FLANGES AND BOLTS

A. Flanges, except as otherwise specified, shall be cast solid, and bolt holes shall have drilled and spot-faced on the back. Stud holes shall not be drilled through. Flanges shall be uniform in thickness and shall come fair and, if required, shall be turned or chipped in a neat and workmanlike manner.

B. Jacking screws shall be provided for covers, etc. where required, and also suitable eye bolts for lifting. Bolts and nuts shall be of the best quality of open hearth, free machining steel. Bolts shall have good, sound well-fitting threads; nuts shall be cold pressed. All heads, nuts and threads shall be of American Standard regular sizes. Ferrous bolts and nuts shall be galvanized by the hot dipped process. Where specified, due to corrosive atmospheric conditions, Type 316 stainless steel bolting hardware shall be provided.

C. All installed flange nuts and bolts shall be torqued to the connecting piping per piping manufacturer requirements. Installed nuts shall be fully engaged on the corresponding threads (bolt or all thread). Installed bolting hardware shall have threads projecting past the nut face, (minimum 1/32 inch). Installed bolting hardware which only partially engages the corresponding nut is not acceptable.

2.07 EQUIPMENT COUPLINGS AND ALIGNMENT

A. Except where otherwise specified for a particular item of equipment, all equipment where flexible couplings are specified or are required for the purpose, a standard self-aligning forged steel coupling with sealed lubrication, as manufactured by Thomas, Koppers, Falk, Sier-Bath, or equal shall be provided between each motor and its driven equipment. One hub of the coupling shall be provided between each motor and its driven equipment. One hub of the coupling shall be firmly fixed and keyed to the equipment shaft with the other hub similarly secured to the abutting drive shaft. Couplings shall be of all metal construction and shall be moistureproof and dustproof. Arrangement of couplings shall be such that there is sufficient room to place a dial indicator for alignment checking of shafts of the motor driven equipment. Each coupling shall be provided with an easily removable guard meeting all OSHA requirements.

B. All equipment and motors/drives shall be field aligned using laser level type indicators or dial indicators and feeler gauges, in accordance with the procedures established by the latest revision of the Hydraulic Institute Standards (ANSI/HI 1.4). Parallel and angular misalignment shall not exceed the limits recommended by both the equipment and the coupling manufacturer.

2.08 EQUIPMENT BEDPLATES

The various items of motor driven equipment, such as pumps, shall be mounted on structural steel bedplates. The bedplates shall be of adequate size to accommodate the equipment and its motor, to form an integral rigid mounting platform. Steel or brass shims shall be used to level equipment bedplates mounted in contact with concrete pads or floors. Jacking bolts or jacking (leveling) nuts on mounting studs shall not be used in lieu of shims. Bedplates shall be grouted to the concrete base and shall be filled with grout in all instances where the manufacturer has made provision for introducing grouting mixture into bedplate cavities. It shall be the Contractor's complete responsibility to determine the proper method, to provide all materials and components required, to coordinate the work, and to set, couple, align and install all equipment in a satisfactory manner.

**PART 3 - EXECUTION**

3.01 MANNER OF INSTALLATION

A. The general arrangement of pipe and equipment shall be as shown on the Drawings. Detailed drawings of proposed departures due to actual field conditions or other causes shall be submitted to the Engineer for approval. The Contractor shall carefully examine the drawings and shall be responsible for the proper fitting of materials and equipment as indicated, without substantial alternation. Because of the small scale of the drawings, it is not possible to indicate the exact location of all piping, offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the space requirements for proper clearances and the structural and finish conditions affecting his work and shall arrange such work accordingly, furnishing such offsets, fittings, valves and accessories as may be required to meet such conditions.

B. Each trade shall determine the location, size, etc. of all chases and openings required for the proper installation of its work, and shall see that such are provided. Where it is necessary to run pipes or ductwork through walls or fittings, the trade performing the work shall notify the Contractor so that proper provisions can be made for same. Each trade shall furnish and set all inserts, sleeves, hanger supports, etc. required for its work and shall be responsible for their proper and permanent location.

C. All piping and ductwork exposed to view shall be run generally parallel with the lines of the building and as close to walls and columns as may be practical and consistent with proper grade and the maintenance of proper clearances for access to all parts requiring servicing.

D. The Contractor, in the execution of the work, shall do no cutting of woodwork, masonry, concrete or other materials after same have been installed, without the written permission of the Engineer. No waterproofing shall be cut for any purpose except on written approval of the Engineer.

3.02 TESTING

A. After erection, the Contractor shall adjust and balance all equipment and systems, and shall demonstrate that all equipment is operating in a satisfactory manner. All rotating equipment shall be lubricated according to recommendations of the manufacturer and all adjustments shall be made to suit anticipated station operating conditions. Each piece of machinery shall be tested to show that it operates quietly, without signs of vibration, overheating, or sign of distress at full specified capacity. Adjustments shall be made as necessary. All defective parts on machinery shall be replaced.

B. The Engineer shall be notified in advance of all tests and all tests shall be conducted to his entire satisfaction.

3.03 MISCELLANEOUS

A. Finished parts shall be well protected in the shop, during transportation and before and after erection to prevent injury of any kind. Injured parts which in the opinion of the Engineer are damaged or which cannot be refitted, shall be promptly replaced by the Contractor without expense to the County. All exposed finished parts of machinery shall be greased or oiled before shipment.

B. The Contractor shall furnish to the County all tools of special nature which are required to adjust or maintain the equipment, but shall not be required to furnish standard tools.

C. All exposed belts, gears, and drives shall be protected with guards. Guards may be of the equipment manufacturer's standard design, but must meet all OSHA Standards, and allow access to the equipment for maintenance without complete disassembly.

3.04 PAINTING AND LABELING

A. All fabricated or assembled surfaces normally painted shall be thoroughly dry and free from all rust, grease, dirt or scale. The Contractor is reminded to correlate the selection of shop prime coats to be compatible with subsequent field applied coats of paint. The Contractor shall touch up paint any item damaged during shipping or installation.

B. Contractor shall not paint over any factory applied nameplate on any piece of equipment. Nameplate shall be masked or temporarily removed and reinstalled for painting purposes.

3.05 NAMEPLATES

A. The Contractor, through the applicable equipment manufacturer, shall provide factory installed corrosion resistant metal nameplates, with data engraved or stamped for permanent attachment on all supplied equipment.

The data shall include manufacturer, product name, model number, serial number capacity, size operating and power characteristics. 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 shall be permanently identified by name and number corresponding to the as-built (redline) drawings, with engraved and laminated, black on white finish pheonolic nameplates. Nameplate data and installation shall be approved by the Engineer. Nameplate lettering shall be minimum 3/8-inch high for small equipment and minimum 1-inch high for large equipment. Motors for motor-driven equipment shall be identified by the same number as the driven unit. Decals, Rotex or Dymo field applied labels will not be acceptable.

## 3.06 ADJUSTMENTS TO RELATED WORK

The final work shall include any adjustments that may be required by the approved equipment furnished, with modifications made to concrete shapes and to dimensions shown on the contract drawings as may be required to suit the details of the approved equipment furnished, all at no additional cost to the County.

END OF SECTION

**SECTION 15060**

**PIPE AND PIPE FITTINGS**

PARAGRAPH INDEX

**SECTION 15060**

**PIPE AND PIPE FITTINGS**

## PART 1 - GENERAL

### 1.01 DESCRIPTION

This Section includes the requirements for furnishing all labor, materials, equipment and appurtenances necessary for the complete and satisfactory installation of all piping systems within and under the pumping station structure, as shown on the Drawings and as required for a complete installation as specified.

### 1.02 SHOP DRAWINGS - MATERIAL LIST

Shop Drawings, including dimensioned Drawings and descriptive literature, shall be submitted as specified under Section 01900. For material and equipment readily identified in standard publications of equipment manufacturers, it will be sufficient to state only the catalog number in the submission. A layout of all systems requiring piping 6-inches and larger shall be also be submitted. Layouts of 4-inch flanged piping systems shall not be submitted except where (in congested areas, or for other purposes) specifically requested by the Engineer. If used, submit five copies of factory hydrostatic test reports for steel pipe and fittings.

### 1.03 GENERAL NOTES

A. Unless otherwise specified herein, starters, H-O-A switches, pushbuttons, and other electrical devices shall be specified and provided under the ELECTRICAL DIVISION of the Specifications, and shall be arranged as shown on the Drawings.

B. Unless otherwise specified herein, motors shall meet the requirements specified in Section 15010. Type of enclosure (open drip proof, totally enclosed, etc.) shall be as specified herein.

C. Selected miscellaneous piping systems may be specified in other sections of the specifications. Miscellaneous piping systems which may not be described specifically by any section of these specifications shall be of the type of pipe and fittings as directed by the Engineer or as shown on the Drawings.

D. 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.

E. 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.

F. Inside the building, all exposed interior cast iron or black steel pipe, fittings and exposed cast iron specials, shall be painted. The Contractor may furnish pipe and fittings with the cast iron pipe industry's standard exterior bituminous coating, or uncoated pipe and fittings, or pipe and fittings with a shop prime coat of paint. In any case, it shall be the Contractor's responsibility to provide a satisfactory final field finish painting job. Sealer coats (on bituminous coated surfaces), thorough field cleaning (of uncoated surfaces), or shop primer which is compatible with field coats, shall be provided as required. Details of painting and materials to be used shall be as specified in Section 09900 entitled PAINTING.

G. Where eccentric reducers are indicated to be used, the reducer shall be installed with its straight side at the top of the piping system, unless otherwise noted on the Drawings.

1.04 GENERAL NOTES - FITTINGS

A. All fittings shall be of the type indicated on the Drawings unless otherwise specified. Ferrous piping shall be provided with ferrous fittings; copper tubing shall be provided with bronze, wrought copper or brass fittings. In general, all fittings shall be as specified hereinafter in paragraph entitled "Pipe and Fittings Schedule".

B. Nipples shall be extra heavy and of same material as piping system in which they are installed. Close nipples are not acceptable.

C. Malleable iron ground joint unions, brass to iron seat, of approved make, shall be used on all connections, up to and including 3-inch in diameter, to risers, appliances and equipment. Flanged connections shall be used for piping larger than 3-inches. Wherever the sizes of pipe are reduced, the fittings shall be made to suit these changes without the use of bushings.

D. All flanges shall come fairly face to face, the pipe in perfect line, the pipes shall not be sprung to make a joint. Gaskets for flanged joints shall be as specified under "Joints". All joints shall be neatly made and with great care.

E. In general, soft copper tubing shall have flared type fittings, and hard copper tubing shall have soldered joint fittings, or "Swagelock" for 1-inch tubing or less.

F. Screwed type systems shall contain ample unions in piping at equipment to allow easy removal of the equipment.

## PART 2 - MATERIALS

2.01 PIPE AND FITTINGS SCHEDULE

A. Pipe and fittings shall be as indicated on the Drawings and as listed in the following schedule. The 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.

| SERVICE | PIPE | | FITTINGS | | TYPE |
|---|---|---|---|---|---|
| | **Material** | **Spec. Ref.** | **Material** | **Spec. Ref.** | **JOINTS** |
| **First Group** | | | | | |
| a. Finished Water 4" and larger | Ductile Iron | ANSI A21.15 (AWWA C115) | Ductile Iron | ANSI A21.10 (AWWA C110) | Flanged Pipe (See Note 3 Below) |
| | Notes for First Group:<br>1. Pipe and fittings, Portland cement lined in accordance with ANSI Specifications A21.4 Section 4-10.1 with curing to be effected by application of a bituminous seal coating which shall cover and seal the cement mortar. The thickness of the cement lining shall be that specified in Section 4.8.2, Double Thickness.<br>2. Pipe shall be Class 54.<br>3. Flanges shall be drilled and faced for ANSI B16.1, Class 125.<br>4. This group is generally for piping to be installed inside the pumping station.<br>5. See paragraphs 2.02 A-D for ductile iron pipe for further specifications. | | | | |
| **Second Group**<br>a. Potable and NPW 3" and Smaller as shown<br>b. Pressure Sensing Lines | Copper Tube Type K Hard | ASTM B88 | Wrought Copper | ANSI 16.22 | Soldered (See Note 1) |

| SERVICE | PIPE | | FITTINGS | | TYPE |
|---|---|---|---|---|---|
| | Material | Spec. Ref. | Material | Spec. Ref. | JOINTS |
| | Notes for Second Group:<br>1. For pressure sensing lines, near instrumentation connections, may be soft temper minimum of 1/4" O.D. with flare or "Swagelock" type compression fittings. | | | | |
| **Third Group**<br>a. Dehumidifier Drain | PVC | ASTM D2665 DWV | PVC | ASTM D2665 DWV | Socket |
| | Notes for Third Group:<br>1. See paragraphs 2.03.A through 2.03.D for further specifications. | | | | |

2.02 DUCTILE IRON PIPE AND FITTINGS

A. Ductile iron pressure pipe shall be made of cast ductile iron of good quality and of such character as shall make the metal castings strong, tough and of even grain and soft enough to satisfactorily permit drilling, tapping and cutting. All piping shall be smooth, free from cold shuts, scale, lumps, blisters, and sand holes and defects of every nature which make it unfit for the use intended. All piping shall be straight and shall be true circles in section with its inner and outer surfaces concentric. No plugging, filling, burning-in or welding will be allowed. 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.

B. Each piece of pressure ductile iron pipe shall have the weight and class designation conspicuously painted on it as near as possible to flange or bell end of the pipe and these designations shall be clearly legible.

C. Where required or shown, the Contractor shall provide ductile iron specials. In general, specials shall consist of spool pieces, less than standard lengths of flanged, spigot end, or bell end pipe, or combination of ends, and nonstandard fittings. The specials shall conform in material, thickness and finish to the pipe in which they are installed. Tapped reinforced bosses shall be provided as an integral part of fittings, when shown or specified.

D. Flanges may be cast integrally with the ductile iron 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. "Uni-flanges" will not be acceptable. Unless otherwise noted, all flanges shall be flat face. Flanges shall be drilled and faced for ANSI B16.1, Class 125.

2.03 POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

A. Those piping systems listed in the preceding schedule and where noted on the Drawings as being "PVC" shall be unplasticized polyvinyl chloride normal impact type, conforming to ASTM SpecificationD1784 and either D1785 or D2665 for PVC pipe Class 12454-B.

1. Pipe shall be DWV (Drain Waste Vent), Schedule forty (40) or Schedule eighty (80) pressure pipe, as indicated in the pipe and fittings schedule specified herein. Pipe shall be extruded and seamless.

2. Pipe shall be that of the Elson Thermoplastics, or equal, and each length shall be clearly labeled with the manufacturer's name, PVC Type, Schedule and Size.

B. Fittings shall be PVC, conforming to: ASTM D2665 for DWV, ASTM D2466 for Schedule 40, ASTM D2467 for Schedule 80, as applicable as manufactured by Elson Thermoplastics, or equal. All fittings shall be solid molded. Welded seams shall not be permitted.

C. Generally, all PVC pipe and fittings shall have socket type joints with solvent cement. Joints shall be made in accordance with manufacturer instructions. Where specifically noted on the Drawings, or where required for connections to valves and/or equipment for special reasons, pipe and fittings shall have threaded ends, or flanged joints. Threaded joints shall be made using the pipe manufacturer's recommended thread lubricant joint compound. Flanges may be the socket type, and shall be complete with rubber gaskets and galvanized steel bolts and nuts.

D. The Contractor shall demonstrate to the full satisfaction of the Engineer that their personnel are adequately skilled in making the joints specified above, prior to the installation of any PVC piping. The Engineer 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. The Engineer shall select the tests and test methods based on existing ASTM Standards.

2.04 JOINTS, COUPLINGS, CONNECTORS AND ADAPTERS

A. Joints

1. All joints at equipment shall conform to the equipment requirements. No direct welded connections shall be made to valves or other equipment. Right and left couplings, long screws, or caulking of pipe threads or gasket joints will not be permitted. Mitered joints for elbows and matching straight runs of pipe for tees and elbows will not be permitted.

2. Soldered or brazed joints shall be made with solder and a noncorrosive past flux. The solder mixture shall be of 95-5 (tin-antimony) content. The use of acid core solder shall not be permitted. The application of excess heat shall be avoided to prevent undue softening or burning of the fittings or tubing when making connections. All soldering operations shall be performed in strict accordance with best accepted practices. Tubing shall be square cut and reamed to remove all burrs. The inside of the fittings and the outside of the tubing at each end shall be well cleaned immediately prior to soldering to remove all traces of oxidation, regardless of how clean the surfaces of the pipe and fittings may appear.

3. Threads shall be standard, clean-cut and tapered. All pipe shall be reamed free from burrs, and kept free from scale and dirt. Unless otherwise specified, threaded joints shall be made up with "Permatex" type 2, black, nonhardening pipe joint compound, or Teflon tape. The use of red lead or white lead will not be permitted. The complete threaded joint shall not have more than two threads exposed when made tight. Threads shall comply with ANSI B2.1.

4. Except where special couplings are indicated, piping requiring screwed connections shall be connected with screwed, malleable iron, ground joint, brass seat, 150 psi unions; for piping requiring flanged connections, flanged malleable iron unions shall be used. The finish of all unions shall match piping in which they are installed. Unions shall be provided at equipment and where required otherwise to facilitate removal of piping or equipment. Ground joint unions shall be as manufactured by Grinnell Company, Inc., or Stockham Valve and Fittings Company, or equal. All gaskets between flanged connections and fitting shall be full face rubber or ring gaskets, 1/8-inch thick.

5. Flanges shall be of the same material as the piping on which installed, and bolts, nuts and washers shall be of stainless steel, with good sound well-fitting threads; the nuts shall be cold punched, hexagonal, trimmed and chaffered. Heads, nuts and threads shall be U.S. Standard sizes. Bolts shall be of such length as to project ¼-inch beyond the nut when the flanged joint with gasket is assembled. All hardware shall be galvanized.

B. Mechanical Couplings

1. Unless specified or shown otherwise on the Drawings, mechanical couplings shall be the Romac 501 Ductile Iron Coupling, Style 38 by Dresser Manufacturing Division, or equal. Each shall be so designed and constructed to withstand an internal line test pressure equal to that of the pipeline in which it is to be installed but not less than 250 psi. The various mechanical couplings shall be suitable for the class

and size of ductile iron pipe or steel pipe as required at the various locations, and shall be without pipe stops. The Contractor shall provide and install mechanical couplings in addition to those shown, as required, for flexibility in installing the various piping systems. Locations of additional couplings must be approved by the Engineer.

2. Harnesses shall be provided across all mechanical couplings unless otherwise specifically noted in the Drawings to be omitted. Harnesses shall be as detailed on the Drawings.

3. Couplings shall be designed to provide a rigid connection, ease of installation, and shall allow for angular deflection and pipe expansion and contraction.

2.05 SPECIALTIES

A. Wye Strainers

1. Wye strainers shall be Model 80 as manufactured by Hayward Industrial Products, Inc., or equal. Strainers shall be rated for 150 psi service. Screens shall be of Type 304 stainless steel construction. Strainers shall be provided with threaded blowoffs and the blowoffs shall be provided with ball valves as specified in Section 15100, entitled MISCELLANEOUS VALVES.

2. Strainers 2-inches and smaller shall be of ASTM B-62 bronze construction and shall have threaded ends. Strainers larger than 2-inches shall be of ASTM A126 Class B construction with flanged ends drilled and faced in accordance with ANSI B16.1 Class 125. Threaded strainers shall be provided with No. 20 mesh screens. Flanged strainers shall be provided with 0.045 inch perforated screen.

2.06 CASTINGS AND SLEEVES THRU WALLS AND FLOORS

A. Castings or sleeves shall be provided in walls and floors for the passage of all pipes.

B. Wall and floor sleeves for pipes smaller than 4-inches shall be standard weight galvanized steel, conforming to ASTM A53. Sleeves passing through floors shall extend approximately ½ -inch above the finish floor. Chromium plated escutcheon plates, of a suitable pattern, shall be furnished and installed to conceal ends of all exposed pipe sleeves above the floors of finished rooms. Sleeves shall be of ample size to permit passage of pipe and insulation (where required) and allow for expansion. The space between pipe and sleeves shall be provided with a mastic caulk, as approved by the Engineer.

C. Generally, except where otherwise noted on the Drawings, for pipes four (4) inches and larger passing through exterior walls, ceilings and floors, castings shall be used. The casting shall be cast or ductile iron. Except where

otherwise shown on the Drawings, the castings shall be flanged at one end and shall have a mechanical joint bell at the other and shall be complete with water stop flange. The wall castings shall be the lengths shown. Flanges and bells shall not be cast flush unless otherwise shown on the Drawings. Where shown on the Drawings, water stop flanges shall also be rated for indicated thrust loads in both directions.

D. Generally, the diameter of sleeves for non-insulated pipe shall be one pipe size larger than the pipe passing through the sleeve. The diameter of sleeves for insulated pipe shall be of suitable size to allow the insulation to be continuous and of full thickness. Sleeves for flanged pipe shall be of ample diameter to pass the flanges, if cast-on flanges are used; if screwed-on flanges are used, sleeves may be one size larger than the pipe. Space between the pipe and sleeve shall be caulked as specified above.

E. The Contractor will not be allowed to box-out the concrete for installation of any castings or sleeves, except with the Engineer's permission for each specific location involved. Castings shall be securely fastened in place so that pouring of concrete will not disturb their position in any manner. The Contractor shall correlate with the other trades (particularly concrete work) to assure that all wall castings and wall and floor sleeves are properly set.

F. For all piping penetrating exterior walls below grade where sleeves or core drill penetrations are to be used, sleeves shall be of ample size to permit passage of pipe and insulation (where required) and allow for expansion and modular mechanical type joint, consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and wall opening. The seal shall be watertight and provide electrical insulation between the pipe and the wall, thus reducing chances of cathodic reaction between these two members. The inside diameter of each wall or floor opening shall be sized as recommended by the manufacturer to fit the pipe and mechanical-seal to assure a watertight joint. Contractor shall familiarize his installation personnel with all manufacturer recommendations and installation bulletins to assure a watertight assembly. Mechanical-seal shall be Link-Seal or equal. Seal shall be placed even with the interior wall to allow access for future adjustment. Annular space along the exterior wall shall be filled with a mastic caulk or other method approved by the Engineer.

## 2.07 DRAINS AND VENTS

All piping systems which do not include other convenient means of draining shall include 3/4-inch hose valves at each low point to facilitate draining of the system. All piping systems, which do not include by nature of the systems a means of venting the air (for example, faucets at sinks are a means of venting), shall be provided with either ½-inch manual gate valve or an automatic air vent valve, as directed by the Engineer, and located at each high point.

## PART 3 - EXECUTION

3.01 INSTALLATION OF PIPING HANGERS AND SUPPORTS

A. Proper and suitable tools and appliances for the safe and convenient handling of pipe and specials shall be used. All pipe and castings shall be carefully examined for defects before laying and no pipe or casting known to be defective shall be laid in the line.

B. During construction, the Contractor shall keep all ends of pipes, including those extending above the roof, and all drains and fixtures, closed with caps, plugs or wooden flange covers, to prevent dirt, building material or other foreign matter from getting into pipe and traps.

C. All hangers, supports, and guides shall be types as approved by the Engineer, arranged to maintain the required grading and pitching of lines, to prevent vibration and sagging, to provide for expansion and contraction, and to provide for adequate support of the pipes.

D. Unless shown otherwise on the Drawings, all pipe hangers and supports shall be in accordance with the following:

1. All hangers shall be adjustable carbon steel clevis type, adjustable malleable split ring swivel type, or adjustable swivel pipe roll type, having rods with machine threads. Hangers for pipe 3/4-inch and larger shall be figure 100 (or 100 ci for cast iron pipe), Figure 240, or Figure 16 of Carpenter & Patterson, Inc., or equal. Hangers for pipe ½-inch and smaller shall be Figure 81 of Carpenter & Patterson, Inc., or equal. Rod diameters shall be not less than and rod spacing shall not be greater than that scheduled below:

| | **Min. Rod Diameter (Inches)** | | **Support Spacing (Feet)** | |
|---|---|---|---|---|
| **Pipe Size (Inches)** | **Water** | **Air** | **Ferrous & Hard Copper Pipe** | **PVC Pipe** |
| 1/2 to 2 | 3/8 | 1/4 | 8 | 5 |
| 2-1/2 to 3 | 1/2 | 1/4 | 10 | 7 |
| 4 and 5 | 5/8 | 3/8 | 10 | 7.5 |
| 6 | 3/4 | 3/8 | 10 | 9 |
| 8 to 12 | 7/8 | 1/2 | 10 | 9.5 |

2. It shall be noted, the maximum design load for any pipe hanger is for a 2000 pound rod load and for a minimum spacing of 3 feet. The cast iron and steel piping up to 16-inch diameter shall have a maximum single rod hanger support spacing of ten feet (as long as the 2000 pound rod loading is not exceeded).

3. Soft copper tubing shall be supported at sufficiently frequent intervals to prevent sag or pockets.

4. Vertical lines shall be supported at their bases, using either a suitable hanger placed in a horizontal line near the rise or a base type fitting set on a pedestal, foundation or support. All vertical lines extending 6 feet or more shall be supported with riser clamps. Riser clamps shall be Figure 126 of Carpenter & Patterson, Inc., or equal.

5. All horizontal piping on vertical walls and all piping near walls for which ceiling anchorage is not practicable, subject to the Engineer's approval, shall be properly supported by heavy welded steel brackets, Figure 139 of Carpenter & Patterson, Inc., or equal, securely anchored into the wall construction. Horizontal pipe (or pipe covering) on vertical walls shall be held at a minimum of one inch from the walls to protect them from wall sweating. Hanger brackets and anchor bolts subject to submergence or water spray shall be of Type 304 stainless steel.

6. All hangers shall be secured in expansion bolts wherever practicable. Hangers and/or rod supports inserted in the concrete slab shall be capable of sustaining the hanger rod load.

7. Drilling of holes for anchors, supports, hangers, etc., in portions of the building which may affect the structural soundness of that portion will be done only after the Contractor has secured permission from the Engineer to do so.

8. All pipes, fittings and equipment 6-inches in diameter and larger, and located relatively close to the various floors, shall be supported by concrete supports where shown on the Drawings, or where directed by the Engineer. Where concrete supports are not feasible, adjustable pipe saddles may be used. These shall be complete with locknut, nipple reducer, pipe stand and floor flange and shall be the Figure 101 of Carpenter & Patterson, Inc., or equal. The size of the support shall be suitable for pipe being supported. Saddle and reducer shall be of cast iron construction. Adjustment height shall be approximately 4-1/2 inches. Support pipe shall be the size required and shall be Schedule 40 galvanized steel pipe. Floor connection shall be by companion flange with at least four stainless steel expansion bolts sized to fit bolt holes. A minimum of 3/4-inches of grout shall be used for leveling.

9. Isolating mats shall be provided between concrete supports and metallic pipe, valves, fittings, and equipment. They shall be as detailed on the Drawings.

10. Hangers which support galvanized pipe shall be galvanized and hangers which support copper pipe shall be copper-plated.

11. All piping connected to pumps shall be supported as near the pump as practicable such that the weight of the pipe is not supported by the pump casing.

12. The pipe roll stands shall be the Figure 17 as manufactured by Carpenter & Patterson, Inc., or equal. The roller and stand shall be of cast iron construction.

13. The sliding valve supports shall be the slide bearing type of teflon construction. The bearing shall be composed of two elements. Each element shall be composed of a 1/4-inch thick carbon steel backing plate with a bonded reinforced teflon pad. The teflon pad shall be 3/32-inch thick. The upper element shall over-lap the lower element by at least one inch in all directions. The elements shall be at least as large as the valve foot, but large enough to limit the bearing pressure to 800 psi. The slide bearings shall be the Fluorogold bearing manufactured by the Fluorocarbon Company

3.02 MINIMUM SLOPES

Soil, waste and drainage piping shall be sloped not less than 1/4-inch per foot in direction of flow unless otherwise indicated on the Drawings.

3.03 CONNECTION OF DISSIMILAR METALS

Wherever pipes of dissimilar metals join, there shall be provided an insulating union, coupling or flange connector for corrosion control. Connectors shall include an approved dielectric separator. Connectors shall be the product of Dresser Corporation, F.H. Maloney Company, Universal Controls Corporation, or equal. Stainless steel nuts, bolts and washers shall be used at all places at which such dielectric separators are used.

3.04 IDENTIFICATION OF PIPING SYSTEMS

A. Painting of the various piping systems and supports shall be as specified under Section 09900 entitled PAINTING.

B. All piping systems listed shall be stenciled with the name of the service to indicate the use of that particular pipe, and an arrow showing the normal direction of flow. Stencils shall be plain block letters of the size indicated hereinafter. Stenciled names shall be located near each branch connection, near each valve and at least every 50 feet on straight runs of pipe. All stenciled names shall be so located as to be legible from the floor. Generally, letters on light colored pipes shall be either black or red; on dark colored pipes letters shall be white. Stenciled names shall be applied after the piping has been tested, covered (if required) and painted. Color coding and names are as specified herein. Any system inadvertently not listed shall be stenciled as directed by the Engineer.

C. All material shall be applied in accordance with the manufacturer's recommendation.

D. No bright metal parts such as stainless steel, chrome plate, etc., shall be painted. Nor is it intended to paint stainless steel, PVC, copper, brass, or aluminum pipes. Pipes of these metals, however, shall be color coded, banded with colors indicated below with 6-inch wide bands not less than 8 feet on centers.

E. The various systems shall be painted and identified as follows:

| Service and Identification | Pipe Color |
|---|---|
| Finished Water | Blue |
| Potable Water | Blue |
| Non-Potable Water | Black |

Piping Covering

| Outside Diameter | Stencil Letter Size |
|---|---|
| Under 3/4 inch | Do not paint stencil |
| 3/4 to 1-1/4 inch | 1/2 inch |
| 1-1/2 to 2 inch | 3/4 inch |
| 2-1/2 to 6 inch | 1-1/4 inch |
| 8-10 inch | 2-1/2 inch |
| Over 10-inch | 3-1/2 inch |

3.05 FIELD TESTING

A. The Engineer shall be notified in advance of all tests and all tests shall be conducted to his entire satisfaction. All tests shall be made prior to insulating piping.

B. For sections of new piping which cannot be isolated from existing piping system valves for test purposes, an in-service leakage test shall be performed with no visual leakage.

C. For pressurized pump/station discharge piping, the test pressure shall be 200 psig. For pump/station suction piping the test pressure shall be 100 psig. The test pressure shall be maintained for at least two hours, with no pressure drop. All gravity flow piping systems, inside or under the various structures, shall be filled with water and there shall be no drop in level after two hours.

D. Repairs to the various systems shall be made with new materials. No caulking of threaded joints, cracks or hoses will be acceptable. Where it becomes necessary to replace pieces of pipe, the replacement shall be the same material and thickness as the defective piece. Tests shall be repeated after defects disclosed thereby have been made good or the work replaced.

E. 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. Valves shall be open during testing and blind flanges/plugs shall be provided where necessary.

F. All equipment used in testing shall be subject to the approval of the Engineer, and shall be such as to properly develop, maintain and measure test procedures. All gauges used for testing shall be the "Test Grade" type, certified specifically for this job

END OF SECTION

**SECTION 15100**

**MISCELLANEOUS VALVES**

PARAGRAPH INDEX

## SECTION 15100

## MISCELLANEOUS VALVES

## PART 1 - GENERAL

1.01 DESCRIPTION

This Section includes the requirements for furnishing all labor, materials, equipment and appurtenances for the complete and satisfactory installation of all valves within and under the pumping station structure which are not specified elsewhere, as shown on the Drawings and as required for a complete installation as specified.

1.02 SUBMITTALS

Submit the following Contractor's Drawings in accordance with Section 01900.

A. Catalog cuts and detail material specifications on all valves.

B. Dimensional drawings for all valves.

C. Wiring diagrams for all electrical items.

D. Manufacturer Standard Operation and Maintenance Manual Information for each valve supplied in accordance with Section 01900.

1.03 GENERAL

A. Valves specified herein shall be 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 or other means to indicate valve position.

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 non-geared valves) and shall be provided with galvanized operating levers and chains, or chain wheels and chains, extending to within 3 feet of the floor. Orientation of stems described above may be altered if approved by the Engineer to better suit space conditions except 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 6 feet above the floor shall include galvanized levers and chains, or chain wheels and chains, extending to within 3 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 operator of the equipment. Valves for equipment or appliance isolation 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 or ball type except as shown or specified otherwise. Gate valves shall be used for isolation service unless shown or specified otherwise.

G. Check valves shall be provided with adjacent gate valves so that they may be repaired without removal from the line.

H. Valves connected to nickel plated or chromium plated piping (primarily in toilet rooms) and exposed to view, shall be correspondingly nickel or chromium plated.

I. Where extension stems are required, they shall be doweled or otherwise securely attached to the valve stem.

J. The valve and operator shall be the responsibility of the valve manufacturer.

## PART 2 - PRODUCTS

2.01 VALVES SMALLER THAN 4 INCHES

A. All valves shall be provided with the type of ends indicated, unless otherwise specified. All valves of any one classification shall be of the same manufacturer.

B. Unless otherwise specified herein for specific items, valves shall be as follows. Equal valves of the Rensselaer Valve Company, Darling Valve and Manufacturing Company, or equal, shall be acceptable.

| | | |
|---|---|---|
| 1. | Gate, on ferrous piping 3" and larger | Stockham Cat. No. G-623, flanged ends<br>Crane Co. No. 465, flanged ends |
| 2. | Gate, on ferrous piping smaller than 3" | Stockham Cat. No. B-122, threaded ends<br>Crane Co. No. 431, threaded ends |
| 3. | Gate, on non-ferrous metal piping | *Stockham Cat. No. B-124, soldered ends<br>Stockham Cat. No. B-122, threaded ends |
| 4. | Check, on ferrous piping | Stockham Cat. No. B-319, threaded ends<br>Kitz Co. Code No. 4 |

| | | |
|---|---|---|
| 5. | Check, on non-ferrous metal piping | *Stockham Cat. No. B-309, soldered ends<br>Kitz Co. Code No. 14 |
| 6. | Globe, on 2" and smaller non-ferrous metal piping | *Stockham Cat. No. B-29, threaded ends<br>Crane Co. No. 14-1/2P, threaded ends |
| 7. | Globe, on 3" and smaller ferrous piping | Lunkenheimer No. 16-PS<br>Crane Co. No. 254XR, threaded ends |
| 8. | Ball, on 3" and smaller non-ferrous piping | *Stockham Cat. No. S-214, threaded or soldered ends<br>Crane Co. No. 9201, threaded ends<br>Crane Co. No. 9202, soldered ends |

* Soldered-end valves shall be installed with unions adjacent to the valves. In lieu of the combination of soldered-end valves and unions, the Contractor may use screwed union-end type valves.

C. Manual air vent valves shall be provided at high points of pipes that do not terminate with faucets or other means of relieving air. Valves shall be 1/2-inch (min.) ball valves.

D. Hose valves shown in blind flanges of main process piping, service as means of draining, shall be installed at the invert of the main pipe and shall be of the type specified herein below. For sections of isolated piping, manual drain valves, 1-inch in size, shall be provided to allow for draining of piping section.

E. Interior Hose valves of size 3/4-inch shall be NIBCO Fig. No. 74 or equal bronze hose valve, with National Standard threaded hose connection. All hose valves shall be furnished with a bronze cap and chain.

F. All miscellaneous connections to the wastewater piping system shall be made with line size corporation stops. Corporation stops shall be suitable for direct connection to ductile iron pipe and shall have male N.P.T. outlet. Corporation stops shall be in accordance with the latest version of AWWA C-800. Corporation stops shall be as manufactured by the Mueller Co., or equal.

G. Manual drain valves shall be provided in each section of pipe that can be isolated from service. Valves shall be 1-inch minimum ball valves.

## PART 3 - EXECUTION

3.01 INSTALLATION

A. Install all valves and appurtenances where shown on the Drawings, in the closed position.

B. Make joints in accordance with the requirements specified for the piping systems in which installed.

3.02 FINISH

A. Exterior of valves and supports shall be field touch up primed and field finish painted as necessary, in accordance with Section 09900, color coded per the associated piping system as per section 15060.

B. Brass and Bronze body valves shall not be painted.

3.03 TESTS

A. Inspect all valves for signs of leakage during pressure testing of the associated piping system. Valve shall be open during the testing of said piping systems.

B. Demonstrate operation of all valves, from fully open to fully closed and back again, twice.

C. Demonstrate operation (i.e. setpoints) of all special function valves, in accordance with the Contract Documents.

END OF SECTION

**SECTION 15102**

**CONE VALVE REHABILITATION**

PARAGRAPH INDEX

**SECTION 15102**

**CONE VALVE REHABILITATION**

## PART 1 - DESCRIPTION

1.01 SCOPE

A. This section covers the requirements for furnishing all labor, materials, equipment and appurtenances for the complete and satisfactory cone valve rehabilitation in Pumping Station No. 2 and Pumping Station No. 3, as shown on the Drawings and as required for a complete installation as specified herein.

B. Related Work Specified Elsewhere May Include But Is Not Limited To:

1. Section 09900: Painting
2. Section 11205: Finished Water Pumping Unit Rehabilitation
3. Section 11210: Finished Water Pumping Units
4. Section 15010: General Mechanical Requirements
5. Section 15060: Pipe and Pipe Fittings
6. Section 15100: Miscellaneous Valves

1.02 QUALITY ASSURANCE

A. Reference Codes and Specifications:

1. ANSI B16.1: "Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250 and 800."
2. ASTM A48: "Specification for Gray Iron Castings."
3. ASTM A36: "Specification for Carbon Structural Steel."
4. ASTM A126: "Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings."
5. ASTM A536: "Specification for Ductile Iron Castings."
6. ASTM B584: "Specification for Copper Alloy Sand Castings for General Applications."
7. AWWA C507: "Ball Valves 6 In. through 48 In."
8. AWWA C541: "Hydraulic And Pneumatic Cylinder And Vane-Type Actuators For Valves And Slide Gates"

B. An experienced cone valve manufacturing and maintenance shop (Valve Rehabilitation Shop) shall perform the work. The Valve Rehabilitation Shop shall have at least ten (10) years experience in the manufacturing and/or maintaining cone valves. The Valve Rehabilitation Shop shall be pre-approved by the Engineer. The Valve Rehabilitation Shop shall inspect the valves and operators and shall prepare a condition report for each valve.

C. Perform shop hydrostatic and seat leakage tests and submit certified test reports as specified herein. Perform certified shop hydrostatic tests on the valve body with the plug in the open position. The test pressure shall be 150 psi and shall be maintained for 15 minutes.

D. Perform certified shop leakage tests across the valve seats. The plug shall be maintained in the closed position by the actuator. The test pressure shall be 150 psi and shall be maintained for 15 minutes. The rate of leakage shall be no greater than 0.4 ounces per minute per inch of valve diameter.

1.03 SUBMITTALS

A. Submit the following Shop Drawings as required in accordance with Section 01900 entitled SPECIAL CONDITIONS:

1. Materials lists, including material specification references.
2. Catalog cuts of components that indicate physical dimensions and performance.
3. Submit intended layout of cone valve control panel with manufacturers' catalog cuts for all valves. Head loss information (Cv or equivalent) for all solenoid valves and flow control valves shall also be provided.
4. Dimensioned assembly drawings of components and statement confirming their suitability for use with existing unit.
5. The Contractor shall submit the name and credentials of the Valve Rehabilitation Shop that will conduct the inspection and repair of the components of the existing cone valves.
6. Approved Valve Rehabilitation Shop inspection report. Report shall include:
    a. Condition of existing valves and recommendations for valve rehabilitation.
    b. Recommended materials of construction for each item, including specification references.
    c. Recommended parts to be replaced to maintain/provide functional use of the valve.

d. Repair shop's statement of performance, certifying that components will maintain operation of respective unit.

7. Provide a Manufacturer's Certificate for each rehabilitated valve in accordance with Section 01900 entitled SPECIAL CONDITIONS.

8. Submit Operation and Maintenance Manuals for all new components in accordance with Section 01900 entitled SPECIAL CONDITIONS.

1.04 EXISTING CONE VALVE INFORMATION

Pumping Station No. 2 – Pump C & D Discharge

Diameter = 14-inch

Year Installed = circa 1994

Manufacturer = Portland Water Valve Company Inc. Portland, OR

Working Pressure 150 PSI

Test Pressure 300 PSI

Hydraulic Cylinder

Manufacturer = Cunningham Manufacturing Co. Seattle, WA

Model = A)Bore = 8

Stroke = 10

Service PSI = 500

Serial No. 101293-190 (Pump D)

Pumping Station No. 3 – Pump G Discharge

Diameter = 20-inch

Year Installed = circa 1994

Manufacturer = Portland Water Valve Company Inc. Portland, OR

Working Pressure 150 PSI

Test Pressure 300 PSI

Hydraulic Cylinder

Manufacturer = Cunningham Manufacturing Co. Seattle, WA

Model = AO

Bore = 14

Stroke = 18

Service PSI = 250

Serial No. 101393-244 (Pump G)

## PART 2 - MATERIALS

2.01 CONDITIONS OF SERVICE FOR CONE VALVES

A. All cone valves shall be suitable for operation in a 150 psi finished water system.

B. All cone valve hydraulic operators shall be suitable for operation with a minimum supply pressure of 25 psi and a maximum pressure of 80 at the inlet to the hydraulic cylinder.

C. Rehabilitation shall be performed on the valves as shown on the Drawings. Rehabilitation shall include:

1. Condition Survey Report at the Maintenance Shop
2. New Hydraulic Cylinders
3. Replacement of all wearing parts in the valve, including but not limited to:
    a. Body Seats
    b. Plug Seats
    c. Valve Shaft bearings/bushings
    d. Packing gland
    e. Shaft Packing
4. Replacement of all wearing parts in the operator mechanism, as recommended by the Rehabilitation Shop inspection report and agreed upon by the Engineer, including but not limited to:
    a. lift nut
    b. crosshead bearing
    c. rotator link
    d. housing seals
    e. cover bushing
    f. roller
    g. retaining hardware
    h. lead screw

i. guide rods

5. Shop hydrostatic and leakage tests

6. Shop primer and finish painting

7. Field operational tests

8. The hydraulic cylinders shall be as specified herein after.

9. Each operator shall be provided with three limit switches as specified herein after.

10. The hydraulic cylinder shall be provided with a mechanical adapter fabricated of ASTM A36 steel for connection to the operator mechanism.

2.02 HYDRAULIC CYLINDER OPERATORS

A. The valve operator and control appurtenances shall be suitable in all respects for operating the valve as specified hereinafter. The operator and all control appurtenances shall be suitable for a working pressure of 100 psig and a test pressure of 150 psig.

B. Each cone valve shall be hydraulic cylinder operated using finished (station discharge or suction) water as the operating medium. Hydraulic operators shall be double acting, and designed in accordance with AWWA C541, except as modified herein.

1. The piston shall be constructed of bronze or stainless steel.

2. Operator cylinders shall be constructed of fiber-reinforced plastic, bronze, or stainless steel.

3. All components shall be of corrosion resistant material.

4. Each new hydraulic operator shall be of the same bore and stroke as the cylinder being replaced on its respective cone valve.

C. The hydraulic cylinder operator for each cone valve shall be mounted to match existing mounting position. The cylinder operators shall be double acting.

D. The cone valve operator (hydraulic cylinder) shall be capable of:

| Parameter | | Pump G |
|---|---|---|
| Pressures | | |
| Maximum differential pressure (transient surge) across valve | | 120 psig |
| Maximum differential pressure across valve | | 180 feet |
| Minimum Water Pressure at Hydraulic | | 25 psig |

| Parameter | | Pump G |
|---|---|---|
| Cylinder Inlet | | |
| Normal Opening | | |
| Stroke Time Range (seconds) | | 60-180 |
| Initial Setting (seconds) | | 90 |
| Normal Closing | | |
| Stroke Time Range (seconds) | | 60-180 |
| Initial Setting (seconds) | | 150 |
| Emergency (Fast) Closing | | |
| Stroke Time Range (seconds) | | 30-90 |
| Initial Setting (seconds) | | 60 |

E. Hydraulic cylinder shall be provided with a signed letter from the manufacturer stating conformance with AWWA C541 with the exception of those items identified in Section 2.02.B.

2.03 CONTROL SYSTEM COMPONENTS

A. Control system components shall be provided by the Valve Rehabilitation Shop. Control components for each valve shall be mounted on a new Cone Valve Hydraulic Control Panel as shown on the Drawings.

B. Interconnecting piping on this control panel shall be run in neat, workmanlike lines, horizontally and vertically. Piping materials are defined in Specification Section 15060.

C. Sizes of piping and control valves shall be as shown on the Drawings unless otherwise approved by the Engineer.

D. Control system components shall include, but not be limited to, solenoid valves, manual isolation and flow (speed) control valves, in-line maintenance valves, filters, piping, and unions. The main components of each Cone Valve Hydraulic Control Panel shall be as follows:

1. Flow control valves shall provide controlled flow in one direction and free flow in the other direction. Flow adjustment can be made under pressure by turning a knob. The knob shall be provided with a locknut or set screw to lock knob position. Valves shall be installed to regulate flow out of the hydraulic cylinders. Each valve shall be of naval bronze construction and shall be the Series F of Parker Hannifin Corporation, or equal.

2. Four-way pilot-acting solenoid valves for normal operation of the valve shall be of forged brass construction, suitable for a maximum operating differential pressure of 125 psig. Each unit shall have a watertight. Provide manual maintained override feature. The unit

shall be suitable for operation in a 120 volt, single phase, 60 cycle system and shall be the Model 8344 Automatic Switch Company (ASCO) (acquired by Schneider Electric), or equal.

3. Two-way normally open solenoid power failure bypass valves to allow fast closure of the pump check service cone valve, shall be of forged brass construction. The valves shall be open when de-energized. These valves shall be suitable for a maximum operating differential of 125 psig. Each unit shall have a watertight and explosion proof enclosure. The unit shall be suitable for operation in a 120 volt, 1 phase, 60 Hz system. Valves shall be the Model 8210 Automatic Switch Company (ASCO) (acquired by Schneider Electric) or equal.

4. The three way valves for Emergency Close shall be the Miser three way diverter ball valve as manufactured by Worcester Controls, Watts LFB-6780 series, or approved equal. The body shall be of brass construction and ball and stem shall be of stainless steel construction. The valves shall be sized as shown on the Drawings and shall be suitable for 200 psi service. The valves shall have 90° operation with stops at both ends and shall not be capable of stopping flow from the common port. Each valve shall be provided with two phenolic nameplates fastened to the control panel with stainless steel fasteners. Nameplates shall be red letters on white field to indicate valve handle "NORMAL" position and "EMERGENCY CLOSE" position.

5. In-line maintenance valves shall be ball type, of bronze construction with threaded ends and lever operator, as specified in Section 15100. All in-line maintenance valves shall be provided with phenolic nameplates fastened to the control panel with stainless steel fasteners. Nameplates shall be black letters on white field indicating if valve is "NORMALLY OPEN" or "NORMALLY CLOSED".

6. Water filters shall be in –line type, suitable for finished water filtration down to a 20-micron particle size.

   a. Water filters shall be sized for the maximum flowrate required to pass through the control panel piping, which is when there is an emergency closure of the cone valve. Filters shall be sized to produce less that 0.5 psi of pressure drop across a clean filter.

   b. The in-line water filter assembly shall consist of a filter head, a filter bowl, and a replaceable filter element. The filter assembly shall be suitable for an operating pressure of 150 psi.

   c. The filter head and bowl shall be 316 stainless steel construction, with minimum 1-inch diameter threaded inlet and outlet ports. Seal shall be Buna-N rubber construction. The filter bowl shall

house the filter element and be connected to the filter head via bolting hardware or clamp.

d. The filter element shall be constructed of polypropylene. The length of the element shall be compatible with the specified filter head and bowl assembly.

e. The in-line water filter assembly shall be constructed from Parker Fulflo Model B filter vessel with a compatible Parker Fulflo Honeycomb cartridge Model No. M15R30, or equal.

2.04 LIMIT SWITCHES

A. Industrial type limit switches shall be provided for monitoring and control of the valve operation. Limit switches shall be actuated by cam, stop or the indicator hand movements when the valve opens or closes as described hereinafter.

B. A minimum of three (3) limit switches shall be furnished and installed on each cone valve. Limit switch placement for the proposed control shall be determined by the Vendor, subject to the approval by the Engineer. Limit switches shall be heavy-duty industrial type, oil tight, NEMA 4, lever arm actuated spring return units with contact arrangement as shown on the Drawings or required. Limit switches shall be as manufactured by Micro-Switch, a division of Honeywell, NAMCO Controls Corporation EA-700 series, or equal.

C. Limit switches shall be double pole with 3 N.O. and 3 N.C. contacts. Limit switches shall be the maintained contact type. All contacts shall be rated to carry minimum 10 amperes of 120-volt power, continuously.

2.05 CONTROL OF CONE VALVES

A. The cone valves are utilized in a pump check service application. The cone valve opens during the associated pump startup sequence and closes during normal and emergency pumping shutdown sequence. This integral operation of pump and cone valve is controlled via the Pump's control circuit located in the Pump's MCC starter cabinet in Pumping Station No. 3.

B. On the Cone Valve Hydraulic Control Panel, automated control of the solenoid valves (energized or deenergized open/close positions) are dictated by the associated pump's control circuit.

2.06 SPARE PARTS

A. The following spare parts shall be furnished, and shall be delivered by the Contractor to the owner.

1. Cone Valve Components

a. One set of valve stem packing

b. One set of hydraulic cylinder rod packing

c. One set of piston seals

2. Control Panel Components

a. Two (2) 4-way solenoids, of each size provided

b. Two (2) 2 way solenoid valves, of each size provided

c. Replaceable filter elements – Provide at least twenty elements for each size provided, or the minimum spare quantity available from the manufacturer, which ever is greater.

2.07 FACTORY FINISH

A. Interior of valves shall be painted using the procedures and coating systems described in AWWA C507.

B. Outside of valves shall be shop prime painted, in accordance with Section 09900, entitled PAINTING.

**PART 3 - EXECUTION**

3.01 INSTALLATION

A. Install cone valves with operators and appurtenances as shown on the Drawings and specified herein. All cone valves shall be installed with stems in the vertical and such that the valve isolates the discharge header from the pump piping. Reuse existing supports under each valve or provide new supports as required. Do not anchor valve to the support. Valves shall be installed with new flange gaskets.

B. Contractor shall provide the services of a certified technician to assist in the installation and testing of the rehabilitated cone valves. Technician shall provide the support necessary in order to provide a Manufacturer's Certificate indicating that the installation in each station, is in accordance with their recommendations.

3.02 FINISH

Outside of valves shall be field touch-up primed and field finish painted in accordance with Section 09900, entitled Painting. The field finish shall match the color of the adjacent finished water piping, unless otherwise noted.

3.03 TESTING

A. Pressure test all cone valves and control systems charging the pipes with actual operating pressure. No observable leakage will be permitted.

B. Demonstrate the operation of each cone valve in the manual control mode and the operation of all limit switches.

C. Demonstrate the operation of each pump check service cone valve in the automatic mode as part of the pump testing procedures as specified in Sections 11205 entitled: Finished Water Pumping Unit Rehabilitation and Section 11210 entitled: Finished Water Pumping Units, respectively.

D. All pump check service valves and controls shall be successfully field tested prior to returning the pumping unit to beneficial service.

END OF SECTION

**SECTION 15106**

**GATE VALVES, 6 INCHES AND LARGER**

PARAGRAPH INDEX

## SECTION 15106

## GATE VALVES, 6 INCHES AND LARGER

### PART 1 - DESCRIPTION

1.01 DESCRIPTION

This Section covers the requirements for furnishing all labor, materials, equipment and appurtenances for the complete and satisfactory installation of gate valves, 6-inches in diameter and larger, for finished water isolation valve service, as shown in the Drawings and as required for a complete installation as specified.

1.02 SUBMITTALS

A. Contractor shall submit Shop Drawings for the gate valves in accordance with Section 01900, to include, but not necessarily be limited to, the following:

1. Manufacturer's drawings and catalog cuts for the valve, which indicate dimensions, performance, materials of construction and all other items of information specified herein.

2. Drawings with complete dimensions, showing the intended orientation of the valve and its operator and clearly identifying the location at which the valve is to be installed.

3. Manufacturer's drawings showing a complete cut-away view of the valve and operator, clearly identifying all component parts.

4. Minimum and maximum input torque over the operating range of the valve.

B. A Manufacturer's Certificate for installation shall be provided for the valves, complete with operators and accessories, in accordance with Section 01900.

C. The Contractor shall submit Operation and Maintenance Manuals for the valve, and accessories, in accordance with Section 01900 and Section 15010 entitled GENERAL MECHANICAL REQUIREMENTS. Manuals shall include number of turns to open and close all supplied gate valves.

D. Submit all factory production test reports, which include all hydrostatic and leakage test results. Valves shall not be shipped until the factory test reports are approved.

1.03 QUALITY ASSURANCE

A. Each valve supplied shall be production tested at the factory in accordance with the latest version of AWWA C509/C515. Submit test results as specified herein.

B. The requirements of Section 15010, entitled GENERAL MECHANICAL REQUIREMENTS shall apply to all work under this section.

**PART 2 - MATERIALS**

2.01 GATE VALVE

A. Gate valves shall be the resilient wedge non-rising stem (NRS) type in accordance with the latest revision of AWWA C509/C515. The wedge shall be constructed of ductile iron and shall be fully encapsulated in EPDM rubber with no exposed iron. The wedge shall be symmetrical and seal equally well with flow in either direction. Metal seams, edges, or screws shall not be exposed within the waterway when the valve is in the fully closed position.

B. The valve body bonnet and yoke shall be ductile iron conforming to ASTM A536. The valve stem shall be of stainless steel construction. The stem nut shall be aluminum bronze conforming to ASTM B150. The stem shall be sealed by graphite non-asbestos packing. The body to bonnet seal shall be an EPDM rubber O-ring or EPDM flat rubber gasket. All bolts, nuts and washers shall be 316 stainless steel.

C. Valves shall be provided with flanged ends, drilled and faced in accordance with ANSI B16.1, Class 125. Tapped holes may be provided where valve design precludes through bolting.

D. Valves shall be of the NRS type with handwheel and bevel gear operator. Bevel gears shall be AISI 1010 carbon steel construction set within a gear case enclosure. Gear ratio shall be a minimum of 2:1.

E. Local position indication of the valve shall be provided.

F. Valves shall be clockwise (right) turning to open.

G. The valves shall be manufactured by J & S Valve, Mueller, Kennedy or equal.

H. Interior and exterior of gate valves shall be factory painted in accordance with AWWA C-509 and C-550. Exterior of gate valves shall be shop primed in accordance with Section 09900 entitled, PAINTING.

## PART 3 - EXECUTION

3.01 INSTALLATION

A. Install all gate valves and appurtenances where shown on the Drawings in the closed position.

B. Make joints in accordance with the requirements specified for the piping systems in which they are installed.

C. Install per requirements of AWWA Manual M44.

3.02 FIELD FINISH

Exterior of gate valves and motor operators shall be field touch-up primed and field finish painted to match existing color systems and in accordance with Section 09900 entitled PAINTING.

3.03 TAGGING

A non-ferrous metal tag shall be securely attached to the operator. The tag shall be embossed, stamped, or otherwise permanently marked (subject to the owners approval) with the direction to open or close the valve along with the number of turns required to fully open or close the valve.

3.04 TESTING

A. Inspect all gate valves for signs of leakage during hydrostatic testing of the associated piping.

B. Demonstrate operation of all gate valves by fully opening and closing each valve two times.

END OF SECTION

**SECTION 15110**

**SURGE RELIEF VALVES**

PARAGRAPH INDEX

## SECTION 15110

## SURGE RELIEF VALVES

### PART 1 - GENERAL

1.01 DESCRIPTION

This Section covers the requirements for furnishing all labor, materials, equipment and appurtenances for the complete and satisfactory installation of surge relief valves, and relief valve position limit switches, as shown in the Drawings and as required for a complete installation as specified.

1.02 QUALITY ASSURANCE

A. The requirements of Section 15010, entitled GENERAL MECHANICAL REQUIREMENTS shall apply to all work under this section.

B. Warranty

The valve manufacturer shall warrant surge relief valves to be free of defects in material and workmanship for a period of three (3) years from date of shipment provided the valve is installed and used in accordance with all applicable instructions.

1.03 SUBMITTALS

A. Contractor shall submit Shop Drawings for the valves in accordance with Section 01900, entitled SPECIAL CONDITIONS to include, but not necessarily be limited to, the following:

1. Manufacturer's drawings and catalog cuts for the valve and limit switch assemblies which indicate dimensions, performance, materials of construction and all other required items of information.

2. Manufacturer's drawings showing a complete cut-away view of the valve, clearly identifying all component parts.

3. Submit manufacturer’s wiring diagram for the limit switch assemblies.

4. The Contractor shall submit Operation and Maintenance Manuals for the surge valve and accessories in accordance with Section 01900 entitled SPECIAL CONDITIONS and Section 15010 entitled GENERAL MECHANICAL REQUIREMENTS.

5. Submit field report documenting observations of valve operating frequency and valve leakage.

## PART 2 - PRODUCTS

2.01 PUMP STATION NO. 3 SURGE RELIEF VALVES

A. Conditions of Service

Surge relief valves shall be installed in a New Surge Relief Vault to be constructed north of Pumping Station No. 3. Valves suitable for operation in an underground vault that is part of a finished water piping system with a maximum working pressure of 150 psi.

B. Function

The valve shall maintain a constant inlet pressure by bypassing or relieving excess pressure and shall maintain close pressure limits without causing surges. If valve inlet pressure decreases below the spring setting, the valve shall close.

C. Main Valve

The valve shall be hydraulically operated, single diaphragm-actuated, angle pattern. The valve shall consist of the body with seat installed, the cover with bearings installed, and the diaphragm assembly. The diaphragm assembly shall be the only moving part and shall form a sealed chamber in the upper portion of the valve, separating operating pressure from line pressure. Packing glands and/or stuffing boxes are not permitted and there shall be no pistons operating the main valve or pilot controls.

D. Main Valve Body

1. No separate chambers shall be allowed between the main valve cover and body. Valve body and cover shall be of cast Ductile Iron. No fabrication or welding shall be used in the manufacturing process.

2. The valve shall contain a resilient, synthetic rubber disc with a rectangular cross-section contained on three and one-half sides by a disc retainer and forming a tight seal against a single removable seat insert. No O-ring type discs (circular, square, or quad type) shall be permitted as the seating surface. The disc guide shall be of the contoured type to permit smooth transition of flow and shall hold the disc firmly in place. The disc retainer shall be of a sturdy one-piece design capable of withstanding opening and closing shocks. It must have straight edge sides and a radius at the top edge to prevent excessive diaphragm wear. No hourglass-shaped disc retainers shall be permitted and no V-type or slotted type disc guides shall be used.

3. The diaphragm assembly containing a 300 series stainless steel stem of sufficient diameter to withstand high hydraulic pressures shall be fully guided at both ends by a bearing in the valve cover and an integral bearing in the valve seat. The seat shall be a solid, one-piece

design and shall have a minimum of a five-degree taper on the seating surface for a positive, drip-tight shut off. No center guides shall be permitted. The stem shall be drilled and tapped in the cover end to receive and affix such accessories as may be deemed necessary. The diaphragm assembly shall be the only moving part and shall form a sealed chamber in the upper portion of the valve separating operating pressure from line pressure.

4. The flexible, non-wicking, diaphragm shall consist of nylon fabric bonded with BUNA-N rubber. The center hole for the main valve stem must be sealed by the vulcanized process or a rubber grommet sealing the center stem hole from the operating pressure. The diaphragm must withstand a Mullins Burst Test of a minimum of 600 psi per layer of nylon fabric and shall be cycle tested 100,000 times to insure longevity. The diaphragm shall not be used as the seating surface. The diaphragm shall be fully supported in the valve body and cover by machined surfaces which support no less than one-half of the total surface area of the diaphragm in either the fully open or fully closed position.

5. The main valve seat and the stem bearing in the valve cover shall be removable. Valve seat shall be retained by flat head machine screws for ease of maintenance. The lower bearing of the valve stem shall be contained concentrically within the seat and shall be exposed to the flow on all sides to avoid deposits. To insure proper alignment of the valve stem, the valve body and cover shall be machined with a locating lip. No "pinned" covers to the valve body shall be permitted. Cover bearing, disc retainer, and seat shall be made of the same material. All necessary repairs and/or modifications other than replacement of the main valve body shall be possible without removing the valve from the pipeline. Packing glands and/or stuffing boxes shall not be permitted.

E. Main Valve Design Parameters:

| **Parameter** | **Value** |
|---|---|
| Valve Size: | 10" |
| Main Valve Body and Cover: | Ductile Iron, ASTM A536 |
| Main Valve Trim: | Stainless Steel |
| End Detail: | Flanged, 150# ANSI B16.42 |
| Pressure Rating: | 250 PSI |
| Temperature Range: | 50-85° F |
| Rubber Material: | BUNA-N |
| Coating: | Epoxy, applied per AWWA C116-03 |
| Options: | Stainless Steel cover hardware.<br>Limit switch as specified herein |

F. Pilot Control System

The pressure relief pilot shall be a direct-acting, adjustable, spring-loaded, diaphragm valve designed to permit flow when controlling pressure exceeds the adjustable spring setting. The pilot control is normally held closed by the force of the compression on the spring above the diaphragm and it opens when the pressure acting on the underside of the diaphragm exceeds the spring setting. Pilot control sensing shall be upstream of the pilot system strainer so accurate control may be maintained if the strainer is partially blocked.

G. Pilot Control Design Parameters:

| **Parameter** | **Value** |
|---|---|
| Pressure Rating: | 250 PSI |
| Trim: | Stainless Steel, Type 303 |
| Rubber Material: | BUNA-N |
| Tubing and Fittings: | Stainless Steel |
| Adjustment Range: | 20-200 PSI |
| Operating Fluids: | Finished Water |
| Options: | Isolation Valves, Pressure Gauge (Inlet) |

H. Manufacturer

The valve shall be the Model No. 50A-01 Pressure Relief Valve as manufactured by Cla-Val Co., or approved equal.

I. Finish

Valve shall be factory primed and painted in accordance with manufacturer recommendations and with Section 09900 entitled PAINTING. Valve paint system shall be suitable for occasional submergence in finished (potable) water.

J. Valve Limit Switch Assemblies

1. Provide limit switch assemblies to indicate remote valve OPEN position for the surge relief valves. Limit switch assemblies shall be the Model X105L as manufactured by Cla-Val, or approved equal. The limit switches shall be the HDLS Series switch, rated NEMA 6P, for submersion resistance. Switch contacts shall be rated for minimum 15 A at 120 VAC. Mounting bracket and hardware shall be stainless steel. Seals shall be BUNA-N.

2. Provide a total of two (2) spare limit switch assemblies.

3. For electrical connection of these limit switches, see DIVISION 16 ELECTRICAL and DIVISION 13 SPECIAL CONSTRUCTION.

2.02 PUMP STATION NO. 2 SURGE VALVE LIMIT SWITCH ASSEMBLIES

A. Provide limit switch assemblies to indicate valve OPEN position for the Pumping Station No. 2 surge relief valves in the existing Station No.2 Valve Vault as indicated on the Drawings. Surge valves in this vault are Cla-Val Model No. 50A-01BYKCKX D.S. pressure relief valves, Size = 6-inch.

B. Limit switch assemblies shall replace the positive visual indicators provided with the valves. Limit switch assemblies shall be the Model X105L as manufactured by Cla-Val. The limit switches shall be the HDLS Series switch, rated NEMA 6P, for submersion resistance. Switch contacts shall be rated for minimum 15 A at 120 VAC. Mounting bracket and hardware shall be brass or stainless steel. Seals shall be Buna-N.

C. No substitutions shall be acceptable for these specified limit switch assemblies. Switch assembly Part No. for the 6-inch valves is 20283603K.

**PART 3 - EXECUTION**

3.01 INSTALLATION

A. Install Surge Relief Valves and Limit Switch Assemblies where shown on the Drawings in accordance with the manufacturer's recommendations.

B. Make joints in accordance with the requirements specified for the piping systems in which they are installed. Provide flange gasketing suitable for Class 125 flat face to Class 150 raised face connection.

C. Pressure Setpoints – The surge relief valves shall be set to open per the following: 95 psi

3.02 FIELD FINISH

Outside of valves shall be field touch-up finished in accordance manufacturer recommendations and with Section 09900 entitled PAINTING.

3.03 TAGGING

A non-ferrous metal tag shall be securely attached to the valve and shall be embossed or stamped with the complete valve model number. Tags shall not be painted over.

3.04 TESTING

A. Inspect all new surge relief valves for signs of leakage and determine valve opening frequency (during normal pump starts, emergency pump stops etc.), a minimum of three times during all functional testing and operation of the Pumping Station No. 3 pumping units, as specified in Section 11205.

B. Provide reports of inspection findings.

C. For Limit Switch Assemblies, Coordinate with field testing performed under DIVISION 13.

END OF SECTION

**SECTION 15262**

**NON-CONDUCTIVE COVERING**

PARAGRAPH INDEX

## SECTION 15262

## NON-CONDUCTIVE COVERING

## PART 1 - GENERAL

1.01 DESCRIPTION

This Section includes the requirements for furnishing all labor, materials, equipment and services necessary for and incidental to, the complete and satisfactory installation of the hot water pipe insulation as shown on the Drawings, and as specified.

1.02 SUBMITTALS

Submit the following Contractor's Drawing in accordance with Section 01900, entitled Special Conditions:

A. Catalog cuts and detail specifications for all components which indicate insulation thickness and physical properties.

## PART 2 - MATERIALS

2.01 GENERAL

A. Scope

1. All new hot water piping located in Pumping Station No.3, as indicated on the Drawings, shall be cleaned and covered.

2. This does not include piping in furred spaces, trenches, wall chases, passing through concrete or cinder block slabs and walls and the area directly under fixtures in toilet rooms.

3. This does not include non-potable water piping and fittings.

B. Pipe Covering

Covering for water pipes shall be Johns-Manville "Micro-Lok 650 AP" with vapor barrier jacket not less than 1-inch thick. Longitudinal laps of jacket shall be either self-sealing or sealed with white Benjamin Foster 85-75 fire resistant adhesive and butt joints shall be wrapped with a 3 to 4-inch strip of the vapor barrier jacket cemented with 85-75 adhesive. Jackets shall be a 3-ply laminate of white kraft and aluminum foil, laminated with flame extinguishing adhesive and reinforced with Fiberglass yarn. Water vapor permeability rating: 0.02 maximum. Insulation thickness for water lines exposed to freezing shall be 1-1/2-inches.

C. Fittings, valves, and flanges for pipe sizes smaller than 4-inch diameter shall be insulated and finished with a white hydraulics setting and one coat of mineral wool cement to a thickness equal to that of the adjoining pipe insulation. Fittings, valves, and flanges for pipe sizes 4-inch diameter and larger shall be insulated with segments

of the molded insulations securely wired in place and finished with a hard smoothing coat of mineral-wool cement. Over the cement surface a white, fire-retardant vapor seal compound is to be applied to the cold water piping only as to form an unbroken vapor seal with the adjacent pipe insulation vapor seal jacket. Pre-molded one-piece fitting covers such as Johns-Manville Zeston 300 Series may be used at the Contractor's option.

D. Unions

The covering shall be neatly terminated at each end of a union with plastic material troweled on a bevel; unions shall not be covered. Covering shall be neatly finished at pipe hangers.

E. Field Applied Jackets

1. Insulated piping exposed to the weather shall be covered with an aluminum jacket, 0.016-inch thick sheet, corrugated finish, with longitudinal slip joint laps, and die shaped fitting covers with factory attached protective liner.

2. Insulated piping located in exposed interior areas shall be covered with a PVC jacket, minimum 20 mil thickness. Jacket with its adhesive, shall be capable of providing a completely sealed system. Jacket Material shall be Johns Manville Zeston Jacketing, or equal.

F. Pipe insulation (non-conductive covering) shall be of the highest grade and installed in a first-class manner. Surfaces of covering shall be smooth and even, with jackets drawn tight and smoothly cemented down at all longitudinal and end laps. Adhesive shall be resistant to vermin and mold, and shall be durable. No scrap pieces of covering shall be used where a full length section will fit.

2.02 FIRE PROTECTION

A. All covering shall be non-combustible and shall meet Factory Mutual requirements in this respect.

B. All insulation shall have composite (insulation, jacket or facing, and adhesive used to adhere the facing or jacket to the insulation) fire and smoke hazard ratings as tested by procedures ASTM E-84, not exceeding:

| | |
|---|---|
| Flame Spread | 25 |
| Smoke Developed | 50 |

C. Accessories, such as adhesives, mastics, cements, tapes and asbestos cloth for fittings shall have the same fire component ratings as listed above.

D. All products or their shipping cartons shall bear a label indicating that flame and smoke ratings do not exceed above requirements.

E. Any treatment of jackets or facings to impart flame-and-smoke safety shall be permanent. The use of water-soluble treatments is prohibited.

2.03 MANUFACTURERS

Pipe insulating (non-conductive covering) materials specified herein are to be as manufactured by Johns-Manville; Owens-Corning; Certain-Teed Products Corp; or equal.

**PART 3 - EXECUTION**

3.01 PREPARATION

A. The insulation shall be applied over clean, dry surfaces only after all tests to the piping systems have been successfully completed.

B. The insulation shall be stored in a dry place prior to application. Installation of wet or damp covering shall not be permitted.

3.02 INSTALLATION

A. Insulation shall be installed to provide a continuous unbroken insulation and reinforced system except for those areas at the pipe supports. Insulation and reinforcing shall be neatly notched at all supports. Insulation at all flanges, flexible couplings and joints shall be installed to totally enclose these points by building the insulation system up over these protrusions.

B. All termination of insulation shall be taped and sealed to prevent "dusting".

C. Where insulated potable and non-potable water piping passes through sleeves or openings in partitions and floors, the insulation shall be continuous through the sleeves and openings.

D. The Contractor shall test and clean, to the satisfaction of the Engineer, the pipe before placing the insulation.

E. The insulation system (insulation and jacket) shall be placed around valves in such a manner that valve operation is not affected.

END OF SECTION

**SECTION 15400**

**PLUMBING FIXTURES AND EQUIPMENT**

PARAGRAPH INDEX

## SECTION 15400

## PLUMBING FIXTURES AND EQUIPMENT

### PART 1 - GENERAL

1.01 DESCRIPTION

This section covers the requirements for furnishing all labor materials, equipment and appurtenances for the complete and satisfactory installation of all plumbing equipment as shown on the Drawings and as required for a complete installation as specified.

1.02 SUBMITTALS

A. Submit the following Shop Drawings in accordance with Section 01900:

1. Catalog cuts and detailed specifications for all equipment which indicate physical dimensions, performance and materials of construction.

2. Wiring diagrams for all electrical items.

3. Piping diagrams for the plumbing equipment.

B. Submit Operation and Maintenance Manuals in accordance with Section 01900, for the following plumbing equipment.

1. Electrical Water Heater

2. Plumbing Fixture Faucets and Valves

C. Quality Assurance

1. Requirements of the National Standard Plumbing Code latest revision, published by the Plumbing-Heating-Cooling Contractors National Association apply to this Section.

2. Section 15050, entitled BASIC MECHANICAL MATERIALS AND METHODS, shall apply to this section.

3. All electrical work associated with the equipment specified in this section shall be in accordance with DIVISION 16 - ELECTRICAL.

D. Delivery, Storage and Handling

1. Delivery: Deliver plumbing fixtures individually wrapped in factory-fabricated containers.

2. Handling: Handle plumbing fixtures carefully to prevent breakage, chipping and scoring of the fixture finish. Do not install damaged plumbing fixtures; replace with new.

## PART 2 - MATERIALS

2.01 GENERAL

Plumbing equipment shall be provided as shown on the Drawings. Electric water heaters, sinks and water closets shall be installed complete and ready for operation. Approved stop valves to match fittings and finish of adjacent piping shall be provided on both hot and cold water supplied to each fixture. The setting heights of sinks shall be as directed by the Owner prior to installation. Supports shall be as provided for sinks to the approval of the Owner.

2.02 ELECTRIC WATER HEATER

A. An electric water heater shall be provided to replace the existing water heater as shown on the Drawings. Water heater shall have a capacity of 20 gallons and have a heating capacity of 6 kW, for 208 volt, 3 phase, 60 Hz power, and listed by Underwriters' Laboratories. The water heater shall have a recovery rate of at least 50 gallon per hour (GPH) with a corresponding 50°F temperature rise.

B. The tank shall be high temperature rated porcelain enamel coated steel, have a minimum 150 psi working pressure, and be equipped with minimum two extruded high density anode rods for corrosion protection. The tank's steel outer jacket shall have a factory finish. The jacket shall enclose the tank foam insulation which shall meet the standby loss requirements of the latest ASHRAE 90.1 standard. The tanks shall be provided with an integral control compartment with hinged door panels for service and maintenance access. Heater controls shall include display lights indicating internal heater functionality.

C. The electric heating element shall be medium watt density with zinc plated copper sheath. The element shall be controlled by an individually mounted thermostat and high temperature cutoff switch. Temperature control shall be factory set at 130°F and adjustable up to 190°F. Heater shall include a CSA or UL certified and ASME rated T&P relief valve, and drain valve. Hot and cold water connections shall be ¾-inch NPT.

D. Electric water heater shall be the Power Pack Model E20-A as manufactured by RHEEM-RUDD or equal.

2.03 PLUMBING FIXTURES

A. General: Unless otherwise specified, provide fixtures, fittings, trimmings, metals, and finishes in accordance with the applicable ANSI publication, and as follows:

1. Water Closet- Flush Valve: Vitreous china, floor mounted, water saver toilet (1.6 gal/flush) with siphon jet action, elongated bowl with

open front seat, 1-1/2" top spud with Sloan #111 flush valve. American Standard "Madera" 16 ½" minimum height water closet, or equal. Contractor to verify existing rough-in dimensions are compatible with the specified unit.

2. Lavatory Sink – 18" x 20" vitreous china wall-hung lavatory, front overflow, rectangular basin, 4" high backsplash, 8" widespread faucet spacing. Lavatory shall be the Missouri Model No. 0436.008US as manufactured by American Standard, or equal. Faucet shall be cast brass construction, with 1/4 turn ceramic disc cartridges, vandal resistant lever handles, all brass drain body, grid strainer drain, 1-1/4" tailpiece, spout with pressure compensating aerator to provide 1.5 gpm flow throughout the pressure range, polished chrome finish. Faucet shall be the Monterrey Model No. 6502.140 as manufactured by American Standard, or equal. Provide flexible supplies and cast brass P-trap.

## PART 3 - EXECUTION

3.01 INSTALLATION

A. No plumbing fixture or devices shall be installed in such a manner as to make a cross connection between the potable supply and polluted water system or drainage system.

B. All plumbing fixtures or devices requiring water, drainage or electrical connections shall have connections made, complete in all respects.

C. The work shall be carefully laid out in advance, and any excess cutting of construction will not be permitted. Damage to building, piping, wiring, or equipment as a result of cutting for installation, shall be repaired by mechanics skilled in the trade involved.

D. Fixtures and devices shall be tightly covered and protected against dirt, water and chemical or mechanical injury. Upon completion of work, fixtures and devices shall be cleaned, adjusted and operated.

E. In the execution of the work, the Contractor shall comply with the National Plumbing Code and/or the local Plumbing Code.

F. Install water closet, sink, and electric water heater as shown on the drawings and in accordance with manufacturer's recommendations

3.02 WATER CLOSET INSTALLATION

A. General: Install water closet as shown on the Drawings and as follows:

1. Two rubber or plastic seat bumpers with metal holders shall be provided and secured to the wall behind the fixture.

2. The centerline of the flush valve shall be on the centerline of the fixture, height above the finished floor, per manufacturer's recommendations, and a minimum of 2-1/2 inches from the wall.

3. Pipe support shall be provided on the long flush pipe outlet and shall be secured rigidly to the wall with suitable anchors.

4. The backflow preventer for the flush valve shall be installed at the discharge of the valve.

3.03 FIXTURE CONNECTIONS

A. Floor mounted Water Closet: Provide connections between soil pipes and floor connected water closet with cast-iron floor flanges.

1. Connection sizes shall be 4-inch for water closet.

2. Floor flanges shall be slipped over the ends of the pipes and caulked in position.

3. Special short radius fittings shall be used where space does not permit the use of standard fittings below the flanges.

B. Setting Compounds and Gaskets: Provide watertight and gas tight seals between flanges and fixtures with plumbing-fixture-setting compound complying with Federal Specifications TT-P-1536, "Plumbing Fixture Setting Compound" or manufacturer's standard non-asbestos gaskets.

1. Neither rubber gaskets nor putty shall be used in sealing connections.

2. All voids between the flange and the wall behind the fixture shall be sealed watertight with plumbing-fixture-setting compound or other approved sealing material.

3. Outlet Flanges and Ends of Soil Pipes: Provide outlet flanges and ends of soil pipes set the correct distance from the face of the floor or wall to make a joint with the gasket and fixture. Obtain approval for the setting of the flange prior to setting any fixture in place.

C. Water Supply Branch Piping: Provide all exposed water supply branch piping (including valves and fittings) not more than 6 feet above the floor in toilet rooms.

1. No water pipe shall be buried in floor construction of any toilet room.

2. Where water piping is not sized on the Drawings, it shall comply with the sizing requirements of the National Standard Plumbing Code.

3. Each hot and cold water supply to the utility sink (Fixture P-2) shall

be provided with a ball valve or compression stop in an accessible location near the fixture.

D. Electric water heater shall be installed to replace the existing water heater, as indicated on the Drawings.

END OF SECTION

**SECTION 15500**

**VENTILATION EQUIPMENT**

PARAGRAPH INDEX

## SECTION 15500

## VENTILATION EQUIPMENT

## PART 1 - GENERAL

1.01 DESCRIPTION

This section covers the requirements for furnishing all labor materials, equipment and appurtenances for the complete and satisfactory installation of the general ventilation equipment as shown on the Drawings and as required for a complete installation as specified.

1.02 SUBMITTALS

A. Submit the following Shop Drawings in accordance with Section 01900:

1. Catalog cuts and detailed specifications for all of the ventilation equipment which indicate performance, materials of construction, and weights.

2. Outline dimensional drawings for all components.

3. Electrical equipment performance data and wiring connection diagrams for all electrical items clearly identifying terminal point and wire designations.

B. Submit Operation and Maintenance Manuals for all of the ventilation equipment in accordance with Section 01900.

C. Submit Air Balancing Test Results as specified herein.

1.03 QUALITY ASSURANCE

A. Requirements of Section 15010, shall apply to this section.

B. All electrical work associated with the equipment specified in this section shall be in accordance with DIVISION 16 - ELECTRICAL.

C. Standards by the Air Movement Control Association, (AMCA) shall be followed as specified herein.

1.04 RELATED WORK

A. For ventilation ductwork, control devices (i.e. coolingstats, freezestats, etc.) and related accessories, refer to Section 15890.

B. For general mechanical requirements, refer to Section 15010.

## PART 2 - MATERIALS

2.01 GENERAL

Ventilation equipment shall contain, but not be limited to: fan assemblies including fan housing, support frame, motor and vibration isolation mechanisms. Ventilation fans shall have sizes and capacities as shown in the schedule on the Drawings.

2.02 STATION NO. 2 EXHAUST FAN (EF-1)

A. Wall mounted, direct driven, propeller type exhaust fan shall be provided and installed as shown on the Drawings. See Drawings for available wall opening sizes.

B. Fans shall carry the AMCA Certificate Rating Air Performance Seal. Fans shall have sizes and minimum capacities as shown in the Drawings. Performance of all units shall be as such to provide not less than the minimum capacity at he indicated static pressure in accordance with AMCA Standard No. 210.

C. Fans shall be of bolted and welded galvanized steel construction utilizing corrosion resistant fasteners. The motor shall be mounted on a 12 gauge steel wire guard. The wire guard shall be bolted to a minimum 14 gauge wall panel with continuously welded corners and an integral Venturi.

D. Propeller shall have aluminum blades riveted to a painted steel hub or cast aluminum blades and hubs. The hub shall be securely fastened to the motor shaft. Propeller shall be balanced in accordance with AMCA Standard 204, balance quality and vibration levels for fans.

E. Motors shall be suitable for operation in a single phase, 120 volt, 60 Hertz circuit. Motor shall be supplied with permanently lubricated sealed bearings and shall be rated for continuous duty. Motor enclosure shall be TEFC. The motor shall be sized to provide the rated brake horsepower required by the fan at all operating points along the fan's performance curve. Motor shall be rated for a 1.15 service factor and shall not have an operating speed greater than 1800 rpm.

F. Direct Drive fans shall not be supplied with any type of variable speed control device. Fan

G. Fans shall be supplied with a mounting sleeve which completely surrounds the fan, and motor side protective screen. The screen shall be in compliance with OSHA regulations. Screen shall be easily removable for fan maintenance purposes. Any exposed sharp edges or corners of the screen shall be covered with a rubber or foam material to protect against personnel injury.

H. All ferrous and steel parts shall be epoxy painted.

I. Acceptable Fan Manufacturers – Models shall be the following or equal:

1. New York Blower – Model EN162H

J. Fans shall be supplied with transition ductwork as shown on the Contract Drawings and as indicated in Section 15890.

2.03 FACTORY FINISH

All fan assemblies shall receive the manufacturer's standard finish.

2.04 SPARE PARTS

The following spare parts shall be provided by the Contractor and delivered by the Contractor to the site.

Two sets of V-belts for each belt driven fan.

2.05 VIBRATION ISOLATION

All fans specified herein shall be provided with elastomer vibration isolation mounting devices. These devices shall be selected by the fan manufacturer to suit the rotating speed, weight, and mounting support locations for each fan supplied. Elastomer vibration isolation mounting devices shall be manufactured by Enidine, or equal.

**PART 3 - EXECUTION**

3.01 INSTALLATION

A. Install all ventilation equipment as shown on the Drawings and in accordance with manufacturer's recommendations. Fans shall be installed complete and ready for operation.

B. Contractor shall provide and install any mounting hardware, mounting brackets, equipment stand, etc., which may be in addition to the fan manufacturer's standard supplied mounting frame and equipment, in order to to install the fans as indicated on the Drawings.

3.02 FIELD FINISH

Field touch up of factory finished equipment shall be in accordance with manufacturer recommendations and in accordance with Section 09900.

3.03 CONTROLS

A. Station No. 2 Exhaust Fan (EF-1).

1. The fan shall be supplied with an EF-1 Fan Control Panel as indicated in the Drawings. This panel shall be supplied with a three-way HAND-OFF-AUTOMATIC (H-O-A) switch.

a. With the H-O-A switch in the HAND position, the associated motor operated dampers, D-1 and D-2, shall begin to open, and

after a preset time delay, (minimum 5 seconds, maximum 30 seconds), the fan shall energize.

b. With the H-O-A switch in the AUTOMATIC position, the following devices shall be provided to call the fan to start:

Adjustable Repeat Cycle Timer: To operate fan for a period of 10 minutes followed by an idle period of 50 minutes.

Coolingstat: To operate the fan continuously when the temperature is above the coolingstat setpoint, until the temperature drops below the setpoint.

c. Once the fan is called to automatically start, the associated motor operated dampers, D-1 and D-2, shall begin to open, and after a preset time delay (minimum 10 seconds, maximum 30 seconds) the fan shall energize.

d. In AUTOMATIC mode only, a freezestat shall be employed to deenergize the operation of the fan, and initiate a low temperature alarm. The freezestat shall prevent operation of the fan until:

The temperature is above freezestat's associated setpoint, and

An adjustable time delay relay (1 to 30 minutes), initially set to 15 minutes, has timed out.

e. Temperature Setpoints:

Initially set the freezestat to actuate at 45 degrees F.

Initially set the coolingstat to actuate at 85 degrees F.

3.04 FIELD TESTING

A. For each ventilation system, provide a functional test of each ventilation system to verify full manual (Hand) and Automatic operation of the fan and all associated motor operated dampers, coolingstats, freezestats, high temperature alarms, indicating lights, etc. for proper operation.

B. The Contractor shall procure and pay for the services of an independent air balancing and testing agency, approved by the Engineer, to balance, adjust and test all heating and ventilating systems. All work by this agency shall be done under the direct supervision of a qualified engineer of the agency. All instruments used shall be accurately calibrated and maintained in good working order. All or parts of the test shall be conducted in the presence of the Engineer. The agency shall be a member of the Associated Air Balance Council.

C. Contractor shall operate all heating and ventilating systems for the time required to perform the tests and make adjustments. Provide all necessary connections, taps, plugs, etc., to enable the collection of required test data. Upon completion of testing of the heating and ventilation systems, submit the

following data to the Engineer and/or Owner for approval:

1. Test and adjust fan rpm to design requirements.
2. Test and record motor full load amperes.
3. Make Pitot tube traverse of main and major branch ducts and adjust to design flow rate.
4. Test and record system static pressures.
5. Test and adjust system for design ventilation air. Test and record entering outside air dry bulb temperatures.
6. Adjust station exhaust ducts to design flow rate.
7. Adjust each diffuser, grille or register to within 10 percent of design flow rate.
8. Identify each diffuser, grille or register as to location.
9. List size, type and manufacturer of diffuser, grille or register: use manufacturer's data for calculations.
10. Indicate design velocity and CFM and test velocity and CFM after adjustment.
11. Cooperate with control supplier to make all damper adjustment to obtain design conditions.
12. Balance all ventilation systems.

D. No leakage testing of any Ventilation System installed ductwork is required.

END OF SECTION

**SECTION 15700**

**DEHUMIDIFICATION EQUIPMENT**

PARAGRAPH INDEX

## SECTION 15700

## DEHUMIDIFICATION EQUIPMENT

### PART 1 - GENERAL

1.01 DESCRIPTION

This section covers the requirements for furnishing all labor materials, equipment and appurtenances for the complete and satisfactory installation of the dehumidification equipment as shown on the Drawings and as required for a complete installation as specified.

1.02 SUBMITTALS

A. Submit the following Shop Drawings in accordance with Section 01900

1. Catalog cuts and detailed specifications for all of the dehumidification equipment which indicate performance, materials of construction, and weights.

2. Outline dimensional drawings for all components.

3. Electrical equipment and motor performance data and wiring connection diagrams for all electrical items clearly identifying terminal point and wire designations.

B. Submit Operation and Maintenance Manuals for all dehumidification equipment in accordance with Section 01900.

C. Provide a Manufacturer's Certificate in accordance with Section 01900.

1.03 QUALITY ASSURANCE

A. Requirements of Section 15010, shall apply to this section.

B. All electrical work associated with the equipment specified in this section shall be in accordance with DIVISION 16 - ELECTRICAL.

### PART 2 - MATERIALS

2.01 DEHUMIDIFIER

A. General: The dehumidifier shall be an industrial grade, self-contained, closed loop heat recovery system. The equipment shall include at least the following components; compressor, dehumidifier coil (evaporator), air reheat coil (condenser), centrifugal air moving blower, blower motor, various refrigeration components including copper piping, valves and all electrical

controls and devices. The dehumidifier shall also include, the following features as required for proper dehumidifying operation:

1. all equipment required for operation with an air cooled remote condenser.
2. all refrigeration parts for full flooding operation.
3. all electrical apparatus to accommodate a remote condenser.
4. all integral humidity sensors and controls.

B. The configuration of the dehumidifier shall be vertical in design.

C. Performance Requirements:

1. The dehumidifier shall have a minimum Moisture Removal Capacity (MRC) of 16.7 lbs./hr. with ambient air at 80 degrees F, 60% relative humidity, at sea level.
2. Provide dehumidification and room air heating.
3. Provide dehumidification and room air cooling when operating in conjunction with the remote outdoor condenser.

D. Cabinet Construction: The base panel shall be 11-gauge galvannealed steel with 11-gauge welded supports on the bottom side for maximum rigidity. The frame panels, removable access doors and top panels shall be 16 or 20-gauge galvannealed steel. Removable access doors shall provide access to all major and minor replaceable components of the unit. The electrical compartment shall be separated from the mechanical area with access with its own door from the outside of the cabinet.

E. Dehumidification Coil (Evaporator): Coil tubes shall be made from 3/8" or 1/2" OD seamless drawn, rifle tube design, copper and be hydraulically extruded into the fins to form a permanent bond, metal to metal, for maximum heat transfer and overall stability. The fins shall be constructed from die-formed flat tempered stock for easy cleaning. All headers, manifolds and connecting copper tubing to be made from heavy wall seamless tubing. Final testing shall consist of leak testing with 420 psig nitrogen gas and sealed after testing to avoid contamination. Coil casing shall be at least 18 gauge galvanized steel. Coil shall have Electro Fin E-coat uniformly applied to all coil surface areas without material bridging between fins. Humidity and water immersion resistance shall be up to a minimum 1000 and 260 hours respectively (ASTM D2247 and ASTM D870). Corrosion durability shall be confirmed through testing to no less than 5,000 hours salt spray per ASTM B117 using scribed aluminum test coupons.

F. Air Reheat Coil (Condenser): This coil shall be constructed with seamless drawn, rifle tube design, copper tubing, hydraulically expanded into the fin

collars to form a metal bond for maximum heat transfer and overall stability. Coil fins shall be tempered aluminum. All headers shall be constructed from heavy wall seamless copper tubing. Coil casing shall be made from at least 18 gauge galvanized steel. Coil testing shall be leak tested with at least 420 psig nitrogen gas and then sealed to avoid contamination. Coil shall have Electro Fin E-coat uniformly applied to all coil surface areas without material bridging between fins. Humidity and water immersion resistance shall be up to a minimum 1000 and 260 hours, respectively (Ref: ASTM D2247 and ASTM D870). Corrosion durability shall be confirmed through testing to no less than 5,000 hours salt spray per ASTM B117, using scribed aluminum test coupons.

G. Compressor: The compressor shall be a scroll design, heavy-duty and fully hermetic. A crankcase heater shall be included to protect against liquid slugging. The compressor shall be protected with both high and low pressure safety switches and internally protected from both overheating and over pressure situations. The compressor shall be vibration isolated externally and internally.

H. Low Ambient Control: The low ambient control shall control discharge pressure regardless of ambient temperature. A hot gas bypass valve shall prevent evaporator coil freeze ups and the need for defrost timers. This control shall also be externally adjustable by the technician to suit specific installations.

I. Refrigerant Receiver Vessel: The receiver shall be safety laboratory listed and meet ASME standards for 400 psig maximum working pressure. Receivers shall also be fitted with pressure safety relief valves listed by safety laboratories for such use. The receiver shall be equipped with roto-lock refrigeration valves to provide for refrigerant pump down for easy replacement of components.

J. Condensate Drain Pan: The drain pan shall be constructed from 20-gauge or heavier stainless steel with silver soldered seams. The pan shall be securely attached with clips, and easily removable for cleaning.

K. Electrical Control Panel: The electrical control panel with hinged door and quarter turn latch shall be readily accessible from the front of the unit. The electrical controls shall include IEC starters for compressor (three phase only) and blower motor and interlock relay. A low voltage power supply for 24 volt control power with integral circuit breaker or fused protection shall be provided. Clearly labeled high and low voltage terminal strips, potential relay, start and run capacitors, automatic reset of low pressure cut-out and a short cycling timer to prevent against rapid cycling of compressor shall be included. Indicating lights shall be displayed outside the cabinet for System, Blower, and Compressor operating status.

L. Power: The dehumidifier shall be provided for operation on 460 Volt, 3 Phase, 60 Hertz power. The dehumidifier shall be supplied with integral step down transformers to supply voltages for its own control circuits

M. Refrigeration Circuitry: All refrigeration copper tubing and components shall be coated with a clear polyurethane coating to prevent early deterioration and degradation. The entire refrigeration system shall be pumped down to no less than 500 microns and charged with the appropriate amount of HFC 407C, type refrigerant, or equal.

N. Insulation: Sound and thermal insulation shall be applied to the bottom, top and all interior sides of the cabinet. It shall be a fiberglass, bonded with a thermosetting resin and flame-attenuated. It shall resist fire up to 250 °F and withstand air over velocities to at least 5000 feet per minute. It shall also possess the following minimum standards. Flame spread – 25, Smoke developed – 15.

O. Air Blower Assembly: The blower shall be a double inlet, forward curve, centrifugal, low RPM type blower that is dynamically and statically factory balanced. Permanently lubricated ball bearings shall provide at least 200,000 hours of average life. The blower shall be vibration isolated when mounted to the cabinet. The Blower Motor shall not be attached mechanically to the blower in any way, other than the drive belt.

P. Blower Motor: The blower motor shall be a totally enclosed fan cooled design (TEFC) with class B insulation, continuous duty, 40 degree C ambient with overload protection. It shall have permanently lubricated ball bearings, a key slotted shaft with rigid or resilient mount. It shall carry a type U thermally protected automatic resetting high temperature control, SF 1.35. The motor shall carry a UL and CSA Listing. Blower motor shall be base mounted and not attached to blower mechanically.

Q. Blower Drive Components: The motor pulley and blower pulley shall be machined cast iron in construction. The motor pulley shall be a variable pitch type that is field adjustable to vary CFM and external static pressure. The pulleys shall be single V-Belt up to and including 5 HP.

R. Return Air Filters: Filters shall be of a disposable type.

S. Paint and Cabinet Finish: All metal cabinet parts shall receive the manufacturer's standard finish.

T. Manufacturer of Equipment: The unit shall be the Model DCA 1500TV as manufactured by Dehumidifier Corporation of America (DCA), or equal.

2.02 REMOTE CONDENSER

A. Provide an air cooled remote condenser to reject heat to the outdoors when the heat generated by the dehumidifier specified herein cannot be used for room air heating. The remote condenser and dehumidifier shall operate integrally.

B. The condenser shall operate integrally with the dehumidifier specified herein. The condenser shall allow the dehumidifier to supplement room cooling if required. The condenser shall be large enough to reject recovered heat outdoors without simultaneously rejecting heat into the room air.

C. The condenser shall be suitable for operation at 100 degree F. ambient temperature. The unit shall be arranged for vertical airflow and shall be UL listed. The condenser shall be a single fan configuration.

D. Cabinet: Cabinet shall be designed for outdoor installation and constructed from heavy embossed aluminum with 10 gauge galvanized steel legs, and 12 gauge base rail. All end panels, center supports and partitions shall have collared tube holes for increased tube life. The cabinet shall include a weather-tight electrical enclosure containing the fan motor contactor and terminal board. The unit shall be provided with lifting eyes for rigging.

E. Power and Controls: The Remote Condenser Unit shall be shall be suitable for operation with 460 Volt, 3 Phase, 60 Hertz electric power. Remote Condenser unit operation shall be controlled from the Dehumidifier's integral control panel. The manufacturer shall provide all control wires and cables needed for installation by the Contractor between the Dehumidifier and Remote Condenser Unit.

F. Condenser Coil: Coils shall be constructed of 3/8" seamless copper tubing on a staggered pattern. Tubes shall be mechanically expanded into continuous fill-collared plate-type aluminum fins for permanent metal-to-metal contact. All coils shall be factory pressure and leak tested at 400 psi. Coils shall be shipped with a dry nitrogen holding charge.

G. Fan: Fan shall be aluminum propeller blade type with painted steel hub. Fan shall have dual square head set screws spaced 90 degrees apart which seat onto one flat and one keyway on the motor shaft. Fan diameter shall not exceed 30 inches. Fan shall be dynamically balanced and factory tested before shipping to ensure quiet operation.

H. Fan Guard: Fan guard shall be heavy gauge, close meshed steel wire with vinyl coating for maximum rigidity and long life.

I. Fan Motor: Motor shall be rated for continuous duty, with permanently

lubricated, sealed ball bearings, and automatic reset thermal overload protection. Motor shall be factory wired with leads terminating in the weather tight electrical enclosure. Fan motor shall be a rigid base type mounted to 12 gauge galvanized steel rails. The motor shall be suitable for operation with 460 Volt, 3 Phase, 60 Hertz power.

J. Manufacturer: The remote condenser shall be manufactured by the same company as the dehumidifier specified herein. Remote condenser shall be the Model LORC-5 as manufactured by Dehumidifier Corporation of America (DCA), or equal.

2.03 SPARE PARTS

A. Drive Belts -- Four (4) for each type and size of belt driven fan or blower supplied.

B. Fuses - Minimum one for each fuse provided with the dehumidifier or condenser unit.

C. Return Air Filters – Minimum Four (4).

**PART 3 - EXECUTION**

3.01 INSTALLATION

A. Install the dehumidifier and remote condenser as shown on the Drawings and in accordance with manufacturer's recommendations.

B. Install refrigerant piping between the dehumidifier and the remote condenser as indicated on the Drawings and in Section 15060.

C. Provide labels for the units in accordance with Section 15010.

3.02 TESTING

Verify automatic and manual operation of the dehumidifier and remote condenser. Testing shall include verification of all alarms, switches, indicating lights and protective features function properly. Correct any deficiencies and retest as needed.

3.03 MANUFACTURER SERVICES

The Manufacturer shall provide the services of a factory authorized technician to assist the Contractor in the installation, startup and testing of the Dehumidifier, Remote Condenser Unit, and all appurtenances specified herein and as required for a complete installation.

END OF SECTION

**SECTION 15850**

**ELECTRIC UNIT HEATERS**

PARAGRAPH INDEX

## SECTION 15850

## ELECTRIC UNIT HEATERS

### PART 1 - GENERAL

1.01 DESCRIPTION

This section covers the requirements for furnishing all labor materials, equipment and appurtenances for the complete and satisfactory installation of all electric unit heaters, as shown on the Drawings and as required for complete installation.

1.02 SUBMITTALS

A. Submit the following Shop Drawings in accordance with Section 01900:

1. Catalog cuts and detailed specifications for all equipment which indicate physical dimensions, performance and materials of construction.

2. Wiring diagrams clearly indicating wiring termination points for all electrical items, including power and control connections.

3. Submit Operation and Maintenance Manuals in accordance with Section 01900 for the unit heaters.

1.03 QUALITY ASSURANCE

A. Requirements of Section 15010, entitled GENERAL MECHANICAL REQUIREMENTS, shall apply to this section.

B. All electrical work associated with the equipment specified in this section shall be in accordance with DIVISION 16 - ELECTRICAL.

### PART 2 - PRODUCTS

2.01 GENERAL

Electric unit heaters shall be provided as shown on the Drawings. Heaters shall be installed complete and shall be ready for operation. Heaters shall have sizes and capacities as shown on the Drawings.

2.02 FORCED AIR UNIT HEATERS

A. Electric unit heaters shall be horizontal discharge type, suitable for NEMA 4X rated washdown duty.

B. Heaters shall have an epoxy coated stainless steel case. Heating elements shall be the fin tube design of 316 stainless steel construction. Elements shall be protected from overheating by automatic thermal overload protection.

C. Heaters shall be suitable for operation on single phase, 480 volt, 60 Hertz service. Heaters shall be supplied with integral electric starters. Heaters shall be supplied with a NEMA 4X control enclosure housing all integral controls. Heaters shall be supplied with a normal open auxiliary contactor which closes when the heater is energized.

D. Heater fans shall be provided with epoxy coated aluminum fan blades dynamically balanced. Integral fan motors shall be totally enclosed with permanently lubricated ball bearings and be coated with epoxy paint for corrosion resistance.

E. Heaters shall be provided with adjustable outlet louver grille, heavy gauge protective rear grille and factory pre-wired wall-mounted swivel bracket. All hardware shall be of stainless steel construction, and the junction box shall be of fiberglass reinforced polyester construction.

F. All unit heaters shall be U.L. listed and/or CSA certified and be provided by the same manufacturer. Electric unit heaters shall be the type HD3D as manufactured by Chromalox, Inc., or equal.

G. Heaters shall capable of being controlled from a remote wall mounted thermostat, as specified in Section 15890.

2.03 WALL MOUNT ROOM HEATERS

A. Heaters shall be the convection type with sloped top. Heaters shall be low profile, 12" high, 5.75" deep, and 24" in length, with top and front constructed of extruded aluminum equivalent in strength to 14 gauge steel. The inlet grill shall be located on the front, and the outlet grill located on the top of the heater. The cabinet back and bottom shall be constructed of satin coat steel with multiple knock outs for convenient power connection. Heaters shall be provided with the standard white finish.

B. Heating element to be heavy duty, corrosion resistant, stainless steel sheath, enclosing a nickel chromium element embedded in compacted mineral insulation. Aluminum fins are to be positively staked to the surface and provide superior heat transfer. Element shall be located in a floating suspension system to eliminate expansion noise. A linear high temperature thermal cutout shall be provided for the full length of the heating element.

C. Heaters shall be provided with a build-in tamper proof thermostat mounted in either the left or right hand terminal box to suit the heater location.

D. Heater capacity shall be 1,500 Watts (5,118 Btu/h output), for operation on 208 Volt, 3 Phase, 60 Hz. Power. All heaters shall be U.L. listed and provided by the same manufacturer. The heaters shall be the Chromalox Model CCAS-12F215, or equal.

2.04 CONTROLS

A. Forced Air Unit Heaters

Each forced Air Unit Heater shall be controlled by its own dedicated remote thermostat in a 120VAC control circuit as specified in Section 15890. Each thermostat shall be initially set for 50 F.

B. Wall Mount Room Heaters

Each Wall Mount Room Heater shall be controlled by an integral thermostat.

2.05 FACTORY FINISH

Unit heaters shall receive the manufacturer's standard finish.

## PART 3 - EXECUTION

3.01 INSTALLATION

A. Install electric unit heaters as shown on the Drawings and in accordance with manufacturer's recommendations.

B. Forced Air Unit Heaters: Orient heater discharge direction as indicated on the Drawings, and in accordance with manufacturer required clearance from interferences. Install heaters with a minimum 8-foot clearance above the finished floor (AFF) unless indicated otherwise.

C. Wall Mount Room Heaters: heaters shall be surface mounted on the walls where indicated on the Drawings. The existing heaters shall be removed and the walls shall be repaired. Refer to the Architectural Drawings for wall repair details.

3.02 TESTING

Verify the automatic operation of all unit heaters, and their associated thermostats.

3.03 SCHEDULE

Refer to the Drawings for a Unit Heater Schedule indicating heater capacities.

END OF SECTION

**SECTION 15890**

**VENTILATION DUCTWORK, CONTROL DEVICES AND ACCESSORIES**

PARAGRAPH INDEX

## SECTION 15890

## VENTILATION DUCTWORK, CONTROL DEVICES AND ACCESSORIES

## PART 1 - GENERAL

1.01 DESCRIPTION

This section covers the requirements for furnishing all labor materials, equipment and appurtenances for the complete and satisfactory installation of the ventilation ductwork, control devices and accessories as shown on the Drawings and as required for a complete installation as specified.

1.02 SUBMITTALS

A. Submit the following Shop Drawings in accordance with Section 01900:

1. Catalog cuts and detailed specifications for all of the ductwork, devices and accessories which indicate performance, materials of construction, and weights as applicable.

2. Dimensional drawings for all components.

3. Electrical connection diagrams for all electrical items clearly identifying terminal point and wire designations.

4. Proposed installation and layout drawings for ductwork

B. Submit Operation and Maintenance Manuals for all control devices and accessories in accordance with Section 01900.

C. Submit Air Balancing Reports for all ventilation systems and ductwork tested in accordance with Section 01900.

1.03 QUALITY ASSURANCE

A. Requirements of Section 15010, shall apply to this section.

B. All electrical work associated with the equipment specified in this section shall be in accordance with DIVISION 16 - ELECTRICAL.

C. The Contractor shall verify all dimensions of duct, fittings, etc., so that all of the duct installation performed will fit together properly and will conform to the arrangement 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 indicated dimensions on the Drawings. All duct and specials shall be accurate to the dimensions shown. Any hubs, spigots, and flanges shall be perpendicular to the axis of the opening.

D. Drawings do not necessarily show all fittings, offsets, unions, hangers, supports, mounting hardware, etc. All such items shall be furnished and installed, however as required for a complete and satisfactory installation of the equipment shown.

1.04 RELATED WORK

A. For related ventilation fans and equipment, refer to Section 15500.

B. For related heating equipment, refer to Section 15850.

C. For louvers, refer to Section 10200.

## PART 2 - MATERIALS

2.01 THERMOSTATS

A. Thermostats shall be located where shown on the Drawings. Each Thermostat shall have minimum 15 amp contacts rated for 120 volts, single phase, 60 Hertz AC service. Thermostat shall contain an internal temperature sensing coil and one SPDT switch which actuates closed upon a fall in temperature. Thermostat shall have a minimum adjustable set point range of 40 to 100 degrees F. Thermostat shall be suitable for wall mounting. Thermostat shall be provided with a NEMA 4X enclosure. Thermostats shall be Model WCRT manufactured by Chromolox, or equal.

B. Freezestats for Ventilation Fan operation shall be located as shown on the Drawings. Each Freezestat shall have minimum 15 amp contacts rated for 120 volts, single phase, 60 Hertz AC service. Freezestat shall contain an internal temperature sensing coil and one SPDT switch which actuates closed upon a fall in temperature. Freezestat shall have a minimum adjustable set point range of 40 to 100 degrees F. Freezestat shall be suitable for wall mounting. Freezestat shall be provided with a NEMA 4X enclosure. Freezestats shall be Model WCRT manufactured by Chromolox, or equal.

C. Coolingstats for Ventilation Fan operation shall be located as shown on the Drawings. Each Coolingstat shall have minimum 15 amp contacts rated for 120 volts, single phase, 60 Hertz AC service. Coolingstat shall contain an internal temperature sensing coil and one SPDT switch which actuates closed upon a rise in temperature. Coolingstat shall have a minimum adjustable set point range of 40 to 100 degrees F. Coolingstat shall be suitable for wall mounting. Coolingstat shall be provided with a NEMA 4X enclosure. Coolingstats shall be Model WCRT manufactured by Chromolox, or equal.

D. High Temperature Alarm shall be located as shown on the Drawings. Each High Temperature Alarm shall have minimum 15 amp contacts rated for 120 volts,

single phase, 60 Hertz AC service. High Temperature Alarm shall contain an internal temperature sensing coil and one SPDT switch which actuates closed upon a rise in temperature. High Temperature Alarm shall have a minimum adjustable set point range of 35 to 100 degrees F. High Temperature Alarm shall be suitable for wall mounting. High Temperature Alarm shall be provided with a NEMA 4X enclosure. High Temperature Alarm shall be Model WCRT manufactured by Chromolox, or equal.

E. Provide a two (2) spares for each of the following items as listed above:

1. Thermostat
2. Freezestat
3. Coolingstat

2.02 DUCTWORK

A. Unless indicated otherwise, all ductwork and casings shall be constructed in accordance with the latest edition of the HVAC Duct Construction - Metal and Flexible Standards published by the Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA). The ductwork and casings for the station ventilation system shall be constructed in accordance with the "±2-inch Water Gauge Pressure Class" standards and shall be of minimum 18 gauge thickness galvanized steel construction.

B. Ductwork system shall be complete and include all duct fittings, turning vanes, transverse reinforcements, hangers, supports, corner closure, access doors, etc., as required and/or shown on the Drawings and as indicated in the HVAC Duct Construction-Metal and Flexible Standards.

C. Unless otherwise indicated in the Drawings, all 90 degree bends in rectangular duct shall be provided with turning vanes in accordance with the HVAC Duct Construction-Metal and Flexible Standards.

D. All hardware, duct reinforcement rods, duct hangers, duct supports and any other metallic appurtenances shall be constructed of galvanized steel, unless indicated otherwise on the Drawings.

E. Circular duct penetration sealing mechanisms through walls or slabs shall be as shown on the Drawings.

1. Where mechanical seals are utilized, mechanical seal shall be "Link-Seal" as manufactured by Thunderline Corporation, or equal. Mechanical seals shall consist of interlocking synthetic rubber links shaped to continuously fill the space between the duct and the wall or slab opening.

F. Rectangular duct sealing through walls or slabs shall be accomplished using a mastic caulk only.

## 2.03 VENTILATION DAMPERS

A. Dampers shall be provided, fabricated to the exact size, and installed in accordance with the Contract Drawings. Dampers shall be sized to completely cover the opening in the duct or wall for the associated louvers. See the Damper Schedule indicated in the Drawings.

B. Motor Operated and Balancing Dampers

1. Frames shall be 6063-T5 aluminum construction, with tabbed and welded corners. Blades shall be double skin 6063-T5 aluminum construction with single-lock seam, air-foiled shaped. Seals shall be double durometer vinyl on blade edges, and metallic compression type at jambs. Axles shall be square or hexagonal, plated solid steel mechanically fastened to the blades. Axle extension/control shaft kits shall be supplied as necessary for connection of motor operator to drive blade axle. Axle bearings shall be celcon or bronze. Linkage shall be in-jamb type, located outside of the air stream; plated steel tie bar and crank plates, and stainless steel pivots.

2. If multiple panels are provided to meet the opening sizes shown on the Drawings, then provide linkage and jackshafting as necessary to allow the multiple panels to operate as if only one unit. Damper Motor operators shall be mounted outside the air stream, unless indicated otherwise on the Drawings.

3. Dampers shall be the Series VCD-43 as manufactured by Greenheck, or equal.

4. Motor Operators for dampers shall be suitable for 120 volts, single phase, 60 Hertz AC service. Motors shall be the power open/spring close type.

5. Damper motors shall have integral limit switches capable of interlocking with the operation of the fans as shown on the Contract Drawings. Damper motors shall be suitable for operation with ambient temperatures ranging from 0 to 120 degrees F and shall be provided with a NEMA 4 or 4X rated enclosure. The damper motors shall be selected and provided by the damper manufacturer to suit the torque requirements of the associated damper. The dampers motors shall be suitable for direct connection to damper drive blade axle directly or using axle extension kit supplied by the damper manufacturer. The damper motors shall be Model NFBUP-S N4 as manufactured by Belimo, or equal.

## 2.04 FLEXIBLE CONNECTIONS

A. Flexible connections shall be provided where indicated on the Drawings. Circular connectors may slip over clamp-on type or flanged. Rectangular connectors shall be flanged.

B. Connectors shall be constructed with polyester reinforced neoprene, NFPA approved non-flammable. Connections shall be Mercer Rubber Co. Duct Type MA-1, MD-4, or equal.

## PART 3 - EXECUTION

3.01 GENERAL

A. Fabrication and installation of all duct systems together with related equipment shall comply with the appropriate requirements of NFPA 90A, SMANCA, and the ASHRAE Guide.

B. Contractor shall furnish and install conduit, wiring, control components, and other electrical items in accordance with DIVISION 16. Damper motors shall be electrically connected to the control circuitry as indicated in the Drawing, suitable for the hazardous or non-hazardous environment as indicated in the Drawings and as specified in DIVISION 16.

C. Contractor shall furnish and install associated louvers as indicated on the Drawings, and in accordance with Section 10200. Contractor shall verify louvers and dampers fit and can operate in the available space in and around the associated wall opening. Installed dampers and motor operators shall not in any way interfere with the operation of or take away any required clearances for any other piece of equipment.

D. All mounting hardware, supporting brackets, and transition pieces shall be supplied by the Contractor, in accordance with the Manufacturer's Recommendations.

E. All motor operators (actuators) for dampers shall be installed outside any ductwork, visible and easily accessible, unless otherwise indicated on the Drawings. Damper motors operators shall be mounted in accordance with the manufacturer's recommendations.

F. Motor operated dampers shall be wired to open during operation of their associated fan(s) as indicated in the damper schedule on the Drawings. Multiple motor operated dampers in the same fan circuit, shall not be wired where a single control relay contact is connected to multiple damper actuators.

G. Freezestat actuation shall deenergize the associated ventilation fans, as indicated in the Drawings and in Section 15500.

H. High Temperature Switch actuation shall activate a local and remote alarm, as indicated in the Drawings and in Section 15850.

I. Thermostats shall operate the associated Unit Heaters, as indicated on the Drawings, and in Section 15850.

J. Coolingstats shall energize the associated ventilation fan as indicated in the Drawings and in Section 15500.

3.02 FIELD FINISH

A. All field touch up of factory finished equipment shall be in accordance with manufacturer recommendations.

3.03 FIELD TESTING

A. The Contractor shall procure and pay for the services of an independent air balancing and testing agency, approved by the Engineer, to balance, adjust and test all ventilating systems, as specified in Section 15500.

END OF SECTION

**SECTION 16050**

**BASIC ELECTRICAL MATERIALS AND METHODS**

PARAGRAPH INDEX

## SECTION 16050

## BASIC ELECTRICAL MATERIALS AND METHODS

**PART 1 -** GENERAL

1.01 DESCRIPTION

A. Section Includes: Requirements for basic electrical materials and methods applicable to Division 16, Electrical and other sections with electrical equipment requirements except when in these individual sections requirements are otherwise specified.

1.02 QUALITY ASSURANCE

A. Electrical Work and Materials: Follow National Electrical Code, which is minimum requirement for electrical work and if there is a conflict between requirements specified in Contract Documents and code, the more stringent will apply as determined and approved by Engineer.

B. Unless otherwise indicated, provide electrical materials and equipment which are the standard products of manufacturers regularly engaged in production of such materials and equipment, except where otherwise shown on Drawings.

1. Provide the manufacturer's latest standard design that conforms to these Specifications.

2. When 2 or more units of same class of material and equipment are required, these units shall be products of same manufacturer.

1.03 SUBMITTALS

A. Submit following in accordance with Section 01900, Special Conditions.

1. Complete list of electrical materials to be furnished, indicating manufacturer.

2. Complete schedule and listing of system and equipment identification labels with legends.

1.04 PROJECT CONDITIONS

A. General: Drawings indicate extent and general arrangement of principal electrical elements, outlets, and circuit layouts.

B. Connections: Properly connect electrical elements and devices provided under this and other sections to form workable system following Contract Documents, whether connections and interconnections are specifically specified or shown on Drawings.

C. Additional Circuits: Install where required by furnished equipment and for proper installation of work, without additional cost to the County.

1.05 IDENTIFICATION FOR SYSTEM AND EQUIPMENT

A. General:

1. Identification: Identify and label each raceway, piece of equipment, and conductor.

2. Label Schedule: Develop schedule from legend shown on Drawings, schedules, and derived from nature of system.

a. Lacking specific data, develop legends from nature of service or system and submit for Engineer's approval.

b. Arrange schedule to produce legible comprehensive identification system.

B. Raceway Identification:

1. Exposed Raceways: Identify at each end within 12 inches of termination.

2. Identifying Labels: Factory manufactured with colored paper machine printed with identifying legend laminated between 2 sheets of vinylite plastic formed to completely encircle raceway.

a. Sizes: Match raceway to which applied.

b. Installation: Following manufacturer's instructions.

3. Legends for Use in Labels:

a. Indicate system voltage and what it serves or type of service.

b. Letter Colors and Minimum Sizes.

1) Raceways 2-1/2 Inch and Smaller: 1 inch high white letters on black background.
2) Raceways Larger than 2-1/2-Inch Diameter: 2 inch high letters with same colors as above.

C. Equipment Identification:

1. Nameplate: Attach to inside surfaces with adhesive and to outside surface with round head, self-tapping metal screws.

a. Letter Colors and Minimum Sizes: Two-color laminated plastic not less than 1/16 inch thick, machine engraved to show white letters not less than 1/4 inch high on black background.

2. Legend: Identify enclosure or piece of equipment.

D. Conductor Identification:

1. Location:

   a. Identify power conductors terminating in panelboards, cabinets, motor control centers, switchgear, and special service outlets at each end and in intervening junction and pull boxes.

   b. Where feeder conductors pass through common box, tag feeder to indicate electrical characteristics, circuit number, and panelboard designation.

   c. Locate labels near conductor ends for terminals and on exposed portions of conductor within pull and junction boxes.

2. Control Wiring: Identify at each end of each wire by number conforming with following:

   a. Wiring for Pump No.1: Label with numbers from 100 to 199.

   b. Wiring for Pump No. 2: Label with numbers from 200 to 299, and so forth.

   c. Wiring for auxiliary equipment.

      1) Use wire numbers not used for pumping units.
      2) Where it is impractical to maintain same wire numbers throughout, install terminal block at junction of different numbered wires.
      3) Type or write with permanent ink each associated wire number on each side of terminal block.

3. Labels: Plastic slip-on ferrule type with durable machine printed letters, numerals, and other identifying characters.

**PART 2 -** PRODUCTS

2.01 RACEWAY AND FITTINGS

A. General:

1. Minimum Size: 3/4 inch.

2. Fittings: Match material and design of raceway.

B. Raceways:

1. Rigid Steel, Heavy Wall, and Hot Dip Galvanized: UL-6 and ANSI C80.1.

   a. PVC coated Rigid Steel: UL-6 and ANSI C80.1 steel and 40 mil bonded PVC jacket meeting requirements of NEMA RN-1 type A-40.

2. Electrical Metallic Tubing (EMT): UL-797 and ANSI C80.3.

3. Rigid Aluminum: UL-6 and ANSI C80.5.

4. Rigid Non-metallic: Schedule 40 PVC meeting requirements of UL-651 with solvent cement joints.

5. Liquid-tight Flexible: Single strip steel, hot-dip galvanized with PVC jacket meeting requirements of UL-1.

    a. Conduit sizes 1-1/4 inch and smaller: Include continuous copper bonding conductor wound spirally between convolutions on inside of conduit meeting requirements of UL-360.

C. Fittings:

1. Material: Same material and finish as raceways and meeting requirements of UL-514 and ANSI C80.4.

    a. Use threaded connectors for rigid metal conduits.

2. Dry Areas: For enclosures, cabinets, and boxes, use nylon insulated bushing and lock nut.

3. Wet Areas: For enclosures, cabinets and boxes, use watertight hub fitting with gasket.

4. Connectors for Liquid tight Flexible Conduit:

    a. Factory installed liner of plastic in areas of contact with conductor insulation.

    b. Neoprene sealing rings when conduit is installed in knockout.

D. Miscellaneous Specialty Fittings:

1. Watertight:

    a. For exterior walls, roof, and where watertightness is required, use watertight sealing sleeves for raceway penetrations consisting of steel sleeve with pressure ring and clamps or assembly of molded rubber links with pressure plates and through bolts which may be tightened at any time.

    b. Seal between raceway and concrete to withstand 25 feet of water head without leaking.

2. Non-watertight: For interior walls, floors, and where watertightness is not required, use schedule 40 galvanized steel pipe sleeves and plastic expandable sealant.

3. Raceway Expansion Fittings with Bonding Jumper: Where raceway crosses building or concrete expansion joints.

E. Raceway Supports:

1. Support raceway at intervals and at locations required by NEC.

a. Do not use perforated straps or plumber's tape for conduit supports.

b. Independently support raceways from structure unless otherwise directed by Engineer.

c. Supports and hangers: Steel, hot dip galvanized after fabrication except for:

d. PVC coated supports: For PVC and PVC coated raceways.

1) Aluminum Supports: For use on aluminum raceways.

2. Fasteners for Concrete: Expansion bolts or inserts, toggle bolts for hollow masonry or frame construction, and preset inserts for prestressed concrete.

3. Surface supported Raceways: Use straps with holes for 1 or 2 fasteners and shaped to fit raceway size.

4. Supports at Structural Steel Members:

a. Hot dip galvanized beam clamps.

b. Drilling or welding: Following Drawings or with Engineer's approval.

5. Suspended Raceways: Use galvanized hanger rods threaded minimum of 1-1/2 inches on each end to permit adjustment and of following sizes:

a. Raceways up to 2 inch diameter: Not less than 3/8 inch diameter.

b. Raceways larger than 2 inch diameter: 1/2 inch diameter rods.

6. Multiple Suspended Raceways: Horizontal channel not be less than 1-1/2 inches square by 12 gage

a. Weld 2 or more together when greater strength is required to limit deflection to 1/2000 of span.

b. Hanger for horizontal channel: Number and size of raceways supported following Drawings or if not shown, at Engineer's direction.

7. Raceways Exposed: For walls below grade, in damp, wet, or corrosive locations use standoff brackets with minimum of 1/4 inch air space between raceway and mounting surface.

8. Corrosive Areas:

a. Supports, Hangers, Preformed Channels, and Clamps: Type 304 stainless steel or PVC coated.

b. Bolts and Nuts: Type 304 stainless steel.

9. Flexible or Expansion Devices: Use where raceway may be affected by dissimilar movements of supporting structures or medium.

2.02 WIRE AND CABLE - 600 VOLTS AND BELOW

A. Low voltage wire and cable shall be in accordance with Section 16120, Electrical Wires and Cables.

B. Wire Cable Identification: Printed at regular intervals throughout entire length.

1. Manufacture or trade name.

2. Size of conductor.

3. Type of insulation.

4. Voltage classification.

C. Color Coding: Throughout entire network for service, feeder, branch, control and low energy signal circuit conductors. Match existing conditions, where applicable.

1. Conductor No. 10 AWG and Smaller: Factory impregnated color throughout its entire length.

2. Conductor No. 8 AWG and Larger: Marked with color coding tape minimum of 0.004 inch in thickness.

a. Color:

1) Green for grounding conductors.
2) White or gray for neutrals.
3) Color of conductors for different voltage systems:

| System | Phase A | Phase B | Phase C | Neutral | Ground |
|---|---|---|---|---|---|
| 120/240 1 phase | black | red | -- | white | green |
| 208/120 3 phase | black | red | blue | white | green |
| 480/277 3 phase | yellow | brown | orange | gray | green |
| Control and low-energy signal | red | -- | -- | white | green |

2.03 WIRE CONNECTIONS AND CONNECTING DEVICES

A. Splice Connectors:

1. Conductor No. 10 AWG and smaller gauge solid conductors: Insulated pressure twist-on nut type.

2. Conductor No. 8 AWG and Larger Gauge: Split bolt or compression type for making parallel or butt splices, with companion preformed plastic insulating covers or tape equivalent to conductor insulation.

B. Termination Components:

1. Stranded and multiple solid conductors at connection to terminals: Solderless terminal lugs or UL listed crimp tool compression style lugs.

2. Control conductor connection terminations: Spade lug or pressure type.

2.04 BOXES

A. Boxes with Open Conduit Holes: Not permitted, and shall be replaced at no cost to the County.

B. Box Size: Size for number of conductors enclosed in box.

C. Boxes on Conduit Raceways: Same material as conduit except on PVC conduit use PVC coated steel.

D. Outlet, Junction, and Pull Boxes.

1. Dry Areas:

a. Boxes meeting requirements of NEMA 12 stainless steel. 1 piece boxes, galvanized sheet steel knock-out type, minimum 4 inches square or octagonal and 1-1/2 inches deep with cover plates compatible for each box.

2. Damp and Wet Areas:

a. Boxes meeting requirements of NEMA 4X, Stainless Steel with threaded external hubs for conduit entrance, same minimum size as boxes in dry areas.

b. Cover plates: Gasketed PVC coated with stainless steel hardware.

3. Corrosive Areas:

a. Boxes meeting requirements of NEMA 4X, stainless steel or match installed conduit with threaded external hubs and

extended ears for conduit entrance, same minimum size as for boxes in dry areas.

b. Cover plates: Gasketed cover plates with stainless steel hardware.

E. Provide at least two (2) spare boxes for each type of box specified.

2.05 WIRING DEVICES

A. Wall Switches: Minimum 20 amperage.

B. Receptacles:

1. General Utility Convenience Receptacles: Minimum 20 amperage, specification grade.

2. Special Purpose Receptacles: Type, rating, and number of poles shown on Drawings.

C. Device Plates for Outlets: 1 piece suited for device installed.

1. Unfinished Walls: Zinc-coated sheet steel or cast metal with rounded edges.

2. Finished Walls: Satin finish stainless steel.

3. Screws: Countersunk heads with color and finish to match plate.

2.06 TERMINAL CABINETS

A. General: Terminal cabinet type following Drawings, with continuous piano hinged door(s), back panel to mount terminal blocks, and terminal blocks.

1. Number: Furnish sufficient terminals to accommodate active and spare conductor terminations on Drawings, plus 30 percent extra.

2. Mounting:

a. Mount terminals and back panels from cabinet front.

b. Mount only NEMA-1 cabinets with fasteners extending through cabinet back.

B. Materials:

1. Sheet Steel Cabinets: Primed and finished coated inside and outside with manufacturer's standard finish.

2. Stainless Steel and Non-metallic Cabinets: Unpainted.

3. NEMA 4 and 4X Cabinets: Quick release latches.

C. Locations:

1. Panels for Dry Areas: NEMA-1, galvanized minimum 16 gauge steel, surface or flush mounted.

2. Panels for Damp, Wet, or Corrosive Areas: NEMA-4X, minimum 16 gauge stainless steel with stainless steel accessories and hardware.

3. Terminal Strips: Standoff mounted and channel mounting type with marking strips.

2.07 ENCLOSED CIRCUIT BREAKERS

A. Applications: UL489, with interrupting capacity following Drawings and UL listed for conductor type used.

1. Type: Molded case, quick-make, quick-break, thermal magnetic trip type, trip indicating and bolted in type.

2. Rating on each breaker: Visible trip.

3. Single Pole Breakers: Full module size.

4. Two and Multiple Pole Circuits: Common trip type having single operating handle.

a. Single pole circuit breakers with handle ties for multiple pole breakers: Not accepted.

B. Used for Service Disconnect: Same as for enclosed applications, except suitable for service entrance.

**PART 3 -** EXECUTION

3.01 GENERAL

A. Install electrical equipment and material of size, type, and general routing following Drawings or approved Contractor's Drawings.

B. Install metallic raceway, fittings, boxes, and cabinets free from direct contact with reinforcing steel.

C. Install fasteners, anchor bolts, anchorage items, and supports as required to insure proper and rigid alignment.

1. Attach equipment with fasteners sized according to size and weight of equipment and thickness of supporting surface.

D. All ductbank penetrations above grade shall be via rigid aluminum conduit only. Provide PVC to rigid aluminum conduit transition coupling at a minimum of 24 inches below grade. Both the ductbank PVC conduit and aluminum penetration conduit shall be coupled below grade.

E. Where aluminum is placed in contact with dissimilar metal, soil, or concrete, install protective tape to prevent corrosion. Protective tape shall

be 3M Scotchrap All-Weather Corrosion Protection Tape, or approved equal.

F. Ground and make metallic conduit, raceways, and cable trays electrically and mechanically continuous.

1. Conduits: Continuous between outlets, boxes, cabinets, and panels, and secured to each box.

2. Ground Conductor: For each conduit run.

3. Do not install more than 1 three-phase circuit or feeder per conduit run.

3.02 CONDUIT RACEWAYS

1. General:

2. Conceal conduits within finished walls, ceiling, and floors, except where otherwise shown on Drawings.

3. Install conduits parallel or perpendicular to building floors, ceilings, and walls, and to avoid interference with other work.

B. Installation:

1. Cut conduits square and deburr cuts to match factory made cuts.

2. Fasten conduit securely to outlets, junction, pull, and terminal boxes.

3. Cap and seal to prevent entrance of foreign material and moisture during installation and before wire pulling.

4. Isolation: Keep conduit minimum 6 inches away from high temperature piping, ducts, flues, and surfaces

5. Mounting on Concrete and Masonry Surfaces: Minimum of 1/4 inch standoff support.

a. Support and fasten conduit to building structural members using pipe straps, wall brackets, hangers, or ceiling trapeze spaced following electrical codes.

b. Support conduit minimum 8 feet and within 3 feet of every box, panel, and enclosure.

6. Multiple Conduits: When 2 or more exposed conduits are in same general routing, install parallel and with symmetrical bends.

a. Channel Racks: For 3 or more exposed conduits, install channel racks with space for 25 percent additional conduits.

b. Make changes in direction with bends and fittings.

c. Field bends and offsets made with hand bender or conduit-bending machine.

7. Conduit Runs: No more than equivalent of three 90-degree bends within 75 feet between boxes or two 90-degree bends within 125 feet.

   a. Pull Boxes: Install where shown, specified, or wherever required to pull conductors and to meet requirement limiting bends.

8. Expansion Joints: Install expansion fitting when conduit crosses building structural expansion joint.

   a. Install conduits cross perpendicular to building structural expansion joints unless Engineer approves otherwise.

9. Conduits that penetrate from below grade or outdoor shall be stubbed up to 4 inches above grade.

C. Use of Different Types of Conduit and Enclosures: Use conduit raceways and enclosures of following material in following locations.

**TABLE 3.2.C: Area Classifications and Enclosure and Conduit Types**

| Area | Area Classification | NEMA Enclosure Type | Conduit Type |
|---|---|---|---|
| Pump Station 2 – lower level | Damp/Wet | NEMA 4X | Aluminum |
| Pump Station 2 – upper level | Damp/Wet | NEMA 4X | Aluminum |
| Pump Station 3 – lower level | Damp/Wet | NEMA 4X | Aluminum |
| Pump Station 3 – upper level | Dry | NEMA 12 | Aluminum |
| Outdoor – above grade | Damp/Wet | NEMA 4X | Aluminum |
| Outdoor – below grade | Damp/Wet | NEMA 4X | PVC Schedule 80 |

D. Earth Buried Conduits:

1. Cover: Minimum 30 inches of cover and minimum 1 foot clearance between other utility crossings and parallel runs.

2. Grade: Maintain grade of minimum 4 inches per 100 feet From 1 manhole or pull box to next or from high point between them.

3. Drain conduits away from building, or, if not possible, install watertight seal at building.

4. Detectable Warning Tape: Placed approximately 12 inches above and directly over centerline of buried conduit.

E. Concrete Encased Conduits:

1. Maintain minimum of 3 inches between conduits and extend conduit minimum of 2 inches beyond concrete encasement.

2. After concrete is set, pull mandrel of not less than 1/4 inch inside diameter of conduit and bristle brush through each conduit.

F. Conduit Penetrations:

1. Concealed Penetrations for Conduits: Not more than 1/4 inch larger than diameter of conduit.

2. Exposed Penetrations through Walls, Ceiling, and Floors Other than Concrete: Exposed conduits not more than 1/4 inch larger than diameter of conduit and void around conduit filled with caulking compound and surface finished same as wall, ceiling, or floor.

3. Concrete Roof or Membrane Waterproofed Wall:

4. Install watertight sealing sleeve that can be tightened from 1 or both sides.

b. If sealing sleeve is not placed with concrete, core drill proper size hole to provide mechanically watertight installation.

5. Non-waterproofed Wall, Floor, or Ceiling:

a. Install galvanized steel sleeve, Schedule 40, and fill space between conduit and sleeve with plastic expandable compound or oakum and lead joint.

b. If sleeve is not placed with concrete, drill hole not less than 1/2-inch or more than 1 inch larger than sleeve, center sleeve and grout sleeve total depth of penetrated concrete with non-shrink grout, polyurethane, or silicone sealant.

G. Spare Conduits:

1. Install for future use following Drawings.

2. Minimum 200-pound strength nylon pull line in each spare conduit and identify at each end origin and termination of conduit.

3. Terminate spare conduits in equipment, boxes, or by couplings plugged flush with building surfaces.

H. Conduit Damage Correction: Repair cuts, nicks, and abrasions, or replace damaged conduit as directed.

3.03 BOXES

A. General:

1. Size and securely install boxes for number of conductors enclosed in box.

2. Mounting on Steel, Concrete, and Masonry Surfaces: Minimum 1/4-inch spacer to hold box away from surface or provide non-corrosive coating between surfaces.

3. Expansion Anchors, Toggle Bolts, or Appropriate Screws: Use to support boxes separately and bolt units to building.

4. Lighting Fixture Outlet Boxes: Use supports adequate to support weight of fixture to be mounted on box.

5. Remove debris including dust, dirt, wire clippings, and insulation from interior of boxes.

6. Replace boxes with open conduit holes at no cost to the County, and repair or replace damaged boxes at Engineer's direction.

7. Do not mount boxes shown on each side of common walls back-to-back, but offset horizontally minimum of 6 inches.

B. Outlet Boxes:

1. Mount boxes flush with finished wall or ceiling and with long axis vertical.

2. Measure mounting heights from finished floor to centerline of outlet box as follows:

3. Switches: 4 feet and mount lighting switches on strike side of door.

4. Duplex convenience outlets: 18 inches.

5. Fixtures and equipment: Follow Drawings.

C. Junction and Pull Boxes:

1. Install pull boxes where required to facilitate conductor installation and to limit conduit runs to less than 150 feet.

2. Install pull and junction boxes in accessible locations with working space in front of and around installation.

3. Do not install boxes in finished areas without Engineer's approval.

D. Terminal Panels: Install Terminal Panels in accessible locations with adequate working space in front of and around the installation, as shown on the drawings.

3.04 CONDUCTORS

A. Install complete raceway system and clear debris and moisture before conductor installation.

B. Install conductors in raceways with no splices between boxes following Drawings.

C. Pull conductors using proper equipment without exceeding manufacturer's recommendation for maximum pulling tension

D. Protect conductor insulation jacket at all times from kinks, scrapes, punctures, and other damage.

1. Replace damaged conductors.

2. Use UL listed lubricating compound compatible with conductor insulated jacket and with raceway to reduce pulling force.

E. Support conductors in vertical risers with woven grips to prevent loading on conductor connectors.

F. For conduits entering buildings or from areas where temperature change may cause condensation or moisture, seal between conductors and conduit after conductors are in place.

G. When using color coding tape, apply with overlapping turns for minimum length of 2 inches starting 2 inches back from termination point.

H. Leave minimum of 6 inches of free conductor at each connected outlet and minimum of 9 inches at unconnected outlets.

3.05 WIRE CONNECTIONS AND CONNECTING DEVICES

A. Connect circuit conductors of same color to same phase throughout installation.

3.06 WIRING DEVICES

A. Switches and Receptacles: Install in accessible locations and with long dimension vertical.

B. Install bonding jumper between grounded box and switch or receptacle ground terminal.

3.07 CABINETS AND ENCLOSURES

A. Mount cabinets and enclosures with minimum of 1-1/2 inch air space all around.

B. Arrange conductors in cabinets, panels, and enclosures neatly, cut to proper length and with surplus conductor removed.

C. Identify each circuit in enclosure.

D. Provide terminals and connectors for type of material used.

3.08 GROUNDING

A. Ground exposed noncurrent carrying metallic parts of electrical equipment, raceway systems, and neutral of all wiring systems following Section 16950, Testing; NEC; and other applicable codes.

B. Grounding System: May be bonded to buried metal piping not less than 2-inch diameter or drive grounding rod minimum of 9 feet into ground.

1. Ground Clamp Connection to Metal Pipe: Not more than 1 foot inside building.

2. Ground Conductor for Connection to Ground: Stranded copper connected by exothermic welding process.

3. Earth Buried Ground Conductors: Uninsulated.

4. File or sand surfaces before connecting ground to ensure good metal to metal contact.

C. Bond grounding conductors to metallic enclosures at each end and to all intermediate metallic enclosures.

1. Where equipment contains ground bus, extend and connect grounding conductors to that bus.

2. Run ground conductors inside conduits enclosing power conductors.

D. Make connections of grounding conductors to circuits 20 amps or above by solderless terminal and 5/16 inch minimum bolt tapped to motor frame or equipment housing.

1. Ground Connections to Smaller Equipment: Made by fastening terminal to connection box.

2. Connect junction boxes to equipment grounding system with grounding clips mounted directly on box or with 3/8-inch machine screws.

3. Remove paint, dirt, or other surface coverings at grounding conductor connection points so good metal to metal contact is made.

3.09 FIELD QUALITY CONTROL

A. Test circuits for shorts.

B. Test ground for continuity and resistance.

1. Grounding Neutrals for Distribution System 600 volts and Below: Not to exceed 10 ohms.

C. Test each individual power circuit at panel with power equipment connected for proper operation.

D. Test in accordance with Section 16950, Testing.

E. Correct defects and failures to Engineer's acceptance.

END OF SECTION

**SECTION 16120**

**ELECTRICAL WIRES AND CABLES**

PARAGRAPH INDEX

## SECTION 16120

## ELECTRICAL WIRES AND CABLES

### PART 1 - GENERAL

1.01 DESCRIPTION

A. Provide all wires and cables as indicated on drawings and as specified herein, for a complete electrical system.

1.02 QUALITY ASSURANCE

A. Comply with applicable portions of Section 16050, Basic Electrical Materials and Methods.

B. Provide components that are the standard product of a manufacturer regularly engaged in the production of the required materials and equipment.

1. The manufacturer shall be responsible for the design, construction and proper operation of all components.

C. Comply with applicable standards, codes and regulations including but not limited to the most recent edition of the following:

1. Association of Edison Illuminating Companies (AEIC).

2. ASTM International (ASTM):

a. B3, Soft or Annealed Copper Wire.

b. B8, Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard or Soft.

c. B29, Refined Lead.

d. B33, Tinned Soft or Annealed Copper Wire for Electrical Purposes.

3. Insulated Cable Engineers Association, Inc. (ICEA):

a. S-19-81, Rubber-Insulated Wire and Cable.

b. S-61-402, Thermoplastic-Insulated Wire and Cable.

c. S-66-524, Cross-linked Thermosetting Polyethylene-Insulated Wire and Cable.

d. S-68-516, Ethylene-Propylene-Rubber Insulated Wire and Cable.

4. National Electrical Manufacturer’s Association (NEMA):

a. W 3, Rubber Insulated Wire and Cable.

b. WC 5, Thermoplastic Insulated Wire and Cable.

c. WC 7, Cross-Linked-Thermosetting Polyethylene-Insulated Wire and Cable.

d. WC 30, Color Coding of Wires and Cable.

5. National Fire Protection Association (NFPA) 70, National Electrical Code (NEC).

6. Underwriters Laboratory Inc. (UL):

a. UL 44, Wires and Cables Rubber/Thermoset Insulated.

b. UL 83, Wires Thermoplastic Insulated.

c. UL 854, Cables, Service Entrance.

d. UL 1277, Tray Cable.

e. UL 1581/IEEE 383, Vertical Tray 70,000 BTU Flame Test.

7. National Electrical Safety Code.

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01330, Submittal Procedures.

1. Product data.

2. Drawings.

**PART 2 - PRODUCTS**

2.01 MATERIALS

A. 600V Cable for Low Voltage Power Circuits:

1. Okonite Company.

2. Southwire Company.

3. Prysmian Cable Systems.

B. Control and Metering Wire:

1. Okonite Company.

2. Houston Wire and Cable.

3. Southwire Company.

C. Instrumentation Cable:

1. Okonite Company.

2. Belden Corporation.

3. Houston Wire and Cable.

D. Telephone Cable / Ethernet Cable:

1. Houston Wire and Cable.
2. Belden Corporation.
3. Belkin International, Inc.

2.02 WIRES AND CABLES

A. Provide copper conductors. Material and stranding of conductors shall conform to ASTM B33, ASTM B3, and to ASTM B8, for the appropriate class No. 12 AWG minimum wire size unless otherwise noted.

B. Tinned Wire used with Natural Rubber Insulation: Conforms to ASTM B33. Uncoated, soft or annealed copper wire conforms to ASTM B3.

C. All wire and cable shall be UL listed.

D. Wires and Cables for Maximum 600-Volt Power Circuits: Type THHN/THWN rated 600-volt, single conductor, stranded copper with thermoplastic insulation and nylon jacket or equivalent.

E. Wires and Cables for Control, Indication, Signal and Alarm Circuits: Single and multi-conductor control cable, Class B or C stranding.

F. Use Type THHN/THWN insulation, 600-volt, heat and moisture resistant polyvinylchloride (PVC) with nylon conductor jacket.

G. Multi-conductor cable to have sunlight resistant PVC jacket, rated flame retardant type TC for use in cable trays.

H. Analog wiring shall be shielded single pair, instrumentation cable designed for noise rejection for process control, computer, or data log applications and meeting NEMA WC 55 requirements.

1. Outer jacket shall be 45 mil nominal thickness.
2. Individual pair shield shall be 1.35 mil, double-faced aluminum/synthetic polymer overlapped to provide 100 percent coverage.
3. Dimension shall be 0.31-inch nominal OD.
4. Conductors shall be:
    a. Bare soft annealed copper, Class B, seven-strand concentric, meeting requirements of ASTM B8.
    b. No. 20 AWG, 7-strand tinned copper drain wire.
    c. Insulation of 15 mil nominal PVC.
    d. Jacket of 4 mil nominal nylon.
    e. Pair conductors, color-code black and red.

5. Cables: Rated 600 volts and 90˚C. Flame retardant type TC rated for cable trays.

I. Cable for Telephone Systems: Solid copper conductors, size No. 22 AWG, color coded polyethylene insulated twisted together to form pairs with varying lay.

1. Fill core spaces with a non-toxic, non-caustic filling compound.

2. Wrap cable core with a non-hygroscopic dielectric tape, shielded with aluminum corrugated tape and covered with a polyethylene jacket.

3. Cable in accordance with REA PE-39 standard.

J. Ethernet Cable shall be CAT 6. Conductor shall be 23 AWG solid bare copper, color coded, to form 4-pair UTP.

## PART 3 - EXECUTION

3.01 INSTALLATION

A. Install electrical equipment and material of size, type, and general routing following Drawings or approved Contractor's Drawings.

B. Install metallic raceway, fittings, boxes, and cabinets free from direct contact with reinforcing steel.

C. Install fasteners, anchor bolts, anchorage items, and supports as required to insure proper and rigid alignment.

1. Attach equipment with fasteners sized according to size and weight of equipment and thickness of supporting surface.

D. Where aluminum is placed in contact with dissimilar metal, soil, or concrete, install protective tape to prevent corrosion. Protective tape shall be 3M Scotchrap All-Weather Corrosion Protection Tape, or approved equal.

E. Ground and make metallic conduit, raceways, and cable trays electrically and mechanically continuous.

1. Conduits: Continuous between outlets, boxes, cabinets, and panels, and secured to each box.

2. Ground Conductor: For each conduit run.

3. Do not install more than 1 three-phase circuit or feeder per conduit run.

F. Install conductors continuous from outlet to outlet and make no splices except within outlet, junction, or terminal boxes.

G. Draw all conductors contained within single conduit at same time. Cut-off section subject to mechanical pulling means, provide maximum slack at all connection, pull, and terminal points.

H. Apply wire pulling compound as recommended by the cable manufacturer to conductors, if required.

I. Use no cable bend with radius of less than eight times its diameter.

J. Wires and cables installed without prior submittal review and Engineer's approval are subject to removal at no additional expense to the County.

K. Support cables in riser raceways at intervals as required by NEC.

3.02 CONDUCTOR IDENTIFICATION

A. Label each wire at all termination points. Carry individual conductor or circuit identification throughout, with circuit number or the identification clearly stamped on terminal boards and printed on directory cards in distribution cabinets and panelboards.

B. Identify each wire in junction boxes, cabinets, and terminal boxes where total number of control, indicating, and metering wires is three or more and no terminal board is provided, including all power wires, by means of plastic split-sleeve, no adhesive, wire marker.

C. In cases similar to above where terminal boards are provided for the control, indicating, and metering wires, identify all wires including motor leads and other power wires too large for connection to terminal boards, by wire markers as specified above.

D. Provide cable and wire identification in accordance with Section 16195, Electrical Identification.

3.03 CONNECTORS, TERMINAL LUGS AND BOARDS

A. Terminate all wires connected to terminal boards, terminal blocks, or to other similar terminals by means of ring and tongue, nylon self-insulated, tin-plated copper pressure terminals.

B. Fabricated terminal boards, installed where indicated, of type 600 volts, 30 amperes, screw terminals, with white marking strips for wire identification, of the 4-, 6-, 8-, or 12-hole type, as necessary.

C. Clearly and permanently mark terminal strips with ink or indelible pencil. Mark each wire consistently throughout entire system, using notation of wires given on manufacturer's wiring diagrams wherever possible.

3.04 FIELD QUALITY CONTROL

A. Field inspection and testing shall be performed in accordance with Section 16950, Testing.

END OF SECTION

**SECTION 16121**

**MEDIUM VOLTAGE CABLES**

PARAGRAPH INDEX

## SECTION 16121

## MEDIUM VOLTAGE CABLES

**PART 1 -** GENERAL

1.01 DESCRIPTION

A. Provide single conductor medium voltage 5kV cables and accessories, as indicated on drawings and as specified herein.

1.02 QUALITY ASSURANCE

A. Comply with applicable portions of Section 16050, Basic Electrical Materials and Methods.

B. Provide components that are the standard product of a manufacturer regularly engaged in the production of the required materials and equipment.

1. The manufacturer shall be responsible for the design, construction and proper operation of all components.

C. Comply with applicable standards, codes and regulations including, but not limited to the most recent edition of the following:

1. AEIC C S6: Association of Edison Illuminating Companies, Ethylene Propylene Rubber Insulated shielded power cables rated 5 through 69 kV.

2. ICEA S68-516/NEMA WC8: Insulated Cable Engineers Association (ICEA)/National Electrical Manufacturers Association (NEMA), Ethylene-, Propylene-, Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

3. ASTM B8: American Society of Testing and Materials (ASTM), Concentric Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.

4. UL 1072: Underwriters Laboratory, Medium voltage power cables.

D. Design to provide satisfactory performance under the specified operating conditions.

1. Comply with following:

a. Furnish certified design test reports for approval prior to production of the cables for design tests performed in accordance with AEIC C S6, ICEA S-68-516 and UL 1072 standards.

b. Perform testing according to “a” above if such tests have not been performed before or if any design change has been

made after previous design testing. Submit certified design test reports, in such event, for approval prior to production of cables.

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01900, Special Conditions.

1. Product data.

2. Shop drawings for splice kits and terminations.

3. Certified design test data for all cables.

4. Submit manufacturer's certification and warranty.

5. Special shipping, storage, protection and handling instructions.

6. Qualifications, certifications, and license card for the specialist proposed to be retained by the Contractor to perform terminations and splicing of all medium-voltage cable.

B. Submit the following before cable shipment:

1. Certified routine test reports for each type of cable, according to Section 01900, Special Conditions.

2. Certified production test report for each type of cable, according to Section 01900, Special Conditions.

C. Warranty

1. The cable manufacturer shall warranty the cable, in writing, to the A/E against factory incurred defects for 40 years.

2. In the event the cable is defective in design, material, or workmanship for the 40-year design life of the cable, the cable manufacturer shall, at its own expense, remove and replace the defective part of the cable with another cable meeting the original design specifications for the failed cable. Such replacement cable shall carry the same warranty as the cable removed by the manufacturer.

D. Submit manufacturer's certificates in accordance with Section 01330, Submittal Procedures.

**PART 2 -** PRODUCTS

2.01 MANUFACTURERS

A. Medium Voltage Cables

1. Okonite Company.

2. Prysmian Cable Systems

3. Southwire Company.

2.02 CABLES

A. Provide cables to comply with following requirements:

1. Soft, annealed copper 98 percent minimum conductivity. Conform to requirements of ASTM B8. Use Class B stranding.

2. Use conductor sizes given in the Contract Documents.

3. UL listed as type MV in accordance with UL 1072 for 105 degrees C continuous, 140 degrees C emergency and 250 degrees C short circuit operation.

4. Conform to AEIC C S6, ICEA S-68-516, NEMA WC8 and UL 1072 standards.

2.03 INSULATION

A. Provide medium voltage 5kV shielded cables consisting of:

1. An extruded layer of EP based semi-conducting shield.

2. Heat, moisture, impact, and ozone-resistant thermosetting EPR-based elastomer insulation other than black or gray in color.

3. Semi-conducting insulation shield.

4. Five mils of helically-applied nonmagnetic uncoated copper tape shield having a 12-1/2 percent minimum overlap.

5. An outer jacket of polyvinyl chloride. Jacket thickness as specified in ICEA S-68-516.

B. Provide 5 kV cables with 133 percent insulation.

2.04 CABLE SPLICES AND TERMINATIONS

A. Use splice kits and terminations specifically designed for the application as recommended by the cable manufacturer.

B. Make splice and plug connections with closed end compression connectors and lugs. Use fittings and compression tools of the circular or hexagonal compression type.

C. Indenter-type compression fittings and mechanical splices are not acceptable.

**PART 3 -** EXECUTION

3.01 FACTORY TESTING

A. Factory Tests

1. Factory test each cable length as follows:

| Cable Rating | BIL (kV) | AC Test |
|---|---|---|

| | | |
|---|---|---|
| 5 kV | 60 | per AEIC |

B. Provide three copies of the final factory inspection tests to the County.

3.02 INSTALLATION

A. Mandrel all conduits before installation and swab to remove accumulated moisture and debris before cables are pulled in.

B. Lines of nylon or polypropylene by compressed air shall be used to snake or pull wire and cable into conduits. Flat steel tapes and steel cables are not permissible.

C. Use a cable lubricant recommended by the manufacturer for pulling cables into ducts.

D. Obtain Engineer approval for complete cable pulling setup, including winches, cable reel, support frames, turning sheaves, etc., before pulling in the cables.

E. Connect a pulling tension meter to the pulling setup. Arrange the pulling equipment and apply pulling methods so that pulling tensions do not exceed the manufacturer's permissible limits for the cable furnished.

F. Securely tie, neatly bundle and rack the cables in manholes.

G. Do not make splices in manholes unless approved by the Engineer.

H. Fireproof all medium voltage cables installed in manholes on an individual basis. Comply with following:

1. Extend fireproofing at least one inch into any duct.

2. Use approximately 30 mils thick by 3 inches wide fireproofing. Apply tightly around each cable, spiral in one-half lapped wrapping, or in a butt jointed wrapping with a second wrapping covering joints in the first wrapping.

3. Smoothen irregularities in cables, such as at splices, with insulation putty before applying fireproofing tape.

4. Install tape with coated side toward the cable and extend not less than one inch into conduit.

5. Install random wrapping of glass cloth electrical tape around installed fireproofing tape to prevent unraveling.

6. Use fireproofing tape:

a. Consisting of a flexible, conformable fabric with one side coated with a flame retardant, flexible, polymeric coating or a chlorinated elastomer.

b. Non-corrosive to the cable sheath.

c. Shall not support combustion.

7. Asbestos materials are not acceptable.

I. Install medium voltage terminators as recommended by the terminator and cable manufacturers.

J. Use flat washer, a Belleville washer and a locknut for lug bolting at terminals, devices, and busbars.

K. Ground cable shields at each splice and termination.

L. All splices and terminations of medium-voltage cables shall be performed by a specialist retained by the Contractor who is qualified and certified to perform such work. Personnel performing splicing and termination of medium-voltage cables shall be certified specifically by the National Cable Splicing Certification Board (NCSCB). No exception will be allowed.

M. All existing cable shall be tested before splicing and re-termination.

N. Prior to splicing or re-termination, all existing cables shall be tested in accordance with Section 16950, Testing.

3.03 IDENTIFICATION OF CIRCUITS

A. Fasten identification tag to the wire bundle near the conduit termination, where conduits enter switchgear, terminal cabinets and the like.

B. To hold the tap, use adjustable, self-locking nylon “Ty-Rap” as manufactured by Thomas and Betts Company, Brady Company, or equal.

C. Use identifying tag of aluminum, brass or rigid fiber, engraved, stamped, or painted with the scheduled feeder number, voltage class, and cable type.

D. Match existing color coding for 5kV cables.

E. When using color coding tape, apply with overlapping turns for a minimum length of 2 inches starting 2 inches back from the termination point.

F. Identification shall be as per Section 16195, Electrical Identification.

3.04 FIELD QUALITY CONTROL AND TESTING

A. Perform field inspection and testing in accordance with Section 16950, Testing.

END OF SECTION

**SECTION 16130**

**ELECTRICAL BOXES AND FITTINGS**

PARAGRAPH INDEX

## SECTION 16130

## ELECTRICAL BOXES AND FITTINGS

**PART 1 -** GENERAL

1.01 DESCRIPTION

A. Provide junction boxes, pull boxes, covers and miscellaneous hardware as indicated, in accordance with the Contract Documents.

1.02 QUALITY ASSURANCE

A. Comply with applicable portions of Section 16050, Basic Electrical Materials and Methods.

B. Provide components that are the standard product of a manufacturer regularly engaged in the production of the required materials and equipment.

1. The manufacturer shall be responsible for the design, construction and proper operation of all components.

C. Comply with applicable codes and standards including, but not limited to the most recent edition of the following:

1. National Electrical Manufacturer's Association (NEMA).
2. UL 886.
3. UL 698.
4. UL 508.
5. National Electric Code (NEC).

D. Design to provide satisfactory performance under the specified operating conditions.

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01330, Submittal Procedures.

1. Product data.
2. Shop drawings.
3. Special shipping, storage, protection and handling instructions, if any.
4. Manufacturer's installation instructions.

B. Submit manufacturer's certificates in accordance with the Section 01400, Quality Control.

1.04 SPARES

A. Provide at least two (2) spare Boxes, for each type of Box specified.

**PART 2 -** PRODUCTS

2.01 MANUFACTURERS

A. Outlet Boxes:

1. Steel City.
2. Appleton Electric Co.
3. Raco.
4. Carlon.
5. Or equal.

B. Pull and Junction Boxes:

1. Crouse-Hinds Co.
2. OZ Electrical Manufacturing Co.
3. Hope Co.
4. Or equal.

C. Fittings:

1. Crouse-Hinds Co’
2. Appleton Electric Co.
3. Robroy Industries.
4. OZ Electrical Manufacturing Co.
5. Carlon.
6. Or equal.

2.02 OUTLET BOXES

A. Provide outlet boxes for use with IMC raceway as follows.

1. Galvanized case metal type.
2. With tapped hubs for conduit entrance.
3. Having galvanized cast metal covers with rubber gasket.

B. Provide non-metallic outlet boxes for use with concealed PVC raceway. Procure from same manufacturer as raceway.

C. Provide non-metallic single- and two-gang outlet boxes with integral mounting feet, for use with PVC raceway. Provide non-metallic blank covers with stainless steel mounting screws. Carlon FS or FD, or equal.

D. For use with PVC coated RMC provide PVC coated galvanized cast metal type outlet boxes with tapped hubs for conduit entrance. Provide covers of PVC coated galvanized cast metal with rubber gasket. Provide minimum 40 mil-thick polyvinyl chloride jacket on exterior surfaces of box bodies and covers.

E. Provide PVC coated cast outlet boxes in hazardous areas (as defined by NEC), as follows

1. Suitable for Class, Division and Group location as indicated.

2. Conform to UL 886.

3. Bearing UL label as suitable for intended application.

2.03 PULL AND JUNCTION BOXES

A. Provide junction or pull boxes where indicated, and where required to facilitate wire pulling and connection.

B. Provide pull and junction boxes less than 100 cubic inches as specified for outlet boxes:

1. Flush NEMA 4 junction boxes – watertight outside flanged with recessed cover type "YR" as manufactured by OZ/Gedney, or equal.

C. Provide pull and junction boxes 100 cubic inches and larger for use with PVC raceway, fabricated from PVC, or equal non-metallic product, and:

1. Equipped with screw cover unless otherwise noted.

2. Adequately support the boxes to maintain shape.

3. Provide NEMA 4X boxes with watertight gasketed covers and external mounting feet.

D. Pull and junction boxes 100 cubic inches and larger installed in hazardous areas, as defined by NEC, shall be suitable for Class, Division and Group as indicated and comply with following:

1. Provide neoprene gasket.

2. Provide stainless steel hinges and natural stainless steel finish.

3. Confirming to UL 886 and bearing UL label as suitable for intended application.

E. Boxes shall be supported to maintain shape. Larger boxes shall be formed of structural bracing into rigid assembly to maintain alignment in shipment and installation

F. Provide drain fittings in NEMA 4X boxes. Crouse-Hinds, Type ECD 11, Killark No. KDB-1, or equal.

2.04 PUSHBUTTON ENCLOSURES

A. Provide boxes for pushbutton enclosures as specified for outlet boxes and for junction and pull boxes except that:

1. NEMA 4X pushbutton enclosures shall conform to UL 508.

2. Pushbutton enclosures installed in hazardous areas as defined by NEC shall conform to UL 698, and shall bear UL label as suitable for its intended application.

2.05 PAINTING

A. Clean and shop prime all non-galvanized, non-stainless steel metal surfaces in accordance with Section 09900, Painting and Coating, System No. 3.

B. Use ANSI 61 light gray as the final exterior color for the pull boxes.

**PART 3 -** EXECUTION

3.01 GENERAL

A. Size boxes in accordance with NEC, or as indicated.

B. Provide suitable box at outlets especially designed to receive type of fixtures and devices to be mounted thereon, except where otherwise noted for recessed fluorescent fixtures.

C. Provide fixture outlets with fixture supports of size and type required for fixture to be hung. Fixture studs, generally, shall be 3/8-inch.

D. Provide boxes of type approved for particular purpose intended.

E. Recessed wall outlet boxes shall be at least 4-inches square.

F. In finished areas, provide box covers to fit outlet box installed of required depth so that the edge of ring is flush with finished material.

3.02 INSTALLATION

A. Securely support each box at two or more points and two or more sides to prevent movement in all directions.

B. Use boxes to support devices and face plates. Do not use face plates and devices to support boxes.

C. Where box is concealed in stud wall, securely attach it to full depth stud (or section of stud) on each side of box.

D. Provide labels in accordance with Section 16195, Electrical Identification.

3.03 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 16950, Testing.

B. Adjusting and Cleaning: Clean surfaces after installation.

C. Grounding:

1. Provide grounding in accordance with Section 16450, Grounding.

2. Tighten connections to comply with tightening torques specified by the manufacturers and UL Standard 486A to assure permanent and effective grounding.

END OF SECTION

**SECTION 16143**

**WIRING DEVICES**

PARAGRAPH INDEX

## SECTION 16143

## WIRING DEVICES

**PART 1 -** GENERAL

1.01 DESCRIPTION

A. Provide plugs, plug connectors, device covers, and switches as indicated on drawings and as specified herein. This section includes the following:

1. Receptacles.
2. Ground fault circuit interrupter receptacles.
3. Plugs.
4. Receptacles with disconnect switches.
5. Switches.
6. Mounting hardware.

1.02 QUALITY ASSURANCE

A. Comply with applicable portions of Section 16050, Basic Electrical Materials and Methods.

B. Provide components that are the standard product of a manufacturer regularly engaged in the production of the required materials and equipment.

1. The manufacturer shall be responsible for the design, construction and proper operation of all components.

C. Comply with applicable codes and regulations including, but not limited to the most recent edition of the following:

1. National Electrical Manufacturers Association (NEMA).
2. National Fire Protection Association (NFPA): 70, National Electrical Code (NEC).
3. Underwriter's Laboratories Inc. (UL).

D. Design to provide satisfactory performance under the specified operating conditions.

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01330, Submittal Procedures:

1. Product data.
2. Drawings.

1.04 PROJECT CONDITIONS

A. General: Drawings indicate extent and general arrangement of principal electrical elements, outlets, and circuit layouts.

1.05 SPARE PARTS

A. Provide at least ten (10) spare parts, for each type of wiring device specified, including switches and receptacles.

**PART 2 -** PRODUCTS

2.01 MANUFACTURERS

A. Toggle Switches:

1. Arrow-Hart, Inc.
2. General Electric Co.
3. Harvey Hubbell, Inc.
4. Or equal.

B. Explosion-proof and Corrosion Resistant Switch:

1. Appleton Electric Co.
2. Crouse-Hinds Products ECM.
3. Or approved equal.

C. Receptacles:

1. Arrow-Hart, Inc.
2. General Electric Co.
3. Harvey Hubbell, Inc.
4. Or equal.

D. Explosion-proof and Corrosion Resistant Receptacles:

1. Appleton Electric Co.
2. Or equal.

E. Receptacles with Disconnect Switches:

1. R. Stahl.
2. Or equal.

2.02 SWITCHES

A. Single pole ac toggle switch, quiet type, 120/277V ac, 20 ampere, ivory, specification grade, provide:

1. Arrow-Hart, Inc.; Catalog No. 1991-I.
2. General Electric Co.; Catalog No. GE5951-2.

3. Harvey Hubbell, Inc.; Catalog No. 1221-I.

4. Or equal.

B. Three-way ac toggle switch, quiet type, 120/277V ac, 20 ampere, ivory, specification grade, provide:

1. Arrow-Hart, Inc.; Catalog No. 1993-I.

2. General Electric Co.; Catalog No. GE5953-2.

3. Harvey Hubbell, Inc.; Catalog No. 1223-I.

4. Or equal.

2.03 EXPLOSION PROOF AND CORROSION RESISTANT SWITCH

A. Single gang, dead end, one pole, 3-way, 4-way, 120/277V ac, 20 ampere, in areas classified as NEC Class I, Division 2 hazardous areas, provide:

1. Appleton Electric Co.; EFS Series.

2. Crouse-Hinds Products ECM; EFS Series.

3. Or equal.

2.04 RECEPTACLES

A. Duplex grounding receptacles, corrosion resistant, 2-pole, 3-wire, 125V ac, 20 ampere, NEMA 5-20R configuration, provide:

1. Arrow-Hart, Inc.; Catalog No. 5739CR.

2. General Electric Co.; Catalog No. GE0526-C.

3. Harvey Hubbell, Inc.; Catalog No. 53CM62.

4. Or equal.

B. Single grounding receptacle, corrosion resistant, 2-pole, 3-wire, 125V ac, 20 ampere, NEMA 5-20R configuration, provide:

1. Arrow-Hart, Inc.; Catalog No. 5361-CR.

2. General Electric Co.; Catalog No. GE0520-C

3. Harvey Hubbell, Inc.; Catalog No. 53CM61

4. Or equal.

C. Clock receptacle, 3-pole, 3-wire, 125V ac, 15 ampere, recessed type for plug cap, with stainless steel cover plate, provide.

1. Arrow-Hart, Inc.; Catalog No. 5708.

2. General Electric Co.; Catalog No. 4224-5.

3. Bryant Electric; Catalog No. 2828GS.

4. Or equal.

2.05 EXPLOSION PROOF AND CORROSION RESISTANT RECEPTACLES

A. Install in areas classified as NEC Class 1, Division 2 hazardous locations, receptacles as below:

1. Meltric DNX Decontactors, as indicated on Drawings.

2. Or equal.

2.06 GROUND FAULT CIRCUIT INTERRUPTER (GFCI) RECEPTACLES

A. Provide ground fault interrupter receptacles of following types and rating.

1. "Feed-thru" type ground fault circuit interrupter, with integral heavy duty NEMA 5-20R duplex receptacles arranged to protect connected downstream receptacles on same circuit.

2. Provide unit designed for installation in a 2-3/4 inch deep outlet box without adapter, grounding type, Class A, Group 1, in accordance with UL Standard 94.3.

3. Explosion proof, 20A, 125V ac, 5 MA trip setting ground fault circuit interrupter with explosion proof receptacle in areas classified as NEC Class I, Division 2 hazardous locations.

4. Snap Switches: Quiet type AC switches. Comply with UL 20 and NEMA WD1.

5. Wall Plates: Single and combination of types, sizes and with ganging and cutouts as indicated.

a. To mate and match with wiring devices to which they are attached.
b. Use metal screws for securing plates to devices with screw heads colored to match finish of plates.
c. Color to match wiring devices except as otherwise indicated.
d. With engraved legend where indicated. Conform to requirements of Section 16195, Electrical Identification.
e. Possessing the following additional construction features:
f. Material and Finish: 0.04 inch thick, Type 302 satin finished stainless steel in wet and/or corrosive area.
g. Material and Finish: Plastic.

6. Plugs: Watertight, solderless, long plug housing and suitable for activating explosion proof receptacles and areas classified as NEC Class I, Division 2 hazardous locations.

7. Mounting Hardware: Stainless steel.

**PART 3 -** EXECUTION

3.01 INSTALLATION

A. Comply with following installation requirements for wiring devices:

1. Install wiring devices and accessories as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC and in accordance with recognized industry practices to fulfill project requirements.

2. Coordinate with other work, including painting, electrical boxes and wiring installations, as necessary to interface installation of wiring devices with other work.

3. Install wiring devices only in electrical boxes, which are clean; free from building materials, dirt and debris.

4. Install stainless steel wall plates in unfinished spaces.

5. Install wiring devices after wiring work is completed.

6. Install wall plates after painting work is completed.

7. Tighten connectors and terminal, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for wiring devices. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Standard 486A. Use properly scaled torque indicating hand tool.

8. Mount receptacles 18 inches above finished floor in office areas, control rooms, conference rooms and similar above grade areas unless shown otherwise. Mount all other receptacles 4 feet - 2 inches above finished floor unless shown otherwise.

9. Securely fasten equipment to walls or other structural surfaces on which they are mounted. Provide independent, factory applied PVC coated steel or stainless steel supports and accessories where no wall or other vertical surface exists.

10. Provide field applied PVC coating for cut ends of PVC coated supports.

11. Space at least 1/4 inch from wall. Spacers shall be stainless steel, PVC or nylon.

12. Mount wall switches 4 feet -2 inches above finished floor unless otherwise noted.

13. Install bonding jumpers between the receptacle ground screws and the outlet boxes on all receptacles.

14. For receptacles with disconnect switches, install four wires between the receptacles and the motor control centers for 3-phase equipment applications.

15. Install three wires between the receptacles and the motor control centers for single-phase equipment applications.

16. For receptacles with disconnect switches, furnish two mating plugs, with each assembly. One mating plug wired to each piece of portable utilization equipment furnished under this contract.

17. Coordinate the size of the connection cords with the mating plugs to be installed to assure a properly sealed fit.

18. Turn in the remaining mating plugs to the County under the same requirements as for spare parts.

3.02 FIELD QUALITY CONTROL AND TESTING

A. Perform field inspection and testing in accordance with Section 16950, Testing.

B. Testing: Prior to energizing circuits.

1. Test wiring for electrical continuity, and for short-circuits.

2. Ensure proper polarity of connections is maintained.

3. Test ground fault interrupter operation with both local and remote fault simulations in accordance with manufacturer recommendations.

C. Subsequent to Energizing: Test wiring devices and demonstrate compliance with requirements, operating each operable device at least six times.

** END OF SECTION **

**SECTION 16160**

**CONTROL ENCLOSURES**

PARAGRAPH INDEX

## SECTION 16160

## CONTROL ENCLOSURES

**PART 1 -** GENERAL

1.01 DESCRIPTION

A. Furnish and install control enclosures as indicated on the Drawings and as specified herein. This includes, but is not limited to, all control panels and control stations.

B. Install and interconnect all equipment, devices, instrumentation and electrical hardware within the enclosures as designated on the drawings and as specified.

C. Coordination:

1. Review the installation requirements of the materials and equipment specified for installation in the control enclosures.

2. Coordinate the size of each control enclosure and the quantity of control enclosures that are required at each location with all equipment and materials to be installed.

1.02 QUALITY ASSURANCE

A. Reference Standards: Comply with all federal and Maryland laws or ordinances, as well as all applicable codes, standards, regulations and/or regulatory agency requirements including the partial listing below:

1. Joint Industrial Council (JIC) Standards.

2. National Electrical Manufacturer's Association (NEMA) Standards.

3. National Fire Protection Association (NFPA): 70, National Electrical Code (NEC).

4. Local and State Building Codes.

B. All electrical materials and equipment shall be new and shall bear the label of the Underwriters Laboratory Inc. (UL), Factory Mutual (FM) or equivalent where standards have been established and label service regularly applies.

C. Attach appropriate union labels to panels, consoles and cabinets as required.

D. Contractor Responsibilities:

1. Furnishing, installing and assuming complete responsibility for the installation and proper operation of all materials, equipment and

hardware within the enclosures as designated on the Drawings and as specified herein.

2. Coordination of the installation and interfacing requirements among the control enclosures and all items installed therein.

3. Coordination, preparation, assembly and submission of all submittals for items furnished and Work performed under this section.

E. The quality of workmanship shall be first class in all respects.

1.03 SUBMITTALS

A. General: Make all submittals in accordance with Section 01330, Submittal Procedures.

B. Shop Drawings and Product Data:

1. Submit in accordance with Section 01330, Submittal Procedures for each enclosure.

2. Provide enclosure-layout drawings as follows:

a. Location plan for each control enclosure. Indicate electrical classification of each location.

b. Location, dimensions, weights, name and manufacturers designation of items mounted in and on the enclosures.

1) Internal layout drawings in particular shall be complete and to accurate scale. It is these drawings which will be reviewed to determine adequate sizing of the panel enclosures.

2) Each component of the control panel shall be included in a bill of materials on the drawings which shall include such information as manufacturer's model number, device designation consistent with layout and wiring drawings, description, quantity, electrical rating or size and material of construction.

c. Mounting details including location of anchoring flanges, holes and data on anchor bolt sizing and load carrying capacity.

d. Locations of external wiring and conduit and equipment connection.

e. Complete point-to-point wiring and piping schematics and diagrams.

f. Nameplate and legend plate schedule indicating text, text size, plate size and plate designation consistent with layout.

C. Enclosure Heat Calculations: For all enclosures, heat calculations shall be provided to verify that internal temperatures are within the limitations of internal components based on ambient temperature and component heat generation data. These calculations shall take into account extremes of ambient temperatures, the effects of panel surface for heat dissipation, insulation, and other factors.

1.04 SPARE PARTS

A. Provide the minimum following spare parts:

1. 5 relay assemblies of each size and type installed.
2. 5 relay bases of each type installed.
3. 1 fuse cartridge for each one installed (including zener barrier fuses).
4. 5 pushbutton contact blocks of each size and type installed.
5. 5 pushbutton operators of each size and type installed.
6. 5 selector switches operator of each size and type installed.
7. 2 potentiometers of each size and type installed.
8. 5 elapsed time meters of each size and type installed.
9. 10 indicating lights of each size and type installed.
10. 1 corrosion inhibitor for each one installed.
11. 10 plug-in replaceable surge elements for each size and type installed.
12. 10 intrinsically safe relays of each size and type installed.
13. 10 zener barriers for each size and type installed.

**PART 2 -** PRODUCTS

2.01 MANUFACTURERS

A. Control Enclosures shall be manufactured by a UL-508 listed shop experienced in provided industrial control panels. Control enclosure manufacturer shall be:

1. ESS Metron
2. SAI Advanced Power Solutions
3. JAGG Electric

2.02 EQUIPMENT REQUIREMENTS

A. Locate equipment, devices, hardware, power supplies, instrumentation and controls, electrical equipment and wiring to be installed inside the enclosures and/or as facial features on the enclosures so that connections

can be easily made and so that there is ample room for servicing each item. Every component in and on the enclosures shall be able to be removed individually without affecting the other components and without the need to move other components.

B. Support and restrain all internally as well as panel mounted components to prevent any movement.

C. Provide mounting strips for the installation of all relays and other components.

D. Provide all devices, electrical hardware, circuit protectors, main power terminals, wiring, support hardware, fasteners and other components required to make the control enclosures complete and workable units.

E. Provide useful space and power supply capacity as spare for future expandability to a minimum of 1 item per item-type installed or 20 percent of quantity of each type-item installed, whichever yields the greater spare space.

F. Provide ac/dc power supplies as required for the specified panel and field mounted instrumentation requiring a dc power source.

G. Devices which penetrate enclosure shall be constructed/rated/installed to maintain enclosure rating.

2.03 ENCLOSURES

A. Manufacturers. Enclosures shall be manufactured by:

1. Hoffman.

2. Rittal.

B. Size: The Contractor shall furnish enclosures of the size and quantity required to house the electrical equipment supplied and all other electrical components installed in the enclosure.

C. Construction Features:

1. Fabricate each enclosure in accordance with Section 16050, Basic Electrical Materials and Methods, Article Conduit Raceways.

2. Continuously weld all exterior seams and grind smooth.

3. Reinforce stainless sheet steel with stainless steel angles if necessary to adequately support equipment and ensure rigidity and to preclude resonant vibrations.

4. Small enclosures shall be 14 gauge, minimum. Large enclosures shall have a 3-inch by 3-inch stainless steel angle base and 2-inch by 2-inch or larger stainless steel angle frame. Minimum thickness of the stainless steel sheet shall be 11 gauge. Large enclosures are stainless steel or steel enclosures with any dimension over

60 inches. Minimum thickness of the large enclosures shall be 12 gauge.

5. Use pan type construction for doors.
6. Mount doors with full length stainless steel piano hinges.
7. Provide a gasket completely around each door opening to meet the NEMA rating of the enclosure.
8. Provide a handle-operated, pad-lockable three point stainless steel latching system for each door on NEMA 12 enclosures.
9. NEMA 4X panels shall have Type 316 stainless steel quick-release latches to open the door(s) and pad-lockable hasp and staple.
10. Use stainless steel fasteners throughout.
11. Conform to NEMA Type 4X construction standards unless otherwise specified, noted or required on the Drawings.
12. Provide interior mounting panels and shelves constructed of 12 gauge steel with white enamel finish.
13. Provide enclosure supports as shown on the Drawings and as required to rigidly install the enclosures. Free standing enclosures which sit on concrete bases shall include a 1/4-inch thick neoprene pad between the enclosure and the base and stainless steel anchor bolts.
14. Provide all holes and cutouts for installation of conduit and equipment.
15. Design panels, consoles and cabinets so that cable and piping enter and leave through the top or bottom of the panel.
16. Finish shall be stainless steel enclosures painted with IEEE/ANSI C57.12.29 coating for harsh environmental protection.
17. Insulate the interior of the box and door to assist heating and cooling of the interior if the enclosure is to be installed outdoors or in an unheated area.
18. Finish: Stainless steel enclosures shall be polished to a No. 4 finish.
19. No screws or bolts shall protrude through from the interior of the panel.
20. Where required for enclosure handling, provide temporary lifting rings. Provide plugs to fill the lifting ring holes after installation.
21. Steel print pocket, matching the interior panel finish, or high impact thermoplastic shall be provided.

22. Provide properly sized grounding bus bars, mounted with insulated mounting brackets, for instrument signal cable shields and ac power. Instrumentation ground bus shall be separated from the ac power ground bus and shall be electrically isolated from the enclosure. Bus bars shall be tin plated copper. Drilled and tapped holes shall be provided for ground wire screw connections. Bus bar system shall be UL component recognized.

23. Mounting Elevations (unless otherwise shown)

    a. Bottoms of indicators and controllers shall be located no lower than 48 inches above the floor on a panel face.

    b. Tops of indicators and controllers shall be located no higher than 70 inches above the floor on a panel face.

    c. Bottoms of lights, selector switches and pushbuttons shall be located no lower than 32 inches above the floor on a panel face.

    d. Tops of lights, selector switches and pushbuttons shall be located no higher than 70 inches above the floor on the panel face.

    e. Tops of annunciators shall be located no higher than 86 inches above the floor on a panel face.

2.04 ELECTRICAL

A. Wiring:

1. For dc signal wiring, use No. 16 AWG stranded shielded, insulated wire with thermoplastic insulation rated for 600 volts and 60 degrees C.

2. For ac power and control and dc power and control wiring to components, use No. 16 AWG minimum stranded wire with thermoplastic insulation type MTW rated for 600 volts and 90 degrees C. For wiring carrying more than 15 amps, use sizes required by NEC.

3. All stranded conductor wiring shall have at least 19 strands in the conductor.

4. Install wiring runs along horizontal or vertical routes to present a neat appearance. Angled runs are not acceptable.

5. Group or bundle parallel runs of wire using plastic troughs with snap-off covers.

6. Wiring to equipment mounted on doors or where movement of the equipment will take place shall be installed in nylon spiral wrapping sheaths.

7. Adequately support and restrain all wiring runs to prevent sagging or other movement.

8. Separate ac wiring from dc wiring.

9. Separate and shield dc signal wiring from control wiring.

10. Network and communication wiring shall be separated from other wiring.

11. Provide separate terminal blocks adjacent to signal terminal blocks for terminating shield wires. Two shield wires are allowed to share a single terminal block screw. Loop connect shields to ground so that removal of a shield termination shall not disconnect other shields from ground.

12. Terminate all wiring at terminal strips or device terminal. All field and spare wiring shall be landed on terminal blocks.

13. Cable ties shall not be secured to adhesive mounting plates, but only to plates solidly bolted or screwed into place.

B. Terminal Blocks:

1. Non-Fused Terminal Blocks:

a. Use screw type terminal strips, with No. 6 screw 600V rating, and numeric identifiers beside each connection. Soldered type connections are not acceptable. Terminal blocks shall accept No. 12 AWG and smaller field wiring.

b. Install spare terminals equal in number to a minimum of 20 percent of the terminals used for each type of wiring, that is: dc signal wiring, dc control wiring and ac power and control wiring.

c. Group terminal blocks for similar signal types together. Arrange terminal blocks and wire ducts on back panel to maintain physical separation of each signal type. Signal types specified elsewhere may include 4 to 20 mA dc analog signals, dc and ac powered discrete contact signals. ac terminals shall be white and dc terminals shall be blue.

d. Write unique terminal numbers legibly on terminal strips with a black waterproof non-smudging pen or utilize pre-printed labels.

e. Manufacturer and Product:

1) Allen-Bradley; Cat. No. 1492-W4.

2) Or equal.

2. Fused Terminal Blocks:

a. All fuses shall be installed in finger-safe terminal blocks with a neon blown fuse indicator for safety and easy troubleshooting.

b. 100 to 300-volt rated.

c. DIN rail mounting.

d. For 1/32-inch by 1-1/2-inch fuses.

e. UL listed.

f. 30 A rated.

g. No. 18 to No. 8 AWG wire range.

h. Manufacturer and Product:

1) Allen-Bradley; Cat. No. 1492-UF8250.

2) Or equal.

C. Relays:

1. All relays shall be sized for the load conditions.

2. Coil Voltages: 120V ac unless shown otherwise on the Drawings.

3. Light duty relays, less than 5 amps load.

a. General purpose machine tool relays with convertible contacts mounted on a standard mounting strip.

b. Shall have 10 amp rated AgCdO contacts.

c. Shall have LED and mechanical visual indicators to show if relay is energized or not.

d. Relay and base shall be approximately 22.5 mm in width. The base shall have a retaining clip. The base shall have a removable bracket so it can be panel or din rail mounted.

e. Shall have a pull-to-test button with manual latching.

f. Manufacturer and Product:

1) Releco; Ice Cube Plus Model C7-A2OX-120VAC with S7-MP base.

2) Or equal.

4. Heavy duty relays, 5 amps and larger load.

a. Shall be used for small motors (single phase 120/240V ac) and similar duty.

b. Shall be horsepower rated when controlling motors.

c. Manufacturer and Product:

1) Allen-Bradley; Bulletin 500 or 500F.

2) Square D; Class 8502.

3) Or equal.

D. Pushbuttons, Potentiometers, and Selector Switches: Two through four positions.

1. Type: Round, corrosion resistant, heavy-duty NEMA 4/4X with NEMA A300 Contacts.

2. Operator Legend Plates: Black laminated plastic with white engraved lettering as designated on the Drawings or as approved. Alarm indicating light and emergency stop legend plates shall be red laminated plastic with white engraved letters. Size shall be 2-3/4 inches by 2-3/4 inches minimum. Lettering shall be 3/16-inch size minimum.

3. All pushbutton switches shall have full guard and button color to match associated indicating light. All pushbuttons shall be bootless. Pushbutton colors shall be the following.

   a. Start: Red.

   b. Stop: Green.

   c. Emergency Stop: Red (illuminated red when depressed).

   d. Alarm Acknowledge: Black.

4. Potentiometers shall be 3-wire type and have a 1,000 ohm resistance element.

5. Contact Blocks: Heavy-duty type.

6. Shall have screw terminals for wire connections.

7. Size: 30.5 mm.

8. All pushbuttons selector switches and potentiometers shall be by the same manufacturer except the five and six position switches.

9. Emergency stop pushbuttons shall be maintained contact 2-1/4-inch red mushroom type requiring a twist and pull action to reset. Legend plate shall be 3 inches by 3 inches (minimum size).

10. Manufacturers and Products:

    a. Allen-Bradley; Bulletin 800H.

    b. Square D; Class 9001, Type SK.

    c. Allen-Bradley; Bulletin 800R, sealed contact selector switches for 4 to 20 mA dc signal switching.

    d. Or equal.

E. Selector Switches: Five and six position.

1. Type: Round, heavy-duty oil tight, NEMA A300.

2. Operator Legend Plates: Black, laminated plastic with white engraved lettering as designated on the Drawings. Size shall be 2-3/4-inch by 2-3/4-inch minimum. Legends shall be as shown on the Drawings and lettering shall be 3/16-inch minimum size.

3. Contact Blocks: Heavy-duty type.

4. Shall have screw terminals for wire connections.

5. Manufacturers and Products:

   a. Magnetek; Gemco.

   b. Or equal.

F. Pilot Lights:

1. Indicating lights shall be LED type 100,000 hours half-life, 120 V ac.

2. Lens color as shown on the Drawings.

3. Push-to-test capability.

4. Manufacturer and Product:

   a. R. Stahl, Inc.

   b. Or equal.

G. Limit Switches:

1. Heavy Duty Type.

2. Operating Head to be available with a lever arm, plunger or wobble stick type operator.

3. Switch to be 2-pole rated at least 10 amps continuous at 120 and 240 volts, 60-Hz ac.

4. Switch enclosure to be rated NEMA 4 and NEMA 13, watertight and oil tight.

5. Able to be mounted in any position.

6. Temperature range minus 20 to 140 degrees F.

7. Manufacturers and Products:

   a. Square D; Class 9007, Type C.

   b. Allen-Bradley; Bulletin 802T.

   c. Or equal.

H. Elapsed Time Meters:

1. For NEMA 12 Control Panels/Stations:

a. Type: Square non-resettable with a synchronous motor.

b. Range: 0 to 99999.9 hours.

c. Temperature Range: 0 to 140E.

d. Voltage and Frequency: 120 volts, 60-Hz.

e. High impact plastic cover.

f. Manufacturer and Product:

1) Eagle Signal Controls; Model HK410l.

2) Or equal.

2. For NEMA 4 or 4X Control Panels/Stations:

a. Type: Round solid state hour meter.

b. Range: 0 to 99999.9 hours with white or black mechanical numbers.

c. Temperature Range: Minus 40 to 85 degrees C.

d. Enclosure: NEMA 4X and 12 sealed high impact polycarbonate.

e. Voltage: 120V ac, 60-Hz.

f. Reset: Automatic roll over.

g. Timing Control: Electronic with quartz crystal.

h. Manufacturer and Product:

1) ENM Company; Series T50, with round SAE NEMA 4X bezel.

2) Or equal.

I. Intrinsically Safe Relays:

1. Type: Dual or single channel transformer type intrinsic safety barrier with built-in amplifier. Relays shall limit hazardous area energy to levels below that which would ignite a specific gas/air mixture and shall be provided in all such applications.

2. Power: 120V ac, 50 to 60-Hz.

3. Power Consumption: Not more than 10 VA.

4. Input: Isolated from output and supply.

5. Output: Relay type SPST. 2A maximum current. 250V maximum voltage.

6. Mounting: DIN rail.

7. Operating Temperature: Minus 13 to 140 degrees F.

8. State Mode of Operation: Switch selectable each channel.

9. Fault Monitoring: LED indicator each channel (lead breakage).

10. Output Status Monitoring: LED indicator each channel.

11. Approvals:

    a. FM Approval Standard No. 3610.

    b. Approved for Class I, II, III; Division 1 and 2; Groups A-G Hazardous Locations.

12. Manufacturers and Products:

    a. Pepperl and Fuchs; Model KHA5-SS1/Ex2.

    b. Cooper Crouse-Hinds; equal model.

    c. Or equal.

J. Intrinsic Safe Barriers/Zener Barriers:

1. Type: Dual channel zener barriers which accept 24V dc field transmitter inputs and limit hazardous area energy to levels below that which could ignite a specific gas/air mixture. Such barriers shall be furnished and installed for all such applications.

2. Working Voltage: 27V dc.

3. Maximum Voltage: 28V dc.

4. Mounting: DIN rail.

5. Approvals: FM approved for Class 1, Division 1 Group D areas.

6. Operating Temperature: Minus 45 to 131 degrees F.

7. Manufacturer and Product.

    a. Pepperl and Fuchs; Model Z787 or Z887.

    b. Or equal.

K. Alarm Modules:

1. Features:

    a. Sub-module configuration for panel interior mounting.

    b. Hermetically sealed relays.

    c. Operating Voltages: 120V ac.

    d. Standard “A” alarm sequence logic.

    e. Fuse protection.

    f. Built-in flasher module.

    g. Isolated SPDT auxiliary contacts for remote annunciation.

h. Integral terminal blocks for alarm input, silence input and horn/strobe outputs.

i. Selectable lock/non-lock alarm input logic for momentary alarms.

j. Field selectable NO/NC contacts.

2. Manufacturer and Product:

a. Ronan; Series X19.

b. Or equal.

L. Surge Protection:

1. Provide surge protection on all communication, analog and digital signals for which the cable/conductor(s) come from outside or under-ground. These signals shall include, but are not limited to all 120V ac digital inputs, 24V dc analog inputs, Ethernet, and remote I/O.

a. Surge protection devices shall be type category C as defined by IEEE C62.41 and consist of a DIN rail-mounted base and a replaceable plug-in surge element: Phoenix Contact Mode MCR- Plugtrab; or equal.

2. Provide surge protection on all other PLC inputs, PLC outputs, relays, and all other instrumentation and controls as recommended by the manufacturer of each device.

3. Provide surge protection for all I/O as specified in this section for I/O which goes to the ITC/PCCS.

2.05 IDENTIFICATION

A. Provide a laminated black nameplate with beveled edges and 1/2-inch white letters to identify each console, panel or cabinet.

B. Provide laminated, beveled edge, plastic legend plates and nameplates with 1/4-inch letters for each front panel mounted device as shown on the Drawings or as approved. Nameplates shall be sized to accommodate the required text and fasteners and shall be consistent with other panel identification to provide a balanced layout configuration. Color shall be white lettering on black background except alarm indicating lights, legend plates and nameplates, which shall be white lettering on a red background and caution/warning nameplates which shall be white lettering on a yellow background.

C. Tag all interior instruments including door-mounted devices and other components with engraved, laminated plastic nameplates with 1/8-inch, minimum, lettering. Legends shall be consistent with component designations on wiring and layout drawings. Nameplates shall be attached

with permanent adhesive to the panel near the device or on the device itself or as otherwise approved by the Engineer.

D. Attach front panel nameplates with both a permanent adhesive and stainless steel machine screws into tapped holes. Attach interior nameplates with a permanent adhesive only.

E. Numerically code terminals on terminal strips as described in Article Electrical, paragraph Terminal Blocks.

F. Color coding shall be in accordance with Section 16050, Basic Electrical Materials and Methods.

G. Number and label each wire in the systems. EACH wire shall have its own individual, unique number. Numbers shall be shown on all submitted drawings.

H. All wires shall be labeled at each termination and junction of the wire and at 30-inch intervals along the wire. All multi-conductor cables shall be labeled at each end and at 30-inch intervals. Labeling shall be self laminating white/transparent self extinguishing vinyl strips (Brady DAT-7-292 or equal) with clear heat shrink tubing over the markers. Length shall be sufficient to provide at least two and one-half wraps. All labels shall be machined printed with wire and/or cable numbers. The internal wires of identical panels (say for similar equipment) shall be identified the same.

I. Provide an 8-inch by 6-inch laminated black nameplate with beveled edges and 1/4-inch lettering for each control panel. Nameplates shall specify operating instructions for each panel and be mounted on or near the control panel as approved by the Engineer. The operating instructions or lettering for each nameplate will be provided by the Engineer after startup. Each nameplate may have the maximum lettering which will fit on the nameplate.

J. Provide a laminated orange nameplate with beveled edges and 1/4-inch lettering for all control panels which contain multiple sources of 120V ac power. This nameplate shall be engraved the following: “WARNING: CONTAINS MULTIPLE SOURCES OF POWER.”

## **PART 3 -** EXECUTION

### 3.01 PREPARATION

A. Product Delivery, Storage and Handling: Comply with Section 16050, Basic Electrical Materials and Methods, and the supplemental requirements specified below.

1. Receive panel mounted instruments and equipment to be installed inside enclosures, panels or consoles and install them at the panel manufacturer's facilities.

2. All equipment and materials shall be packaged at the factory to protect each item from damage during shipment and storage.

3. Disassemble sectionalized consoles, panels and cabinets for shipment after completion of factory testing.

4. Mount consoles, panels, or cabinets on skids for shipment.

5. Provide other blocking and cushioning material as required to prevent damage during shipment.

6. Provide temporary lifting lugs on each shipping package.

7. Include approximately one pint of touch-up paint for each finish color in shipment.

8. Do not ship enclosure to job site until the environment where the enclosure will be installed is as it will be at the conclusion of the Project.

B. Job Conditions:

1. Comply with requirements specified in Section 16050, Basic Electrical Materials and Methods.

2. Contractor shall coordinate the Work with any Work under this and other Contracts which may be in progress and could affect the installation and locations of the control enclosures.

3.02 INSTALLATION

A. Install equipment in conformance with NEC and all local codes.

B. Floor mounted enclosures shall be installed on concrete bases with 1/4-inch thick rubber type pads. These pads shall completely cover the area of the enclosure that is against the base.

C. Install and interconnect all equipment, devices, electrical hardware, instrumentation and controls and process controller components into, out of and among the enclosures as indicated on the drawings.

D. Keep enclosures clean at all times. Keep enclosures doors closed except when actually working in the enclosure. Protect all equipment during installation including hole punching for conduit connection. Remove all filings and thread cuttings from enclosures.

3.03 FIELD QUALITY CONTROL

A. Comply with Section 16950, Testing.

END OF SECTION

**SECTION 16170**

**DISCONNECT SWITCHES**

PARAGRAPH INDEX

## SECTION 16170

## DISCONNECT SWITCHES

**PART 1 -** GENERAL

1.01 DESCRIPTION

A. Provide labor, material, equipment and incidentals required for disconnect switches as indicated on drawings and as specified herein.

1.02 QUALITY ASSURANCE

A. Comply with applicable portions of Section 16050, Basic Electrical Materials and Methods.

B. Provide components that are the standard product of a manufacturer regularly engaged in the production of the required materials and equipment.

1. The manufacturer shall be responsible for the design, construction and proper operation of all components.

C. Comply with applicable standards, codes and regulations including but not limited to the most recent edition of the following.

1. National Electrical Manufacturers Association (NEMA): KS-1, Enclosed Switches.

2. National Fire Protection Association (NFPA): 70, National Electrical Code (NEC).

3. Underwriters Laboratories Inc. (UL): 98, Enclosed Switches.

D. Design to provide satisfactory performance under the specified operating conditions.

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01900, Special Conditions.

1. Product data.

2. Shop drawings.

3. Special shipping, storage, protection and handling instructions.

B. Submit operation and maintenance manuals in accordance with Section 01900, Special Conditions.

1.04 WARRANTY

A. Contractor shall provide extended warranty of five (5) years.

**PART 2 -** PRODUCTS

2.01 MANUFACTURERS

A. Disconnect Switches:

1. Square D.
2. Eaton Electrical.
3. General Electric.

2.02 DISCONNECT SWITCHES

A. Type: Fused or un-fused, horsepower rated, heavy duty, single throw, three poles with visible blade and safety handle.

B. Rating: Interrupting rating of 50,000 RMS symmetrical amperes when using one-time, non-current limiting fuses.

C. Fuses: Provide current limiting Class "J" fuses when used with disconnect switches.

D. Enclosure: NEMA 4X stainless steel or cast aluminum for all locations.

E. If disconnect switch is fused type then install the blown fuse indicator module kit, module boot kit and termination kit.

F. Install the equipment ground switch on each switch.

G. Install an electrical interlock kit with 1 N.O. and 1 N.C. 120V ac contact to denote open or closed status of disconnect switch.

H. Provide the following minimum spare parts: One spare fuse for each type and size, up to a minimum of 6 for any type and size.

I. Provide at least one (1) complete disconnect switch of each type specified on drawings.

**PART 3 -** EXECUTION

3.01 INSTALLATION

A. Mount equipment so that sufficient access and working space is provided for ready and safe operation and maintenance.

B. Securely fasten equipment to walls or other structural surfaces on which they are mounted. Provide independent galvanized steel supports where no wall or other vertical surface exists. Space at least 1/4-inch from wall. Use stainless steel, PVC or nylon spacers.

C. Install according to requirements of Section 16050, Basic Electrical Materials and Methods.

D. Use all stainless steel mounting hardware.

E. Furnish and install in each disconnect a corrosion inhibitor type Crouse Hinds No. CID-101, or approved equal.

3.02 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 16950, Testing.

B. Grounding:

1. Provide equipment grounding in accordance with Section 16450, Grounding.

2. Tighten connections to comply with tightening torques specified by the manufacturers and UL Standard 486A to assure permanent and effective grounding.

3.03 MANUFACTURER FIELD SERVICES

A. Provide manufacturer's field services in accordance with Section 01900, Special Conditions. Manufacturer's field services shall respond to the County's request for correction of problems during startup and warranty power within 4 hours.

B. Training:

1. Provide training to instruct representatives of the County and Engineer as follows:

a. Disconnect Switches: 1 hour.

END OF SECTION

**SECTION 16195**
**ELECTRICAL IDENTIFICATION**
PARAGRAPH INDEX

# SECTION 16195

# ELECTRICAL IDENTIFICATION

**PART 1 -** GENERAL

1.01 DESCRIPTION

A. Provide electrical identification products and components for identification of electrical materials, equipment and installation, including but not limited to the following:

1. Buried electrical line warnings.
2. Conduits, raceways, cables, and conductors.
3. Electrical manhole and handhole covers.
4. Operational instruction signs.
5. Warning and caution signs.
6. Equipment labels and signs.

1.02 QUALITY ASSURANCE

A. Comply with applicable portions of Section 16050, Basic Electrical Materials and Methods.

B. Provide components that are the standard product of a manufacturer regularly engaged in the product of the required materials and equipment.

C. Comply with applicable codes and standards including, but not limited to the most recent edition of the following.

1. American National Standards Institute (ANSI): A13.1, Scheme for the Identification of Piping Systems, with regard to type and size of lettering for raceway and cable labels.
2. National Fire Protection Association (NFPA): 70, National Electrical Code (NEC).

D. Design to provide satisfactory performance under the specified operating conditions.

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01330, Submittal Procedures.

1. Product data.
2. Schedule of identification nomenclature to be used for identification signs and labels.

3. Samples of each color, lettering style, and other graphic representation required for identification materials; samples of labels and signs.

**PART 2 -** PRODUCTS

2.01 ELECTRICAL IDENTIFICATION PRODUCTS

A. Provide Adhesive Marking Labels for Raceway and Metal-Clad Cable:

1. Pre-printed.

2. Flexible.

3. Self-adhesive labels with legend indicating voltage and service (emergency, lighting, power, light, power dc, air conditioning, communications, control, and fire).

B. Colored Adhesive Marking Tape for Raceways, Wires, and Cables: Provide self-adhesive vinyl tape not less than 3 mils thick by 1 inch to 2 inches in width.

C. Pre-tensioned Flexible Wraparound Colored Plastic Sleeves for Raceway and Cable Identification: Provide flexible acrylic band, sized to suit the raceway diameter and arranged to stay in place by pre-tensioned gripping action when coiled around the raceway or cable.

D. Underground Line Marking Tape:

1. Provide permanent, bright-colored, continuous-printed, plastic tape compounded for direct-burial service not less than 6 inches wide by 4 mils thick.

2. Provide printed legend, indicative of general type of underground line below.

E. Wire/Cable Designation Tape Markers: Provide vinyl or vinyl-cloth, self-adhesive, wraparound, cable/conductor markers with preprinted numbers and letters.

F. Aluminum, Wraparound, Cable Marker Bands:

1. Provide bands cut from 0.014-inch thick, aluminum sheet, fitted with slots or ears for securing permanently around wire or cable jacks or around groups of conductors.

2. Make arrangement for applying legend with stamped letters or numbers.

G. Plasticized Card Stock Tags:

1. Provide vinyl cloth with preprinted and field-printed legends to suit the application.

2. Use orange background, except as otherwise indicated, with eyelet for fastener.

H. Brass or Stainless Steel Tags:

1. Provide metal tags with stamped legend punched for fastener.

2. Dimensions: 2 inches by 2 inches by 19 gauge.

I. Engraved, Plastic-Laminated Labels, Signs, and Instruction Plates:

1. Provide engraving stock melamine plastic laminate, 1/16-inch minimum thick for signs up to 20 square inches, or 8 inches in length; 1/8-inch thick for larger sizes.

2. Provide engraved legend in white letters on black face and punched for mechanical fasteners.

J. Baked-Enamel Warning and Caution Signs for Interior Use: Provide preprinted aluminum signs, punched for fasteners, with colors, legend, and size appropriate to the location.

K. Fasteners for Plastic-Laminated and Metal Signs: Provide self-tapping stainless steel screws or number 10/32 stainless steel machine screws with nuts and flat and lock washers.

L. Cable Ties:

1. Provide fungus-inert, self-extinguishing, one-piece, self-locking nylon cable ties, 0.18-inch minimum width, 50-pound minimum tensile strength, and suitable for a temperature range from minus 50 to 350 degrees F.

2. Provide ties of specified colors when used for color coding.

**PART 3 -** EXECUTION

3.01 INSTALLATION

A. Lettering and Graphics:

1. Coordinate names, abbreviations, colors, and other designations used in electrical identification work with corresponding designations specified or indicated.

2. Install numbers, lettering, and colors as approved in submittals and as required by code and as specified in Section 16050, Basic Electrical Materials and Methods.

B. Install identification devices in accordance with manufacturer's written instructions and requirements of NEC.

C. Sequence of Work: Where identification is to be applied to surfaces that require finish, install identification after completion of finish work.

D. Conduit Identification.

1. Identify Raceways of Certain Systems with Color Banding:

    a. Provide bands for exposed or accessible raceways for identification.

    b. Provide pre-tensioned bands, snap-around colored plastic sleeves, colored adhesive marking tape, or a combination of the two.

    c. Make each color band 2 inches wide, completely encircling conduit, and place adjacent bands of two-color markings in contact, side by side.

    d. Install bands at changes in direction, at penetrations of walls and floors, and at 40-foot maximum intervals in straight runs.

E. Identify Junction, Pull, and Connection Boxes

1. Provide code-required caution sign for boxes, with pressure-sensitive, self-adhesive type label, indicating system voltage in black, preprinted on orange background.

    a. Install label on outside of box cover.

    b. Label box covers with identity of contained circuits.

    c. Use pressure-sensitive plastic labels at exposed locations.

    d. Provide similar labels or plasticized card stock tags at concealed boxes.

F. Underground Electrical Line Identification:

1. During trench backfilling, for exterior underground power, signal, and communications lines, install continuous underground plastic line marker, located directly above line at 12 inches below finished grade.

2. Where multiple lines are installed in a common trench or concrete envelope, do not exceed an overall width of 16 inches; install a single line marker.

G. Electrical Manholes and Handholes:

1. Provide identification on all new electrical manhole and handhole covers.

2. Identification shall consist of metal tags with stamped legend punched for fastener. Dimensions shall be 2 inches by 2 inches by 19 gauge.

H. Install line marker for underground wiring, both direct-buried and in raceways.

I. Use conductors with factory-applied color on the entire length of the conductors except as follows:

1. Use following field-applied color-coding methods in lieu of factory-coded wire for sizes larger than No. 10 AWG.

    a. Apply colored, pressure-sensitive plastic tape.

        1) Provide half-lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made.
        2) Apply the last two laps of tape with no tension to prevent possible unwinding.
        3) Use 1-inch-wide tape in colors as specified.
        4) Do not obliterate cable identification markings by taping.
        5) Adjust tape locations slightly to prevent obliteration.

    b. Use of colored cable ties in lieu of pressure-sensitive tape.

        6) Apply three ties of specified color to each wire at each terminal or splice point starting 3 inches from the terminal and spaced 3 inches apart.
        7) Apply with a special tool or pliers, tighten for snug fit, and cut off excess length.

2. Power Circuit Identification:

    a. Securely fasten identifying metal tags or aluminum wraparound marker bands to cables, feeders, and power circuits in vaults, pull boxes, junction boxes, manholes, and switchboard rooms.

    b. Use 1/4-inch steel letter and number stamps with legend to correspond with designations on drawings.

    c. Where metal tags are provided, attach them with approximately 55-pound test monofilament line or one-piece self-locking nylon cable ties.

J. Tag or label conductors as follows.

1. Future connections: Indicate cable for future connection or connection under another contract, with identification indicating source and circuit numbers.

2. Multiple Circuits: Where multiple branch circuits or control wiring or communications/signal conductors are present in the same box or enclosure (except for three-circuit, four-wire home runs):

    a. Label each conductor or cable.

    b. Provide legend indicating source, voltage, circuit number, and phase for branch circuit wiring.

c. Indicate phase and voltage of branch circuit wiring by means of coded color of conductor insulation.

d. For control and communications/signal wiring, use color coding or wire/cable marking tape at terminations and at intermediate locations where conductors appear in wiring boxes, troughs, and control cabinets.

e. Use consistent letter/number conductor designations throughout on wire/cable marking tapes.

3. Match identification markings with designation used in panelboards shop drawings, Contract Documents, and similar previously established identification schemes for the facility's electrical installations.

K. Apply warning, caution, and instruction signs and stencils as follows:

1. Install warning, caution, or instruction signs where required by NEC, where indicated, or where reasonably required to assure safe operation and maintenance of electrical systems and of the items to which they connect.

2. Install engraved plastic-laminated instruction signs with approved legend where instructions or explanations are needed for system or equipment operation.

3. Install butyrate signs with metal backing for outdoor items.

4. Emergency Operating Signs: Install engraved laminate signs with white legend on red background with minimum 3/8-inch high lettering for emergency instructions on power transfer, load shedding, or other emergency operations.

L. Install equipment/system circuit/device identification as follows:

1. Apply equipment identification labels of engraved plastic-laminate on each major unit of electrical equipment in building, including central or master unit of each electrical system. This includes communication/signal/alarm systems, unless unit is specified with its own self-explanatory identification.

2. Except as otherwise indicated, provide single line of text, with 1/2-inch-high lettering on 1-1/2-inch-high label (1-inch-high where two lines are required), white lettering in black field.

3. Text shall match terminology and numbering of the Contract Documents and shop drawings.

4. Apply labels for each unit of the following categories of electrical equipment.

a. Panelboards, electrical cabinets, and enclosures.

b. Access doors and panels for concealed electrical items.

c. Motor control centers.

d. Motor starters.

e. Pushbutton stations.

f. Contactors.

g. Remote and local annunciators.

h. Control devices.

i. Transformers.

j. Disconnect switches.

M. Apply circuit/control/item designation labels of engraved plastic laminate for disconnect switches, breakers, pushbuttons, pilot lights, motor control centers, and similar items for power distribution and control components above, except panelboards and alarm/signal components, where labeling is specified elsewhere..

N. For panelboards, provide framed, typed circuit schedules with explicit description and identification of items controlled by each individual breaker.

O. Install labels at locations indicated and at locations for best convenience of viewing without interference with operation and maintenance of equipment.

END OF SECTION

**SECTION 16225**

**THREE PHASE ELECTRIC MOTORS**

PARAGRAPH INDEX

## SECTION 16225

## THREE PHASE ELECTRIC MOTORS

**PART 1 -** GENERAL

1.01 DESCRIPTION

A. Provisions of this section govern the quality of design, fabrication, workmanship, operation, etc., of all materials, equipment and appurtenances to be furnished and installed for three phase electric motors.

B. The Contractor shall furnish and install all materials, equipment and appurtenances necessary for the complete and satisfactory installation of three phase electric motors as shown on the Drawings and specified in the various Specifications.

C. The Contractor shall also meet requirements specified in Division 1, General Requirements for such work as operating and maintenance manuals, guaranty, shop and working drawings, spare parts, etc. as associated with motor-driven equipment.

1.02 REFERENCES

A. Reference Standards: Comply with all federal and the State of Maryland laws or ordinances, as well as all applicable codes, standards, regulations, and/or regulatory agency requirements including the partial listing below.

1. Institute of Electrical and Electronics Engineers (IEEE): Applicable standards.

2. National Electrical Manufacturers Association (NEMA): Applicable standards.

3. National Fire Protection Association (NFPA):

a. National Electrical Code (NEC).

b. National fire codes.

4. Occupational Safety and Health Administration (OSHA): Applicable rules and regulations.

5. State of Maryland Building Code.

6. State of Maryland Electrical and Mechanical Codes.

1.03 SUBMITTALS

A. General: Submittals shall be in accordance with Section 01330, Submittal Procedures.

B. Shop Drawings:

1. Submit Drawings and data for motor characteristics and wiring diagrams.

2. Detailed drawings of proposed departures to this specification, due to actual field conditions or other causes shall be submitted to the Authority for approval as part of shop drawings.

C. Product Data:

1. The Contractor shall compile a Motor Data List of information obtained from equipment suppliers and shall prepare a complete tabulation of all motors to be furnished under the Contract; six copies of the tabulation shall be submitted to the County and shall include the following:

a. Name of motor-driven equipment.

b. Horsepower.

c. Nameplate voltage.

d. Full load current.

e. Locked rotor code letter.

f. Enclosure type (open drip-proof, totally enclosed, fan cooled, etc.).

2. Final approval of starting equipment shop drawings will be withheld until submittal of the complete motor data tabulation.

D. Factory Test Reports: Submit certified copies of factory test reports for the factory tests required herein.

1.04 DELIVERY, STORAGE AND HANDLING

A. Comply with the requirements for the specified driven equipment.

1.05 SPARE PARTS

A. Contractor shall furnish spare parts as recommended by manufacturer.

1.06 WARRANTY

A. Contractor shall provide extended warranty for five (5) years.

**PART 2 -** PRODUCTS

2.01 THREE PHASE ELECTRIC MOTORS

A. Description:

1. Scope: Furnish all motors referenced to this section in other sections in accordance with this section. The motors shall be furnished as part of the driven equipment but shall meet the requirements of this section.

2. Provide lifting lugs on all motors weighing in excess of 50 pounds to facilitate installation and removal.

B. Quality Assurance:

1. Reference Standards: Comply with all applicable provisions of:

a. State and local codes.

b. NEC.

c. NEMA.

d. IEEE Standard 841 of 2001.

2. Required Manufacturer's Services:

a. Manufacturer's Service Organization:

1) The motor manufacturer shall have a full capability service organization with factory trained field service personnel and shall have a repair facility and stocking distributorship within a 300-mile radius of the project.

C. Constant Speed Motors:

1. Horizontal squirrel cage type, continuous duty, premium energy efficient, corrosion resistant meeting IEEE 841.

2. NEMA Design B, normal starting torque.

3. Service Factor: 1.15.

4. Temperature Rating: 40 degrees C ambient, continuous duty.

5. Voltage Rating: 2400 volts, 3-phase, 60-Hz.

6. Motor Construction:

a. Enclosures: TEFC, unless noted otherwise, meeting IEEE 841 Standard 2001.

b. Frame to be cast iron.

c. Insulation:

1) Nonhygroscopic.

2) Class F insulation meeting the latest NEMA MG 1, Section IV paragraph 31.40.4.2 which requires motors to operate with up to 1,600V peak voltages and rise times less than 0.1 microsecond.

d. Fans: Conductive plastic or nonsparking bronze alloy.

e. Conduit Box: Conduit box volume shall meet or exceed Table 1 of IEEE 841 Standard 2001.

f. Motor Leads: Nonbraided, nonwicking leads, compression grounding lugs.

g. Bearings: Nonshielded, easily accessible, regreasable fill and drain.

h. Positive lubrication system.

i. Inpro seals on both shaft ends. Motors with only one seal will not be allowed.

j. Low Bearing Temperature Rise:

1) 50 degrees C: 3,600 rpm.

2) 60 degrees C: 1,800 rpm and slower.

k. Bearing Life: Minimum L-10 rating 50,000 hours belted, or more than 130,000 hours when direct coupled.

l. Shaft Slinger: Neoprene.

m. Paint:

1) External: Manufacturer's corrosion and mill duty to be compatible with Section 09900, Painting and Coating.

2) Windings and Rotor: Additional coat of non-hygroscopic epoxy varnish.

n. Nameplate: Stainless steel. Comply with Section 16195, Electrical Identification.

o. Automatic breather drains provided for positive drain.

p. All external bolts shall be sealed.

q. Unused lifting eyebolts shall be sealed.

r. Provide a 5-year manufacturer warranty.

s. Explosion Proof: If explosion-proof motors are required for a particular location, the motor shall be rated for a Class I, Division 1, Group D hazardous location with T3C temperature code. These motors shall be provided with all IEEE 841 features including inpro seals on both ends, even though the IEEE 841 specification does not specifically recognize explosion proof motors. These motors shall be built with all IEEE 841 features and the motor nameplate shall be stamped “IEEE 841 Features.”

7. Manufacturers:

a. Reliance Electric.

b. US Motors.

c. Or equal.

D. Efficiency and Noise Levels: As a minimum, all motors shall meet the following guaranteed efficiencies, power factor, and shall not exceed these maximum noise levels.

| Horsepower | RPM[1] | Full Load Eff. % [2] | Power Factor | Sound Pressure dBA @ 3 Feet |
|---|---|---|---|---|
| 3/4 | 1,200 | 81.3 | 62.2 | 51.5 |
| 1 | 1,800 | 85.6 | 81.7 | 56.5 |
| | 1,200 | 78.5 | 72.0 | 51.5 |
| 1-1/2 | 3,600 | 84.9 | 91.1 | 65.5 |
| | 1,800 | 84.5 | 75.2 | 56.5 |
| | 1,200 | 86.6 | 73.9 | 54.0 |
| 2 | 3,600 | 86.0 | 89.8 | 65.6 |
| | 1,800 | 86.7 | 82.4 | 56.5 |
| | 1,200 | 87.5 | 76.5 | 54.0 |
| 3 | 3,600 | 88.5 | 88.3 | 71.0 |
| | 1,800 | 88.5 | 83.5 | 63.0 |
| | 1,200 | 89.5 | 74.8 | 58.0 |
| 5 | 3,600 | 88.7 | 87.7 | 71.0 |
| | 1,800 | 88.6 | 86.9 | 63.0 |
| | 1,200 | 89.5 | 76.9 | 58.0 |
| 7-1/2 | 3,600 | 90.3 | 91.5 | 72.0 |
| | 1,800 | 90.3 | 86.4 | 68.0 |
| | 1,200 | 90.3 | 81.0 | 60.0 |
| 10 | 3,600 | 91.0 | 92.7 | 72.0 |
| | 1,800 | 90.2 | 87.2 | 68.0 |
| | 1,200 | 91.1 | 82.2 | 60.0 |
| 15 | 3,600 | 92.0 | 90.8 | 71.0 |
| | 1,800 | 92.5 | 83.9 | 65.0 |
| | 1,200 | 92.4 | 81.2 | 60.0 |
| 20 | 3,600 | 92.0 | 91.2 | 71.0 |
| | 1,800 | 92.6 | 84.3 | 65.0 |
| | 1,200 | 92.5 | 81.6 | 60.0 |
| 25 | 3,600 | 93.3 | 89.2 | 71.0 |
| | 1,800 | 93.6 | 84.1 | 65.0 |
| | 1,200 | 93.1 | 84.3 | 61.0 |
| 30 | 3,600 | 93.2 | 88.8 | 71.0 |
| | 1,800 | 93.6 | 83.1 | 65.0 |
| | 1,200 | 93.6 | 83.7 | 61.0 |
| 40 | 3,600 | 94.1 | 88.0 | 72.0 |
| | 1,800 | 94.2 | 83.3 | 66.0 |
| | 1,200 | 94.2 | 80.5 | 68.0 |
| 50 | 3,600 | 94.3 | 88.2 | 72.0 |
| | 1,800 | 94.5 | 84.2 | 66.0 |
| | 1,200 | 94.2 | 80.6 | 68.0 |

| Horsepower | RPM[1] | Full Load Eff. % [2] | Power Factor | Sound Pressure dBA @ 3 Feet |
|---|---|---|---|---|
| 60 | 3,600 | 95.0 | 89.2 | 72.0 |
| | 1,800 | 95.0 | 87.0 | 72.0 |
| | 1,200 | 95.0 | 85.8 | 69.0 |
| 75 | 3,600 | 95.1 | 90.1 | 76.0 |
| | 1,800 | 95.0 | 86.0 | 72.0 |
| | 1,200 | 95.0 | 85.0 | 69.0 |
| 100 | 3,600 | 95.0 | 91.8 | 77.0 |
| | 1,800 | 95.4 | 87.4 | 73.0 |
| | 1,200 | 95.1 | 85.6 | 73.0 |
| 125 | 3,600 | 95.5 | 89.9 | 78.0 |
| | 1,800 | 95.8 | 87.9 | 75.0 |
| | 1,200 | 95.5 | 85.8 | 73.0 |
| 150 | 3,600 | 96.2 | 89.8 | 78.0 |
| | 1,800 | 96.2 | 88.5 | 75.0 |
| | 1,200 | 96.2 | 84.3 | 74.0 |
| 200 | 3,600 | 96.2 | 88.7 | 78.0 |
| | 1,800 | 96.2 | 89.3 | 76.0 |
| 250 | 3,600 | 96.3 | 92.4 | 84.0 |
| | 1,800 | 96.4 | 89.0 | 76.0 |
| 300 | 3,600 | 96.0 | 91.6 | 89.0 |
| | 1,800 | 96.5 | 89.0 | 79.0 |

[1] Any motor which has an rpm that is not included in this table shall meet or exceed the requirements of the next closest rpm in the table.

[2] Efficiency values shown on motor nameplate. These values are determined by NEMA testing and marking standards in MG1-12.53a and 12.53b.

E. Motor Controls: Controls for each motor shall be manual or automatic as specified or as shown on the Drawings and in the Specifications.

**PART 3 -** EXECUTION

3.01 FACTORY TESTING

A. Routine factory tests as required by NEMA MG 1-12.55 and IEEE Standard 112 Appendix A shall be performed on each actual motor to be delivered to the site. The routine factory tests shall at least include the following certified tests:

1. No load current.

2. No load speed.

3. Locked rotor current (single phase).

4. Winding resistance.

5. High potential.

6. Bearing and vibration check with vibration data recorded.

7. In addition to the routine factory tests, the motor manufacturer shall certify that the motors provided are electrical duplicates of previously tested motors and shall provide certified tabulated data and curves for the previously tested motor electrical design.

3.02 INSTALLATION

A. Comply with the requirements for the specified driven equipment.

3.03 FIELD QUALITY CONTROL

A. Comply with the requirements for the driven equipment. Perform motor testing in accordance with Section 16950, Testing.

END OF SECTION

**SECTION 16280**

**POWER FACTOR CORRECTION CAPACITORS**

PARAGRAPH INDEX

**SECTION 16280**

**POWER FACTOR CORRECTION CAPACITORS**

**PART 1 -** GENERAL

1.01 DESCRIPTION

A. Provide Power Factor Correction Capacitor as indicated on drawings and as specified herein.

1.

1.02 QUALITY ASSURANCE

A. Comply with applicable portions of Section 16050, Basic Electrical Materials and Methods.

B. Provide components that are the standard product of a manufacturer regularly engaged in the production of the required materials and equipment.

1. The manufacturer shall be responsible for the design, construction and proper operation of all components.

C. Comply with applicable standards, codes and regulations including but not limited to the most recent edition of the following:

1. National Electrical Manufacturer's Association (NEMA)

2. National Fire Protection Association (NFPA) 70, National Electrical Code (NEC)

3. Institute of Electrical and Electronics Engineers (IEEE)

4. American National Standards Institute (ANSI)

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01330, Submittal Procedures.

1. Product data.

2. Drawings.

1.04 SPARE PARTS

A. Provide two (2) complete Power Factor Correction Capacitors, and all other spare parts as recommended by manufacturer.

1.05 WARRANTY

A. Contractor shall provide five (5) year extended warranty.

**PART 2 -** PRODUCTS

2.01 MANUFACTURERS

A. Power Factor Correction Capacitors:

1. ABB

2. Power Survey International

2.02 EQUIPMENT RATINGS

A. The system operating voltage is 2400V as indicated on the drawings.

B. The kVAR for 2.4kV capacitor banks shall be as specified between 25kVAR to 825KVAR in increments of 25kVAR.

C. The capacitor shall be rated for continuous duty from –40ºC to +45ºC ambient at 3,300 ft. (1,000 meters) and below.

D. Total Harmonic Distortion (THD) of 5% of voltage waveforms shall not affect the life of capacitors.

E. A +/- 10% variation in line voltage shall not affect the life of the capacitor.

F. The capacitor shall be suitable for operation over a temperature range of–40ºC to +45ºC.

G. The capacitor shall be improved to a Power Factor of 0.93 maximum, with minimum acceptable Power Factor of 0.90, as required by the Power Company.

2.03 ENCLOSURE

A. The assembly shall have capacitor cell, capacitor mounting frame for multiple capacitor cells, termination box, current limiting fuses, and viewing window.

B. The enclosure (capacitor cell & terminal box assembly) shall be rated NEMA 1, 3R, and 12.

C. The enclosure steel shall be 14 gauge thick steel.

D. The terminal box inside shall have a grounding stud welded to the frame near the top and front cover.

E. The terminal box inside shall have adequate space for shielded cables and stress cones.

F. The enclosure terminal box shall be designed for top or side entry.

G. The terminal box shall have a removable top and front cover.

H. The viewing window shall be mechanically reinforced in the rear inside.

I. The front cover shall be removable and bolted with platted bolts.

J. The overall dimensions shall not exceed 46”H x 30”W x 22”D.

K. The enclosure front cover shall have gaskets.

L. A ground screw shall be provided inside the termination and suitable for cable shield ground.

M. Capacitors shall include “Danger, turn off power and wait five minutes before working inside unit” labels, in accordance with Section 16195, Electrical Identification.

N. A terminal box shall be provided on top of the capacitor cans for power connections.

O. The front removable cover shall have a handle for lifting the front cover.

2.04 CAPACITOR

A. Individual capacitors shall be film/foil design with a biodegradable NFPA Class III B dielectric fluid.

B. Capacitors shall have less than 0.2 watts per KVAR losses and low internal heat generation.

C. Each capacitor cell shall contain less than three gallons of liquid.

D. Capacitors shall be designed to meet ANSI / IEEE standard 18, NEMA CP1, and IEC 871-1.

E. Capacitors shall have warning labels affixed in front of the equipment in clear view that state, “Danger, High Voltage”.

F. Capacitor case material shall be ANSI 409 stainless steel and painted ANSI#70 grey suitable for outdoor installation.

G. Capacitors shall be 3-phase, 3-bushing, 60kV BIL. (For CSA labeled units the BIL is 75kV).

2.05 DISCHARGE RESISTORS

A. Each capacitor unit shall be provided with an internal discharge resistor to reduce the residual voltage to less than 50 volts within five minutes after the capacitor is disconnected from source of supply.

2.06 FUSES

A. To provide for major fault protection and capacitor case rupture protection, current limiting fuses shall be provided on the capacitor bank.

B. Fuses shall be current limiting and rated 50kAIR.

C. Fuses for 2.4kV nominal voltage shall be rated 4.3kV.

D. Each fuse shall be equipped with a pop-up button to provide visual indication of a blown fuse.

E. All three phases for each capacitor shall have fuses. (Option for only two phase fused is available if specified).

F. The top of the fuses shall have a copper "L" bracket for power cable terminations.

G. The bottom of the fuse shall have a external female ½" – 13 UNC – 2B.

2.07 POWER TERMINATIONS

A. Each assembly shall be furnished with 0.562" diameter hole in copper L-bracket on top of the fuse for termination of Customer 1- hole lug.

B. The Customer's cable termination hole will be supplied with Grade 5 bolts, flat washers, lock washers and nuts.

C. For units with multiple capacitor cells the phase shall be paralleled using silver platted copper bus.

2.08 GROUNDING

A. The capacitor case shall be bonded to the terminal box ground stud.

B. The front removable cover shall have ground stud. The main enclosure steel shall have a grounding stud.

C. The front removable covers shall be bonded to the main ground stud of the terminal box using green grounding conductor.

2.09 MOUNTING

A. The assembly shall have holes in the base frame to anchor the equipment to the floor.

B. For assemblies with multiple capacitor cells the frame shall have provisions for anchoring the floor at four places spaced equally around the equipment.

C. The termination box shall have "WARNING HIGH VOLTAGE" label.

D. The termination box shall have "DISCONNECT BEFORE OPENING" label.

E. The termination box shall have "WAIT 10 MINUTES BEFORE TO ALLOW CAPACITORS TO DISCHARGE" label.

2.10 FINISH

A. The paint system shall be suitable for outdoor installation. Exterior color shall be light grey.

**PART 3 -** EXECUTION

3.01 FACTORY TESTING

A. All capacitors shall be tested in compliance with IEEE Standard 18 and CSA requirements for capacitance, dissipation factor, terminal to terminal, and terminal to case dielectric strength, and oil leaks.

B. Each capacitor unit shall be tested for low voltage capacitance, ground test over-voltage, dielectric test over-voltage, capacitance measurement, loss measurement, and discharge resistor measurement.

C. Each assembly shall be tested for insulation integrity (Megger) Phase to Ground and Phase to Phase before shipment using 500V Megger output.

D. Provide three copies of the final factory inspection tests to the Engineer.

E. 60kV Impulse design test shall be done on each design of the capacitor bank. (For CSA labeled units the BIL is 75kV).

3.02 INSTALLATION

A. Install power factor correction capacitors as directed and as shown on the drawings.

B. Install power factor correction capacitors in conformance to NEC.

3.03 FIELD QUALITY CONTROL AND TESTING

A. All capacitors shall be tested in compliance with IEEE Standard 18 and CSA requirements for capacitance, dissipation factor, terminal to terminal, and terminal to case dielectric strength, and oil leaks.

B. Each capacitor unit shall be tested for low voltage capacitance, ground test over-voltage, dielectric test over-voltage, capacitance measurement, loss measurement, and discharge resistor measurement.

C. Each assembly shall be tested for insulation integrity (Megger) Phase to Ground and Phase to Phase before shipment using 500V Megger output.

D. 60kV Impulse design test shall be done on each design of the capacitor bank. (For CSA labeled units the BIL is 75kV).

E. Test each individual Power Factor Correction Capacitor connected for proper operation.

F. Field inspection and testing shall be performed in accordance with Section 16950, Testing.

G. Correct defects and failures to Engineer’s acceptance.

END OF SECTION

**SECTION 16323**

**DRY TYPE TRANSFORMERS**

PARAGRAPH INDEX

## SECTION 16323

## DRY TYPE TRANSFORMERS

**PART 1 -** GENERAL

1.01 DESCRIPTION

A. Provide dry type general purpose air cooled transformers as shown on the Drawings and specified herein.

1. Provide appurtenances as specified and as shown on the Contract Documents.

1.02 QUALITY ASSURANCE

A. Comply with applicable portions of Section 16050, Basic Electrical Materials and Methods.

B. Provide components that are the standard product of a manufacturer regularly engaged in the production of the required materials and equipment.

1. The manufacturer shall be responsible for the design, construction and proper operation of all components.

C. Comply with applicable standards including, but not limited to the most recent edition of the following:

1. American National Standards Institute (ANSI): C89.2, Dry-Type Transformers for General Applications.

2. National Electrical Manufacturers Association (NEMA): ST 20-86, Dry-Type Transformers for General Applications.

3. National Fire Protection Association (NFPA): 70, National Electrical Code (NEC).

D. Design to provide satisfactory performance under the specified operating conditions.

1.03 SUBMITTALS

A. Comply with Section 01900, Special Conditions. Include the following information:

1. Product data.

a. Submit rated name plate data; weight; dimensions; and test performance of each type of transformer indicated on the drawings.

2. Shop drawings.

3. Special shipping, storage, protection and handling instructions.

4. Manufacturer's installation instructions.

5. Rated nameplate data including, but not limited to: weight, dimensions, and test performance of each type and size of the transformers indicated on the drawings.

B. Submit the following before transformer shipment:

1. Certified routine test reports (for each transformer) in accordance with ANSI/IEEE Standard C57.12.40 and Section 01900, Special Conditions.

2. Certified production test reports (for each network protector) in accordance with ANSI/IEEE Standard C57.12.44 and Section 01900, Special Conditions.

3. Certified sound level test report.

4. Installation, operation and maintenance manuals.

C. Submit manufacturer's certificates in accordance with the Section 01900, Special Conditions.

D. Submit operation and maintenance manuals in accordance with Section 01900, Special Conditions.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver, handle and store the equipment in accordance with Section 01400, Quality Control.

B. Contractor shall apply temporary heat according to the 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 SPARE PARTS

A. Contractor shall provide all required spare parts as recommended by the manufacture.

1.06 WARRANTY

A. Contractor shall provide five (5) years extended warranty.

**PART 2 -** PRODUCTS

2.01 MANUFACTURERS

A. Dry-Type General Purpose Transformers:

1. MGM Transformers.

2. Eaton Electrical.

3. General Electric.

2.02 DRY-TYPE GENERAL PURPOSE TRANSFORMERS

A. Provide dry-type general purpose transformers that comply with the following:

1. Energy efficient, dry-type, designed for NEMA TP-1.
2. kVA, primary voltage and connection, secondary voltage and connection, and number of phases, as specified in the Drawings.
3. Constructed of highest quality low loss core materials to minimize power loss and vibration.
4. Core and coil assemblies, mounted on rubber isolation pads to minimize and isolate sound transmission.
5. Use copper windings.
6. Provide an electrostatic shield between the windings to attenuate and isolate source line noise. Ground the shield to the enclosure.
7. Maximum Temperature Rise above 40 Degrees C: 115 degrees C.
8. Having four 2-1/2 percent taps, two above and two below nominal on primary windings.
9. Sound Level: 3 dB below NEMA Standard.
10. Insulation Class: 220 degrees C.
11. Size of Neutral: 100 percent.
12. Provide additional coil capacity to compensate for higher nonlinear load loss.
13. Heavy gauge ventilated indoor enclosure.
14. UL listed.

**PART 3 -** EXECUTION

3.01 FACTORY TESTING

A. Provide three copies of the final factory inspection tests to the Engineer.

3.02 INSTALLATION

A. Install transformers in the motor control center, on walls, floor or as directed and as shown on the drawings.

B. Mount transformers with vibration isolators so that the vibrations are not transmitted to the structural parts of the building or to other equipments.

C. Install conduit system to transformer enclosure using flexible couplings at the transformer to help prevent noise transmission.

D. Adjust tap settings to provide proper voltage at panelboards with mean average loads energized and operating.

E. Install transformers in conformance to NEC.

F. Adjustment: Adjust transformer taps to provide optimum conditions at utilization voltage.

G. Protection: Apply temporary heating accordance with manufacturer's recommendations within enclosure of each transformer throughout periods during which equipment is not in a space that is continuously under normal control of temperature and humidity.

3.03 FIELD QUALITY CONTROL AND TESTING

A. Perform field inspection and testing in accordance with Section 16950, Testing.

B. Grounding:

1. Provide equipment grounding.

2. Tighten connections to comply with tightening torques specified by the manufacturers and UL Standard 486A to assure permanent and effective grounding.

3.04 MANUFACTURER'S FIELD SERVICES

A. Provide services in accordance with Section 01900, Special Conditions. Manufacturer's field services shall respond to the County's request for correction of problems during startup and warranty power within 4 hours.

B. Training:

1. Provide training to instruct representatives of the County and Engineer as follows:

a. Dry Type Transformers: 2 hours.

END OF SECTION

**SECTION 16330**

**MEDIUM VOLTAGE DISCONNECT SWITCHES**

PARAGRAPH INDEX

# SECTION 16330

# MEDIUM VOLTAGE DISCONNECT SWITCHES

**PART 1 -** GENERAL

1.01 DESCRIPTION

A. Provide medium voltage air interrupter switch.

1. Include 2.4 kV primary switch assembled as a complete and fully operational unit.

2. Provide appurtenances as specified and as shown on the Contract Documents.

1.02 QUALITY ASSURANCE

A. Comply with applicable portions of Section 16050, Basic Electrical Materials and Methods.

B. Provide components that are the standard product of a manufacturer regularly engaged in the production of the required materials and equipment.

C. The manufacturer shall be responsible for the design, construction, and proper operation of all components.

D. Comply with applicable standards including, but not limited to the most recent edition of the following:

1. American National Standards Institute (ANSI).

2. Institute of Electrical and Electronic Engineers (IEEE).

3. InterNational Electrical Testing Association (NETA).

4. National Electrical Manufacturer's Association (NEMA).

5. National Fire Protection Association (NFPA): 70, National Electric Code (NEC).

6. Underwriter's Laboratories, Inc. (UL).

E. Design to provide satisfactory performance under the specified operating conditions.

F. The manufacturer shall provide an extended 5-year warranty.

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01900, Special Conditions.

1. Product data.

2. Certified transformer design test data (made on an essentially duplicate transformer unit) in accordance with the ANSI/IEEE Standard C57.12.00 including:

   a. Resistance measurements of all windings on the rated voltage tap and the tap extremes.

   b. Impedance voltage and load losses at rated current and frequency on the rated voltage connection and at the tap extremes.

   c. Temperature rise at minimum and maximum ratings. Alternatively, calculated temperature rise data, based on thermally similar transformer units, may be provided.

   d. Lightning impulse test.

   e. Audible sound level.

   f. Lifting and moving devices mechanical test.

   g. Tank pressure test.

3. Shop drawings for 5 kV primary switch.

4. Wiring diagrams.

5. Special shipping, storage, protection, and handling instructions.

6. A list of manufacturer's recommended parts required to maintain the equipment for a period of 1 year, with current price information.

7. A list of special tools, materials, and supplies furnished with the equipment for use prior to and during startup, and for future maintenance.

8. Manufacturer's installation instructions.

B. Submit in accordance with Section 01330, Submittal Procedures:

C. Submit the following before equipment shipment:

   a. Certified routine test reports in accordance with ANSI/IEEE Standard, for each 5 kV primary switch.

   b. Certified production test reports in accordance with ANSI/IEEE Standard, for each 5 kV primary switch.

   c. Installation, operation and maintenance manuals.

   d. Submit operation and maintenance manuals before providing training to County personnel.

   e. A list of manufacturer's recommended parts required to maintain the equipment for a period of 1 year, with current price information.

f. A list of special tools, materials, and supplies furnished with the equipment for use prior to and during startup, and for future maintenance.

g. Manufacturer's installation instructions.

1.04 SPECIAL TOOLS AND SPARE PARTS

A. Provide spare parts recommended by the manufacturer. At a minimum, provide the following spare parts:

1. 2.4 kV Primary Fuses: 3.

B. Furnish one complete set of special tools required to disassemble, service, repair, and adjust the equipment.

**PART 2 -** PRODUCTS

2.01 MANUFACTURERS

A. 2.4 kV Primary Switch:

1. Eaton Electrical.
2. S&C Company.
3. Power Controls Inc.
4. Park Detroit

B. 2.4 kV Primary Fuse:

1. Eaton Electrical.
2. Cooper Power Systems.
3. General Electric.
4. S&C Company.
5. Square D.

2.02 PRIMARY SWITCH

A. Provide medium voltage disconnect switch for each 2400V, 250hp three phase electric motor located in Pump Station 2.

B. Air Interrupter Switch:

1. Provide two position air interrupter switch as follows:

a. Open/close, three-pole, quick-made quick-break, gang operated, in accordance with ANSI C37.20.3.

b. Operating Handle: External, with locking provisions and position indicator.

c. Load break, fused, rated for 100 amperes, 60 kV BIL.

d. Momentary and fault close rating (one time duty cycle rating) of 61,000 amperes rms asymmetrical and short time current (2 seconds) of 25,000A rms symmetrical.

e. Mechanically interlocked to prevent opening access door while switch is closed.

f. Separate fuse compartment within enclosure accessible through hinged door mechanically interlocked with switch.

g. Full height, freestanding, with visual inspection window and flanges for close coupling to transformer, through ATC.

h. Ground Bus: Copper, 1/4-inch by 2-inch (minimum).

2. Ratings:

a. Nominal Voltage: 2.4 kV.

b. Maximum Voltage: 5 kV.

c. BIL: 95 kV.

d. Main Bus Rating:

1) Continuous Current: 200A.

2) Short Circuit Rating: 40,000A rms symmetrical at rated nominal voltage.

C. Power Fuse:

1. Current limiting type with following ratings:

a. Continuous current in accordance with Coordination and Short Circuit Study.

b. Rated interrupting capacity of 25,000 amperes rms, symmetrical.

D. Feeder Conductors:

1. Incoming feeders to enter enclosure from bottom, unless otherwise specified.

2. Outgoing feeders to exit enclosure from top, unless otherwise specified. Provide dual output lugs on outgoing feeders to provide separate connectivity to both motor and power factor correction capacitor.

E. Surge Arrestors: Provide surge arrestors, connected to incoming cable terminal. Comply with the following.

1. Metal oxide, distribution type.

2. Suitable for solidly grounded system.

3. Rated: In accordance with manufacturer's recommendation and approval by the Engineer.

F. The metal-enclosed load interrupter switchgear shall consist of dead-front, completely metal-enclosed vertical sections containing load interrupter switches, rating and type noted on the drawings or specified herein.

G. The following features shall be supplied on every vertical section containing a three-pole, two-position open-closed switch:

1. A minimum 8-inch x 16-inch high-impact viewing window that permits full view of the position of all three switch blades through the closed door. The window shall not be more than 58 inches above the switch pad level to allow ease of inspection.

2. The door shall be interlocked with the switch so that:

   a. The switch must be opened before the door can be opened

   b. The door must be closed before the switch can be closed

3. A hinged grounded metal barrier that is bolted closed in front of every switch to prevent inadvertent contact with any live part, yet allows for a full-view inspection on the switch blade position

4. Provision for padlocking the switch in the open or closed position

5. A hinged cover with rustproof quarter turn nylon latches over the switch operating mechanism to discourage casual tampering

6. The switch shall be removable from the structure as a complete operational component.

H. Vertical section construction shall be of the universal frame type using die-formed and welded or bolted parts. All enclosing covers and doors shall be fabricated from steel whose thickness shall be equal to or greater than those specified in ANSI/IEEE C37.20.3. No owner removable hardware for covers or doors shall be thread-forming type. To facilitate installation and maintenance of cables and bus in each vertical section, a split removable top cover and padlockable hinged rear door held closed by bolts shall be provided. A G90 grade galvanized base shall isolate equipment from contact with the concrete pad providing protection from rust. Heavy-duty hot dipped galvanized anchor clips shall be provided to anchor the switchgear to the concrete pad.

I. Each vertical section containing a switch shall have a single, full-length, flanged front door and shall be equipped with two (2) rotary latch-type padlockable handles. Provision shall be made for operating the switch and storing the removable handle without opening the full length door.

J. Each load interrupter switch shall have the following features:

1. Three-pole gang-operated mechanism

2. Manual quick-make, quick-break over-toggle-type mechanism that does not require the use of a chain or a cable for operation, and utilizes a heavy-duty coil spring to provide opening and closing energy

3. The speed of opening and closing the switch shall be independent of the operator, and it shall be impossible to tease the switch into any intermediate position under normal operation

4. Separate main and break contacts to provide maximum endurance for fault close and load interrupting duty

5. Insulating barriers between each phase and between the outer phases and the enclosure

6. A maintenance provision for slow closing the switch to check switch blade engagement and slow opening the switch to check operation of the arc interrupting contacts.

**PART 3 -** EXECUTION

3.01 FACTORY TESTING

A. The County reserves the right to witness all factory tests. The County reserves the right to back charge the Contractor if a second trip is needed to witness equipment due to manufacturer errors in fabrication or engineering.

B. Provide 2 weeks written notice to the County so arrangements can be made to witness tests.

C. Provide three copies of the final factory inspection tests to the County for approval prior to shipment.

D. Primary Switch:

1. Visual and Mechanical Inspection:

a. Inspect for physical damage:

1) If visual inspection reveals damage, broken bushings, or inoperative switch, undertake internal inspection and all the tests required to locate the damage.

2) Submit a detailed report to the County. Identify the damage, cause of the damage, and corrective measures taken to assure the County of the quality of the metal-enclosed switchgear assembly.

b. Compare equipment nameplate information with latest one-line diagram and record/report discrepancies.

c. Check proper operation of the primary switch in both positions – open and close.

d. Check operation of interlocks with primary fuse.

2. Electrical Tests:

a. Perform an insulation-resistance test pole-to-ground, pole-to-pole and across open pole. Make closed switch tests pole-to-pole and pole-to ground.

b. Check operation of auxiliary contacts.

3.02 INSTALLATION

A. Install the 5kV primary switch and appurtenances in accordance with the instructions of the manufacturer and in accordance with the Contract Documents.

B. Moving of Units: Use qualified riggers experienced in handling large air interrupter switches.

C. Connections: Set disconnect switch assemblies in place and connect as shown on the approved shop drawings and in accordance with manufacturer's written instructions.

D. Relay Settings and Calibration: Set and calibrate relay settings in accordance with the protective coordination study.

3.03 FIELD QUALITY CONTROL AND TESTING

A. Perform field inspection and testing in accordance with Section 16950, Testing.

B. Adjusting and Cleaning: Adjust operating mechanisms for free mechanical movement.

C. Grounding:

1. Provide equipment grounding.

2. Tighten connections to comply with tightening torques specified by the manufacturers and UL Standard 486A to assure permanent and effective grounding.

3.04 MANUFACTURER'S FIELD SERVICES

A. Provide services in accordance with Section 01900, Special Conditions. Manufacturer's field services shall respond to the County's request for correction of problems during startup and warranty power within 4 hours.

B. Training:

1. Provide training to instruct representatives of the County and Engineer in accordance with Section 01900, Special Conditions as follows:

a. Medium Voltage Disconnect Switches: 2 hours.

END OF SECTION

**SECTION 16396**

**ELECTRICAL SYSTEM STUDY**

PARAGRAPH INDEX

## SECTION 16396

## ELECTRICAL SYSTEM STUDY

**PART 1 -** GENERAL

1.01 DESCRIPTION

A. Furnish an electrical short-circuit, over-current protective device coordination study, and arc flash analysis including coordination with Baltimore Gas and Electric (BGE) for the electrical system required under this construction contract.

B. **THE SHORT CIRCUIT ANALYSIS, PROTECTIVE DEVICE COORDINATION STUDY AND ARC FLASH STUDY MUST BE APPROVED BY THE ENGINEER PRIOR TO SUBMITTING SHOP DRAWINGS OF ELECTRICAL EQUIPMENT. SHOP DRAWINGS OF ELECTRICAL EQUIPMENT WILL NOT BE REVIEWED UNTIL THE SHORT CIRCUIT ANALYSIS, PROTECTIVE DEVICE COORDINATION STUDY, AND ARC FLASH STUDY ARE APPROVED BY ENGINEER. NO EXCEPTIONS WILL BE ALLOWED**.

C. The electrical short-circuit, over-current protective device coordination study, and arc flash analysis shall be performed by a third party vendor that is not providing any equipment on the project.

1.02 QUALITY ASSURANCE

A. Comply with applicable portions of Section 16050, Basic Electrical Materials and Methods.

B. Comply with applicable standards including, but not limited to the most recent edition of the following:

1. American National Standards Institute (ANSI): C37.010, Application Guide for AC High Voltage Current Circuit Breakers on a Symmetrical Basis.

2. Institute of Electrical and Electronics Engineers (IEEE):

a. 141-1993, Recommended Practice for Electric Power Distribution in Industrial Plants.

b. 242-2001, Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems.

c. 399, Recommended Practice for Industrial and Commercial Power System Analysis.

d. 1582-2004/2004a, IEEE Guide for Performing Arc Flash Hazard Calculations.

3. InterNational Electrical Testing Association (NETA): ATS, Latest Edition: Acceptance Testing Specifications for Electrical Power and Distribution Equipment and Systems.

4. National Fire Protection Association (NFPA):

   a. 70, National Electric Code.

   b. 70E, Standard for Electrical Safety in the Workplace.

1.03 SUBMITTALS

A. Submittals shall be in accordance with Section 01330, Submittal Procedures.

B. The short circuit analysis, protective device coordination study and arc flash study shall be approved by the Engineer prior to submitting the release of equipment for manufacture. The shop drawings of the equipment will not be reviewed until the short circuit analysis, protective device coordination study, and arc flash study are approved by Engineer. No exceptions will be allowed.

C. All short circuit analysis, protective device coordination study and arc flash hazard study shall be performed with the aid of digital computer program as specified herein.

D. The Contractor shall affix approved arc flash labels on electrical equipment at least 30 days prior to energizing the electrical equipment.

E. Contractor shall submit complete settings for all relays included in study. For any microprocessor relays used, Contractor shall provide electronic configuration files incorporating all relay settings. Electronic files shall include all parameter settings for enabled and disabled functions as shown in coordination study, and shall be submitted with the studies specified herein for Engineer approval.

F. Submittals shall include specific recommendations to the protection scheme to correct any instances where the calculated incident energy was deemed to be in excess of 40 $cal/cm^2$. Provide additional studies implementing the specific recommendations.

G. Study shall be signed/sealed by a professional electrical engineer registered in the State of Maryland, responsible for performing the studies.

H. The study report shall include the following sections:

1. Descriptions, purpose, basis, and scope of the study.

2. Detailed one-line diagram with identification/parameters of electrical equipment, protective devices/settings, impedance elements, all distribution components, etc.

3. Study shall simulate multiple system operating conditions to determine the worst-case scenario.

4. Short circuit analysis for the studied distribution system including fault duty report, momentary duty report, and interrupting duty report.

5. Evaluation of equipment withstand ratings protective device interrupting ratings, versus calculated short circuit currents.

6. Protective device time-current coordination study to ascertain an optimal protection and selectivity of protective devices.

7. Arc flash evaluation with detailed summary spreadsheet tabulating incident energy and arc flash hazard/risk category at each location.

I. Provide sample arc flash labels for each type of equipment for review and approval by the Engineer.

**PART 2 -** PRODUCTS

2.01 SIMULATION SOFTWARE

A. Electrical system studies shall be performed using the latest version of:

1. SKM; PowerTools.

2. ESA; EasyPower.

**PART 3 -** EXECUTION

3.01 ELECTRICAL EQUIPMENT

A. The Drawings and Specifications indicate the general requirements for the medium voltage and low voltage equipment. Determine additional specific characteristics of equipment furnished in accordance with the results of the short circuit and protective device coordination, and arc flash analysis study.

B. The scope of the study applies to all new equipment and associated components furnished under this Project, as shown on the Drawings. In addition, this study shall include the following existing equipment shown on the Drawings:

1. Existing 33kv Switchgear in Substation Building.

2. Existing 2400V Switchgear in Generator Building.

3. Existing 2400V MCC in Pumping Station No. 3.

4. Existing 500A Automatic Transfer Switch in Pumping Station No. 3.

5. Existing 120/208V Panel LP-GEN in Generator Building.

6. Existing 277/480V Panel DP-SUB in Substation Building.

7. Existing 120/208V Panel LP-SUB in Substation Building.

8. Existing 277/480V Panel MDP in Pumping Station No. 2.

9. Existing 120/208V Panel PP in Pumping Station No. 2.

10. Existing 277/480V Panel SS in Pumping Station No. 3.

11. Existing 277/480V Panel P in Pumping Station No. 3.

12. Existing 120/208V Panel L in Pumping Station No. 3.

3.02 STUDY REQUIREMENTS

A. Provide comprehensive report complying with following:

1. Contactor shall obtain all the correct data required for the short circuit and protective coordination and arc flash analysis study. Past study will be provided to the Contractor, upon request, for informational purpose only.

2. Obtain required study data including available fault currents and upstream protective device information from the utility company. Include copy of utility correspondence letters in submittal.

3. Study shall be prepared by an experienced professional engineer registered in the State of Maryland with a minimum of 5 years experience in the preparation of short circuit, protective device, and arc flash analysis studies of medium and high voltage industrial systems.

4. Submit the study report to the Engineer for approval prior to submitting electrical equipment shop drawings and prior to release of equipment for manufacture.

5. Reset and calibrate any existing relays on the upstream and downstream side of the equipment, if required, by the coordination study at no additional cost to the County.

6. Provide protective devices, protective device settings, relays, fuses, breakers, etc. in accordance with the coordination study.

B. Include following features in report.

1. Perform additional studies and accordingly provide specific recommendations to improve protection device coordination and to reduce arc flash hazard category of all new electrical equipment to Category 4 and below.

2. Multifunction Relays: Based on the protective device settings as determined from the power system study, Contractor shall provide complete relay device configuration settings files for each multifunction relay installed or modified under this project together with the study report. Contractor shall provide the relay settings files on a CD as well as include the hard copy printouts for each multifunction relay. Configuration settings files shall be provided using the latest authoring software version for the installed or modified relays.

3. Perform additional short circuit, coordination, and arc flash analysis simulation scenarios to reflect a closed-transition condition at the 33kV

substation, 2400V MCC at Pumping Station No.3, and 2400V switchgear in the Generator Building. The additional scenarios shall assume that the main-tie-main breakers at each of the substations (i.e. 2400V MCC) are momentarily closed with the incoming sources paralleled.

3.03 SHORT CIRCUIT STUDY

A. Perform short circuit of entire electrical distribution system to calculate available three-phase and ground fault currents at each location within the electrical system. Provide calculations for symmetrical half-cycle three-phase fault currents, momentary three-phase fault currents, and asymmetrical 3-cycle/5-cycle/8-cycle three-phase fault currents.

B. Study shall include simulation of both the normal condition and the worst-case operating condition that yields the greatest calculated fault currents.

C. Provide fault duty report, momentary duty report, and interrupting duty report. Provide equipment evaluation report confirming that manufacturer's equipment withstand and interrupting ratings are adequate for the worst-case calculated fault currents.

D. Short circuit study shall consist of all electrical equipment identified in Paragraph 3.1.B of this Specification.

3.04 COORDINATION STUDY

A. Provide phase overcurrent and ground overcurrent study with the following items as a minimum:

1. Coordination plots graphically indicating the coordination proposed for the several systems. Provide plots centered on full scale log-log forms.

2. Coordination plots with:

a. Complete titles.

b. Representative one-line diagrams and legends.

c. Associated power company's relay or system characteristics, motor controller fuses and relays.

d. Significant motor starting characteristics.

e. Transformer characteristics including inrush points.

f. Complete operating bands for low voltage circuit breaker trip devices, fuses, if applicable, and the associated system load protective devices.

3. Coordination plots which define the types of protective devices selected, together with the proposed coil taps, time dial settings and pickup settings required.

4. In the long time region of the coordination plots, indicate:

a. A complete tap scale for each medium voltage relay.
b. Full load current transformer parameters.
c. Designate the pickups required for the low voltage circuit breakers.

5. In the short time region, indicate:

a. The medium voltage relay instantaneous elements.

b. The magnetizing inrush.

c. ANSI withstand transformer parameters.

d. The low voltage circuit breaker, short time and instantaneous trip devices.

e. Fuse manufacturing tolerance bands, including the low voltage network protector fuses, when applicable.

f. Significant symmetrical and asymmetrical fault currents.

B. Coordinate each item of equipment as follows:

1. Select each primary protective device required for a delta-to-wye-connected transformer so that the characteristics or operating band is within the transformer parameters which includes a parameter equivalent to 58 percent of the ANSI withstand point to afford protection for secondary line-to-ground faults.

2. Provide the transformer damage curve for each transformer when the selected protective device is not within the associated parameters.

3. Separate low voltage power circuit breakers from each other and the associated primary protective device by a suitable current margin for coordination and protection in the event of secondary line-to-line faults.

4. Separate medium voltage relays by a minimum 0.1-second time margin when the maximum three-phase fault flows, to assure proper selectivity.

5. Suitably terminate the protective device characteristics or operating band to reflect the actual symmetrical and asymmetrical fault currents sensed by the device.

6. Source combinations, large motors, or generators.

C. Obtain pertinent information for the upstream and downstream protective devices including:

1. Characteristics and settings.

2. Feeder sizes, types, and lengths including motors connected to the substations and motor control centers.

3. Motors and disconnect switches connected to the MCCs.

D. Coordination study shall consist of all electrical equipment identified in Paragraph 3.1.B of this Specification.

3.05 ARC FLASH ANALYSIS

A. Provide arc flash analysis results in a tabular format depicting the following for each bus: bus name, protective device name, bus voltage, calculated 3-phase bolted fault current, calculated arc-fault current, trip delay, breaker opening time, equipment type, grounding type, arc flash boundary, working distance, incident energy, and NFPA 70E hazard/risk category. For each bus in the table, provide description indicating location within the distribution system.

B. Arc flash analysis results shall include all motor contributions and generator contributions. Arc flash calculations shall include evaluation of all studied equipment that can be operated or maintained while energized including, but not limited to, disconnect switches, control panels, etc.

C. Arc flash analysis shall include the new arc flash maintenance switches on the 33kV switchgear feeder breakers. Include recommended settings for the arc flash maintenance mode operations.

D. Arc flash analysis shall consist of all electrical equipment identified in Paragraph 3.1.B of this Specification.

3.06 ARC FLASH LABELS

A. Provide arc flash labels on all studied equipment including, but not limited to, disconnect switches, control panels, etc. for arc flash and shock hazard in accordance with the NFPA 70E for safe work practices and for personal protection. Layout and format of arc flash labels shall exactly match the layout of existing arc flash labels installed at the facility.

B. The arc flash labels for equipment shall be 4 inches by 6 inches and shall include the following at minimum:

DANGER
ARC FLASH AND SHOCK HAZARD
Appropriate PPE required for arc flash and shock hazards

NFPA Hazard/Risk Category

Flash Hazard Boundary _____ inches

Incident Energy _____cal/$cm^2$ at _____ inch working distance

PPE Required

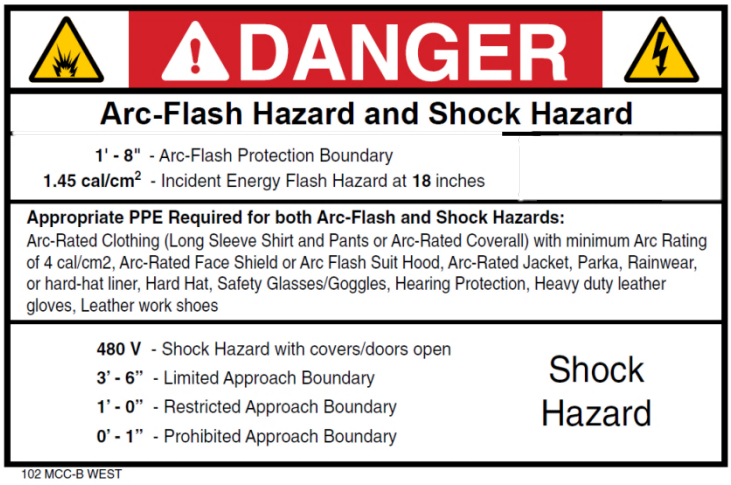
Shock Hazard Voltage _____volts

Limited Approach Boundary _____inches

Restricted Approach Boundary _____inches

Prohibited Approach Boundary _____inches

C. Label layout provided shall be in accordance with the sample template below:




D. Arc flash labels template shall be:

1. Brady; Label Part No. Y464249, Lot No. 5701477.
2. Or equal.

E. During submittal review, submit sample label of each equipment type for Engineer's approval. Arc flash labels shall be in accordance with NFPA 70, NFPA 70E, and all applicable standards of ANSI Z535. Arc flash labels shall be prepared and affixed onto corresponding electrical equipment upon completion of approved arc flash analysis. Labels shall consist of a die-cut material that is resistant to facing, moisture, heat, rain, or freezing temperatures. Labels shall be provided with over-laminate or as directed by the Engineer.

F. Install arc flash labels on electrical equipment in accordance with NEC Article 110.16 and NFPA 70E. Labels shall be installed by the Contractor under direct supervision of the professional engineer who is performing the power systems study. On MCC and switchgear equipment, labels shall be affixed on each accessible front and rear cubicle doors or buckets.

G. Arc flash labels shall be provided for all electrical equipment identified in Paragraph 3.1.B of this Specification.

END OF SECTION

**SECTION 16400**

**PANELBOARDS**

PARAGRAPH INDEX

# SECTION 16400

# PANELBOARDS

**PART 1 -** GENERAL

1.01 DESCRIPTION

A. Furnish and install panelboards including circuit breakers and cabinets complete, in conformance with the latest NEMA Standards and Federal Specifications listed below as shown on Drawings and as specified herein.

B. Related work specified elsewhere may include but is not limited to:

1. Section 16050, Basic Electrical Materials and Methods.

2. Section 16450, Grounding.

3. Section 16950, Testing.

1.02 QUALITY ASSURANCE

A. Reference Standards: Comply with all Federal and the State of Maryland laws or ordinances, as well as all applicable codes, standards, regulations and/or agency requirements including the partial listing below:

1. National Electrical Manufacturers Association (NEMA):

a. AB1, Molded Case Circuit Breakers.

b. PB1, Panelboards.

2. Federal Specifications (FS):

a. W-C-375a,b, Molded Case Circuit Breakers.

b. W-P-115a,b,c, Panelboards.

3. National Fire Protection Association (NFPA): 70, National Electrical Code (NEC).

4. Underwriter's Laboratories, Inc.:

a. 50, Electrical Cabinets and Boxes.

b. 67, Panelboards.

1.03 SUBMITTALS

A. The shop drawings of the electrical equipment will not be reviewed until the short circuit analysis, protective device coordination study, and arc flash study are approved by Engineer in accordance with Section 16396.

B. General: Provide all submittals in accordance with Section 01330, Submittal Procedures.

C. Shop Drawings:

1. Drawings and data covering outlines, wiring diagrams and certified test data reports, shall be submitted in accordance with the Section 01900, Special Conditions.

2. Submit time-current characteristic curves for each rating of circuit breaker supplied.

3. Provide a separate circuit schedule with loads for each panelboard.

D. Service Manuals: Submit in accordance with Section 01900, Special Conditions.

E. O&M Training: Submit in accordance with Section 01900, Special Conditions.

1.04 DELIVERY AND HANDLING

A. Shipping: Ship materials complete with identification and quantity of items.

B. Acceptance at Site: Inspect and inventory items upon delivery to site.

1.05 SPARE PARTS

A. Contractor shall furnish spare parts as recommended by manufacturer.

1.06 WARRANTY

A. Contractor shall provide five (5) years extended warranty.

**PART 2 -** PRODUCTS

2.01 MANUFACTURERS

A. Contingent upon products' compliance with the specifications, acceptable manufacturers are as follows:

1. Eaton Electrical.

2. Square D.

2.02 MANUFACTURED UNITS

A. All panelboards shall be completely factory assembled, deadfront type, with automatic branch circuit breakers.

B. Furnish panelboards complete with branch circuit breakers and a main circuit breaker, or solderless main lugs only, as indicated on the Drawings.

C. Furnish panelboards with full capacity separate ground bus and furnish panelboards connected to 3-phase, 4-wire service with an insulated neutral bus.

D. All circuit breaker connections shall be in hole tapped by the manufacturer.

E. Furnish the panelboard main, neutral and grounding buses, with minimum 98 percent conductivity rectangular tin-plated copper bars provided with bolted type lugs as necessary.

F. Tin-plated copper buses, connectors and terminals shall conform to the latest standard requirements.

G. Prevent terminal lugs from turning per NEMA standard PBI and ensure they are suitable for the conductor material and size.

H. The design of the interior should permit replacement of circuit breakers without disturbing adjacent units and without machine drilling or tapping.

I. Install panelboard in motor control center (MCC) if shown on the Drawings. Panelboard shall be provided and installed by the MCC manufacturer when installed in the MCC.

2.03 EQUIPMENT

A. Ratings:

1. Voltage ratings listed below shall apply to each panelboard, as shown on the drawings.

a. 480 volt, 3-phase, 3-wire, 60-Hz.

b. 480/277 or 120/208 volt, 3-phase, 4-wire, 60-Hz.

c. 120/240 volt, 1-phase, 3-wire, 60-Hz.

d. 125 volts, 2-wire, dc.

2. Provide main bus-bracing for each ac panelboard adequate for 22,000 amperes rms symmetrical short circuit for 120/208 volts 60-Hz panelboards and 65,000 amperes rms symmetrical short circuit for 480 volts 60-Hz panelboards.

3. Provide main bus-bracing for each dc panelboard adequate for 10,000 amperes rms symmetrical short circuit at 125V dc, unless otherwise indicated.

B. For all circuit breakers:

1. Furnish bolt-on type branch and main circuit breakers. Furnish frame sizes, trip settings and number of poles as indicated. Clearly and visibly mark circuit breakers with ampere trip rating.

2. Furnish all breakers with quick-make, quick-break, toggle mechanisms and thermal-magnetic, inverse time-limit overload and instantaneous short circuit protection on all poles, unless otherwise indicated. Automatic tripping shall be indicated by the breaker handle assuming a clearly distinctive position from the manual ON and OFF position. Furnish breaker handle that is trip free on overloads. Multi-pole breakers shall be common trip.

3. Do not use single pole breakers with handle ties or bails in lieu of multi-pole breakers.

4. Furnish non-padlocking type handle lock device on breakers where indicated on schedules to prevent the manual opening of the selected breakers, unless otherwise indicated.

5. Furnish padlocking device on breakers as indicated to prevent the opening of indicated breakers.

6. Ensure that voltage and interrupting rating of all breakers in a panelboard is not less than voltage and short circuit rating of the panelboard main buses, as indicated. Furnish breakers suitable to operate satisfactorily at the frequency indicated.

7. Furnish ground fault interrupter circuit breakers for certain circuits as indicated on the drawings.

8. Furnish single pole breakers with full module size. Do not install two pole breakers in a single module.

9. Provide solderless lug type breaker terminals.

10. Where schedules indicate space for future breakers, provisions shall be such that no additional connectors will be required to add breakers.

C. Branch Circuit Breakers:

1. 480-volt rating, 225- and 100-ampere frame, minimum interrupting rating 65,000 rms symmetrical amperes at 480 volts , or as shown on the Drawings.

2. 120/240-volt, 60Hz, 100-ampere frame, minimum interrupting rating 22,000 rms symmetrical amperes at 120 volts, or as shown on the Drawings.

3. 125V dc, 100-ampere frame minimum interrupting rating 10,000 rms symmetrical amperes volts, or as shown on the Drawings.

4. 1 pole, 2 pole, and 3 pole with trip settings as shown on the Drawings.

D. Main Circuit Breakers:

1. 480-volt rating, 225-ampere frame, minimum interrupting rating 65,000 rms symmetrical amperes at 480 volts, or as shown on the Drawings, whichever is greater.

2. 240-volt rating, 100-ampere frame, minimum interrupting rating 22,000 rms symmetrical amperes at 240 volts, or as shown on the Drawings, whichever is greater.

3. 125V dc, 100-ampere frame minimum interrupting rating 10,000 rms symmetrical amperes or as shown on Drawings, whichever is greater.

4. 2- or 3-pole with trip settings as shown on the Drawings.

2.04 COMPONENTS

A. Cabinets:

1. Provide NEMA 12 cabinets, unless otherwise indicated, without knockouts. Drill cabinets only for the exact conduit entrances and mounting bolts.

2. Finish cabinet fronts, trims and surface-mounted boxes in ANSI 61 light-gray enamel over a rust-inhibitive primer. Attach the fronts (exterior trims) to the boxes or interior trims, by quarter-turn, indicating trim clamps. Design cabinets for surface or flush mounting as indicated.

3. Unless otherwise specified, construct panelboard cabinets of code-gauge galvanized, sheet steel and equip with gutters of size in accordance with NEC for the risers and outgoing circuits. Ensure that the cabinets do not exceed 78 inches in height.

4. Panelboards shall have dead-front shield to provide access to wiring gutters with front removed, without exposing bus compartment.

5. Furnish fronts with adjustable trim clamps for attachment to front of panelboard enclosure.

6. Complete fronts with doors, catches, and spring-loaded door pulls. Catch and door pull assembly not to extend beyond front of door. Three-point catch and vault-type handle provided on all doors over 48 inches high, doors over 24 inches wide, and on all double doors. No door locks to be provided.

7. Attach doors to fronts with semi-concealed or concealed hinges.

8. Continuous piano hinges provided on all doors over 36 inches high.

9. Identify each circuit by typewritten directory with transparent tough plastic cover, fastened to inside surface of door.

10. Install panelboard in MCC if shown on the Drawings.

**PART 3 -** EXECUTION

3.01 INSTALLATION

A. Mount all panelboards such that the height of the top operating handle does not exceed 6 feet 6 inches from the floor. Install all conduit, wiring, and grounding as indicated.

B. All circuit breakers installed in existing panelboards shall be manufactured by the original panelboard manufacturer and shall be fully compatible with the panelboard.

3.02 FIELD QUALITY CONTROL

A. Make required continuity and operational tests. Provide directory card filled-out.

3.03 MANUFACTURER'S FIELD SERVICES

A. Provide services in accordance with Section 01900, Special Conditions. Manufacturer's field services shall respond to the County's request for correction of problems during startup and warranty power within 4 hours.

B. Training:

1. Provide training to instruct representatives of the County and Engineer as follows:

a. Panelboards: 1 hour.

END OF SECTION

**SECTION 16450**

**GROUNDING**

PARAGRAPH INDEX

**SECTION 16450**

**GROUNDING**

**PART 1 -** GENERAL

1.01 DESCRIPTION

A. Provide a single, complete, electrically continuous grounding system.

1. Provide grounding system to provide ground resistance less than 5 ohms.

2. Provide appurtenances as specified and as shown on the contract documents.

1.02 QUALITY ASSURANCE

A. Comply with applicable portions of Section 16050, Basic Electrical Materials and Methods.

B. Provide components that are the standard product of a manufacturer regularly engaged in the production of the required materials and equipment.

1. The manufacturer shall be responsible for the design, construction, and proper operation of all components.

C. Comply with applicable standards including, but not limited to the most recent edition of the following:

1. American National Standards Institute (ANSI): C2, National Electric Safety Code.

2. National Fire Protection Association (NFPA): 70, National Electrical Code (NEC).

D. Design to provide satisfactory performance under the specified operating conditions.

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01330, Submittal Procedures.

1. Product data.

2. Conductor routing and connection diagrams.

1.04 SPARE PARTS

A. Contractor shall furnish spare parts as recommended by manufacturer.

**PART 2 -** PRODUCTS

2.01 MANUFACTURERS

A. Ground Rods:

1. Copperweld Corporation.
2. ITT Blackburn Company.
3. Or equal.

B. Exothermic Welding:

1. Erico Products Inc.
2. American Brass Mfg. Co.
3. Burndy Corporation; Therm-O-Weld.
4. Or equal.

C. Connecting Hardware:

1. American Brass Mfg. Co.
2. Anderson Electric Corp.
3. Burndy Corporation.
4. O.Z./Gedney, Division of General Signal Corporation.
5. Or equal.

2.02 CONDUCTORS

A. Provide grounding conductors to comply with the following:

1. Cables or Wire:
   a. Class A bare or insulated copper.
   b. Sizes as indicated on the drawings and specified herein or as required by the NEC, whichever is larger.
   c. All conductors protected from physical damage resulting from exposure.
2. Main grounding conductors, grounding electrode conductors and main bonding jumpers:
   a. No smaller than No. 4/0 stranded bare cable.
   b. Use annealed copper
   c. With no less than 19 strands in the cable unless otherwise stated on drawings.
3. Furnish bare conductors where buried in earth or where embedded in concrete.
4. In buildings run insulated grounding conductors with green insulation only.

5. Insulated grounding conductors having insulation rated at 600 volts.

6. Furnish grounding conductors for installation in all non-metallic raceway in addition to, and not to be considered as, the neutral wire of the systems.

2.03 CONNECTIONS

A. Provide grounding connections as follows:

1. Make all buried and concealed ground connections by exothermic welding.

2. Make accessible connections to structural members by exothermic welding process. Where exothermic welding is not feasible, bolted connectors are acceptable with approval from the County/Engineer.

3. For connections to equipment or ground bus, use acceptable bolted connectors suitable for and matching with grounding provisions furnished.

4. Use all clamps, connectors, lugs of copper alloy.

5. Ground Clamps: Multi-bolt type, saddle clamp on compression type, assembled with Everdur silicon bronze.

6. In manholes, for buried ground grid connections, and where indicated on the Drawings, ground cable connections shall be made by Cadweld process.

7. Apply grounding bushings on both ends of conduit run and intermediate enclosures.

2.04 GROUND RODS

A. Provide ground rods as below:

1. Copper clad steel.

2. 3/4-inch in diameter.

3. 10 feet long or 20 feet long - made up of two 10-foot lengths coupled together with bronze couplings, as required to provide ground resistance of at least 5 ohms.

B. Provide rolled scar-resisting surface, with both ends of the rod receiving the same heavy coating of copper as the body of the rod.

C. The end of the driving rod chamfered and the point machined smooth to aid in driving.

**PART 3 -** EXECUTION

3.01 INSTALLATION

A. Install grounding conductors as follows:

1. Prevent from exposure to physical damage.
    a. Install connections firm and tight.
    b. Arrange conductors and connectors to avoid strain on connections.
2. Bury equipment grounding conductors 18 inches deep.
    a. Bring loops or taps up for connections to equipment or other items to be grounded.
3. Install all grounding conductors in conduit except the grounding electrode conductor or where shown otherwise.
4. Connect building steel to the station ground system using bonding cable with exothermic welds.
5. Connect to piping by welding or brazing.
    a. Use copper bonding jumpers on all gasketed joints.
6. Comply with following:
    a. Install loop type, low impedance, grounding system.
    b. Interconnect all components to provide at least two ground connections for each major item of electrical equipment.
    c. Ensure that severing of any single grounding conductors in this system does not remove grounding protection on any major item.
7. Perform exothermic welding with properly sized molds in good conditions.

B. Install ground rods as follows:

1. Provide ground rods at manholes, substations and buildings whether indicated on drawings or not.
2. Make connection to overall grounding system as indicated.
3. Ensure that final resistance of interconnected ground system is 5 ohms, or less. Measure ground resistance in normally dry conditions and not less than 48 hours after rainfall.

C. Equipment Grounding:

1. Ground all electrical equipment by means of a grounding conductor installed in raceway feeding that equipment.
2. Use copper wire sized in accordance with NEC.
3. Grounding conductors installed in conduit, having green, 600-volt insulation.

a. Connect transformer cases and neutrals to grounding system.

b. Connect neutral ground connection at transformer terminal as shown on drawings.

c. Provide two separate, independent, diagonally opposite, connections for power transformers so removal of one connection will not impair continuity of other unless otherwise stated.

4. Provide connections as follows:

a. Connect two separate ground connections from ground grid to ground bus of switchgear spot network assemblies and all outdoors substation equipment.

b. Each connection for item of equipment, from different section of ground grid.

5. Provide grounding for motors as follows:

a. Install a separate grounding conductor from ground system to all 2400-volt motors and equipment, in addition to raceway system.

b. Provide ground connection to motor frame, independent of mounting bolts or sliding base.

c. Ground motor to nearest point on grounding system, unless otherwise indicated.

6. Scrape bolted surfaces clean and coat with oxide-resistant conductive compound.

7. Ground all conduit and armored cables leaving the service equipment, spot network and/or motor control centers, to the service equipment spot network and/or motor control center ground bus.

8. Provide grounding for lighting standard as follows:

a. Drive a ground rod near base of standard, in accordance with requirements of National Electric Safety Code.

b. Connect ground rods to grounding conductor brought with street lighting feeder cable.

9. Ensure that suitable separate ground conductor connects lightning arresters with system ground. Where lightning arresters are furnished with electrical equipment, ground connections are not inherently provided.

10. Ground wire fences when used to enclose electrical equipment.

a. Unless otherwise indicated, provide minimal grounding.

1) Buried outside peripheral ground loop.

2) Connections to each corner fence post and nearby ground rod.

3) Flexible connections to each gate.

4) At least two connections to grounding system from approximately opposite positions of fence.

1. Also connect the ground rods to the grounding conductor run with the direct burial cable.

D. Instrumentation Grounding:

1. Install separate main ground conductors for all dc and instrumentation panels and instruments.

2. Connect dc and instrumentation grounds to the main station grounding system at a properly selected point as shown on the Drawings or as recommended by the instrumentation supplier.

3. Provide ground connection for shielded cable at one location only, in accordance with the recommendation of the instrumentation manufacturer/supplier.

3.02 FIELD QUALIY CONTROL AND TESTING

A. Perform field inspection and testing in accordance with Section 16950, Testing.

END OF SECTION

**SECTION 16481**

**MOTOR CONTROL CENTER MODIFICATIONS**

PARAGRAPH INDEX

**SECTION 16481**

**MOTOR CENTER CONTROL MODIFICATIONS**

**PART 1 -** GENERAL

1.01 DESCRIPTION

A. Furnish, install, test, and place in satisfactory operation the 2400V motor control center modifications specified herein and as shown on the Drawings. The Contractor is responsible for providing a fully functional and workable system.

B. The existing motor control center lineups with draw-out fused contactor elements are manufactured by Eaton Electrical, AMPGARD model. Available as-built record drawings of the motor control center will be provided to the Contractor following the bid, upon request, prior to commencing construction activities.

C. The motor control center modifications consist of replacing branch circuit cabling, lug modifications to accommodate power factor correction capacitors, and modifying existing Multilin SR469 relays to accommodate new RTD signals.

D. Coordinate all work with other trades and disciplines. All work shall be performed in a manner to maintain the integrity of the existing MCC.

E. Contractor to procure four (4) spare Multilin SR469 relays; One (1) spare set of six (6) of each of the following Current Limiting Power Fuses: 200-9R, 170-6R, and 130-4R, turned material over to the County.

1.02 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American National Standards Institute (ANSI):

a. C2, National Electrical Safety Code.

b. C39.1, Requirements for Electrical Analog Indicating Instruments.

c. C57.13, Requirements for Instrumentation Transformers.

2. Institute of Electrical and Electronics Engineers (IEEE).

3. National Fire Protection Association (NFPA): 70, National Electrical Code (NEC).

4. Underwriters' Laboratories Inc. (UL).

B. Submit following in accordance with Section 01900, Special Conditions.

1. Complete list of electrical materials to be furnished, indicating manufacturer.

2. Complete schedule and listing of system and equipment identification labels with legends.

1.03 QUALITY ASSURANCE

A. Comply with applicable portions of Section 16050, Basic Electrical Materials and Methods.

B. Motor control center components shall be assembled in accordance using ANSI and, where applicable, NEMA rated components. Components designed and built to International Electrotechnical Commission (IEC) standards are not acceptable.

C. Motor control center modifications vendor shall have proven track record and experience in performing medium voltage motor control center and switchgear modifications. Vendor shall have successfully completed five (5) projects of similar extent and complexity over the past five (5) years.

D. Provide components that are the standard product of a manufacturer regularly engaged in the production of the required materials and equipment.

1. The manufacturer shall be responsible for the design, construction, and proper operation of all components.

E. Design to provide satisfactory performance under the specified operating conditions.

1.04 SUBMITTALS

A. Comply with Section 01330, Submittal Procedures and Section 16050, Basic Electrical Materials and Methods.

1. Shop Drawings of all equipment provided.

2. Shop Drawings showing:

a. MCC modification procedure including product data for new components including methods used.

b. Control wiring modifications for existing FVNR cubicles. Show point-to-point connections depicting all existing layout with proposed modifications.

c. Revised pump control schematic showing modifications to pump elementary control diagrams.

d. Revised GE Multilin SR469 connection diagrams depicting existing and modified condition to the protective relay schematics. Include logic description for all input and output signals.

e. Overall three-line diagram for switchgear depicting the existing layout with proposed modifications.

f. MCC elevation drawings depicting the layout of the existing and proposed modified system.

g. Manufacturer representative's certification for the installed modifications including certification that the installation is in accordance with original equipment manufacturer standards.

h. Control equipment wiring diagram inclusive of all auxiliary control wiring devices, as required.

**PART 2 -** PRODUCTS

2.01 MANUFACTURERS

A. The manufacturing firm or authorized representative performing all motor control center modifications shall be:

1. Eaton Electrical Service and Systems.

2. No Substitution Allowed

B. Power fuses:

1. Eaton, HLE-type.

2. No substitution allowed.

2.02 CONTROL WIRING AND TESTING

A. Wire and test switchgear to satisfy the requirements of the operation described or necessary.

B. Minimum wire size for control wiring shall be No. 14 AWG. Minimum wire size for potential transformer wiring shall be No. 12 AWG. Minimum wire size for current transformer wiring shall be No. 10 AWG. No. 10 AWG or larger wire shall be used to decrease resistance as required.

C. Route outgoing control wires for outgoing cell-to-cell interconnecting wiring to master terminal blocks with suitable numbering strips numbered in agreement with manufacturer's detailed wiring diagrams.

D. Terminate control wiring in molded terminal blocks acceptable to the Engineer. Provide a minimum 10 percent spare terminal blocks for each circuit breaker auxiliary compartment.

E. Existing control terminal block and control wiring layout based on as-built drawings. If discrepancies are observed between Drawings and actual field conditions, Contractor shall modify Drawings accordingly and submit to Engineer for approval. If spare contacts are required for a particular relay or signal is not available, Contractor shall provide auxiliary relays for contact multiplication.

2.03 WIRE CONNECTIONS AND CONNECTING DEVICES

A. Splice Connectors:

1. Conductor No. 10 AWG and smaller gauge solid conductors: Insulated pressure twist-on nut type.

2. Conductor No. 8 AWG and Larger Gauge: Split bolt or compression type for making parallel or butt splices, with companion preformed plastic insulating covers or tape equivalent to conductor insulation.

B. Termination Components:

1. Stranded and multiple solid conductors at connection to terminals: Solderless terminal lugs or UL listed crimp tool compression style lugs.

2. Control conductor connection terminations: Spade lug or pressure type.

**PART 3 -** EXECUTION

3.01 INSTALLATION

A. Motor control center modifications shall be performed as shown on Drawings and in accordance with manufacturer's recommendations and installation instructions.

B. Replace branch circuit cabling for all pumps as shown on Drawings. As required, the manufacturer shall replace any cable termination lugs to accommodate new cabling. All medium voltage cable terminations shall be performed as per Section 16121, Medium Voltage Cables.

A. Provide branch dual lug output on motor control centers for pumps, as shown on Drawings. As required, the manufacturer shall replace any cable termination lugs to accommodate dual lug output to provide separate connectivity to both pump assembly and power factor correction capacitor.

C. Reprogram and configure existing GE Multilin SR469 relays in existing MCC to accommodate new RTD signals and power factor correction capacitors for new motors and pumps. Manufacturer shall coordinate with motor and pump vendor to determine RTD type and lead types, and successfully configure the protective relay to issue trip command upon an over-temperature condition. Manufacturer shall also program a second alarming over-temperature condition which will results in a contact closure on a virtual digital output. All over-temperature alarm and trip condition shall be denoted on home screen of the Multilin SR469 display. All new pump bearings, motor bearings, and motor windings RTDs shall be specified 120-ohm Nickel.

D. Prior to installation, provide certification from manufacturer's representative certifying that the modifications to be performed are in accordance with manufacturer's recommendations and installation instructions. Include certification in shop drawing submittal.

3.02 FIELD ADJUSTMENTS

A. Perform additional motor control center modifications as required during construction to form a workable system. Any additional MCC modifications required shall be approved by Engineer prior to proceeding with the Work.

3.03 MANUFACTURER'S CERTIFICATION

A. Upon completion of installation, a qualified, factory-trained manufacturer's representative shall certify in writing that the equipment has been installed, adjusted, and tested in accordance with the manufacturer's installation instruction and recommendations.

3.04 FIELD QUALITY CONTROL

A. Field inspection and testing shall be performed in accordance with Section 16950, Testing.

END OF SECTION

**SECTION 16500**

**LIGHTING**

PARAGRAPH INDEX

# SECTION 16500

# LIGHTING

**PART 1 -** GENERAL

1.01 DESCRIPTION

A. Provide lighting indicated on the Drawings and as specified herein.

B. Furnish and install all applicable appurtenances as required and as shown on the Contract Documents.

1.02 QUALITY ASSURANCE

A. Comply with applicable portions of Section 16050, Basic Electrical Materials and Methods.

B. Provide components that are the standard product of a manufacturer regularly engaged in the production of the required materials and equipment.

1. The manufacturer shall be responsible for the design, construction, and proper operation of all components.

2. Include lighting fixtures complete with supports, ballasts, LED drivers, and lamps as a complete and fully operational unit.

C. Comply with applicable standards including, but not limited to the most recent edition of the following:

1. National Electrical Manufacturer's Association (NEMA).

2. National Fire Protection Association (NFPA):

a. National Electrical Code (NEC), Article 410, Lighting Fixtures, Lamp Holders, Lamps, Receptacles and Rosettes.

b. NEC Article 500, Hazardous (Classified) Locations.

3. Occupational Safety and Health Administration (OSHA).

4. Underwriter’s Laboratories Inc. (UL):

a. 57, Electric Lighting Fixtures.

b. 844, Electric Lighting Fixtures for Use in Hazardous Locations.

c. 924, Standard for Safety of Emergency Lighting and Power Equipment.

d. 1570, Fluorescent Lighting Fixtures.

e. 1571, Incandescent Lighting Fixtures.

f. 1572, High Intensity Discharge Lighting Fixtures.

g. 8750, Light Emitting Diode Equipment in Lighting Products.

D. Design to provide satisfactory performance under the specified operating conditions.

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01900, Special Conditions.

1. Product data.
2. Catalog cuts.
3. Shop drawings.
4. Wiring diagrams.
5. Photometric layout.
6. Special shipping, storage, protection, and handling instructions.
7. Manufacturer's installation instructions.

B. Submit manufacturer's certificates.

1.04 SPECIAL TOOLS AND SPARE PARTS

A. Provide spare parts recommended by the manufacturer. At a minimum, provide the following spare parts:

1. Spare ballast of each type: 10 percent, not less than 2.
2. Spare lamps of each type: 10 percent, not less than 2.
3. Spare LED driver of each type: 10 percent, not less than 2.
4. Photocell and Contactor: 1 of each type.
5. Lighting Fixture: 2 of each type.

B. Furnish two complete sets of special tools required to disassemble, service, repair and adjust the equipment.

**PART 2 -** PRODUCTS

2.01 LIGHTING FIXTURES

A. Provide lighting fixtures complete with supports, ballasts, LED drivers, and lamps as a complete and fully operational unit.

B. Provide lighting fixtures at locations as indicated on drawings and as specified herein.

2.02 LUMINAIRES

A. Comply with the following:

1. Provide complete with supports, LED drivers, ballasts, lamps and incidentals.
2. Feed-through type, or separate junction box.
3. Wire Leads: Minimum No. 12 AWG.
4. Components accessible and replaceable without removing luminaires from ceiling.
5. Provide integral provision for grounding.
6. Provide integral surge protection capability within fixture.
7. UL Listed suitable for the location intended to be installed.
8. Integral heat sink as required for proper heat dissipation.

2.03 BALLASTS AND LED DRIVERS

A. Provide ballasts and LED drivers meeting requirements for:

1. Fixture light output.
2. Reliable starting.
3. Radio interference.
4. Total harmonic distortion.
5. Electromagnetic interference.
6. Dielectric rating.
7. Certified by electrical testing laboratories to conform to Certified Ballast Manufacturer's specifications.
8. To produce reliable starting of lamps at minus 20 degrees F at 90 percent of nominal line voltage, in exterior locations.

B. Ballasts for Fluorescent Lamps:

1. Type "P" premium high power factor, energy type, compatible with lamps specified.
2. Having minimum "A" and maximum allowable noise level limited to 30 decibels, when measured at 2 feet from installed fixture.
3. Electronic type for T8 type lamps, operating at 120/277V.
4. With automatic resetting, thermo-protector to prevent case temperature from exceeding 110 degrees C in the event of a short circuit.

C. Drivers for LED Fixtures:

1. High power factor.
2. Class P, Type 1 outdoor.

3. Low total harmonic distortion.

4. Sound rated A.

5. Short circuit and overload protection.

6. Thermal protection.

2.04 LIGHTING CONTROL

A. Provide photocell for lighting control as follows:

1. Automatic ON/OFF switching photo control.

2. Self-contained, die-cast aluminum housing, unaffected by moisture, vibration, or temperature changes.

3. Set for switching “ON” at dusk and “OFF” at dawn.

4. Having time delay feature to prevent false switching.

5. Field adjustable to control operating levels:

a. Adjusting light level from 1 to 10 foot candles.

b. Turn-on, turn-off differential .1 to 1 foot candles.

6. Operate from a 120/277V power source.

7. Contact position, normally closed at night.

8. Provide switch to bypass photocell.

9. Provide auxiliary contactor for switching, if lighting load exceeds rating of photocell.

2.05 EMERGENCY LED DRIVER

A. Emergency Ballasts:

1. Compliant with UL 924.

2. 90-minute run time.

3. Field replaceable battery packs for ease of replacement.

4. Certified for use in sealed and gasketed fixtures.

B. Manufacturer:

1. Philips Bodine.

2. Or approved equal.

**PART 3 -** EXECUTION

3.01 FACTORY TESTING

A. Perform production tests according to manufacturer’s practices and applicable standards.

B. Provide three copies of the final factory inspection tests to the County.

3.02 INSTALLATION

A. Luminaire Installation:

1. Install the lighting fixtures and appurtenances in accordance with the instructions of the manufacturer and in accordance with the Contract Documents.

2. Connections: Mount fixtures in place and connect as shown on the approved shop drawings and in accordance with manufacturer's written instructions.

3. Comply with following general installation requirements:

a. Provide proper hangers, pendants and canopies as necessary for complete installation.

b. Provide additional ceiling bracing, hanger supports and other structural reinforcements to building required to safely mount.

c. Install plumb and level.

d. Measure mounting heights shown for wall mounted or pendant mounted luminaires from the bottom of the luminaires to finished floor or finished grade, whichever is applicable.

e. Install each luminary outlet box with stainless steel stud.

f. Feed the fixtures independently with circuit wires. Do not route wires through the other fixtures.

4. Install pendant mounted fixtures as follows:

a. Provide swivel or flexible type hangers and canopies to match luminaires, unless otherwise noted.

b. Space single-stem hangers on continuous-row fluorescent luminaires nominally 48-inchs apart.

c. Provide twin-stem hangers on single luminaires.

d. Pendant mount using conduit stems of the same type of conduit as used in the area meeting the requirements of Section 16050, Basic Electrical Materials and Methods.

e. Maintain UL Listing of fixtures.

f. Attach mounting to building structure with stainless steel expansion anchors and as shown on the drawings.

5. Install swinging type fixtures as follows:

a. Provide safety cable at each support that is capable of supporting four times the vertical load from the structure to the luminaires.

6. In finished areas:

   a. Install fixtures symmetrically with tile pattern.

   b. Locate fixtures with centerlines either on centerline of tile or on joint between adjacent tile runs.

   c. Install recessed luminaires tight to finished surface such that no spill light will show between ceilings and sealing rings.

   d. Locate junction boxes at minimum 1-foot from luminaires for flush and recessed luminaires.

   e. In concealed locations, install junction boxes to be accessible by removing luminaires.

   f. Provide wiring and conduit as follows:

      1) Having temperature rating required by luminaires.

      2) As required by location of luminaires as detailed in Section 16050, Basic Electrical Materials and Methods.

   g. Provide plaster frames when required by ceiling construction.

   h. Provide independent supports as follows:

      1) Provide each recessed fluorescent luminaire with two safety chains or two No. 12 soft-annealed galvanized steel wires of length needed to secure luminaire to building structure independent of ceiling structure.

      2) Tensile strength of chain or wire, and method of fastening to structure, adequate to support weight of luminaires.

      3) Fasten chain or wire to each end of luminaires.

7. In unfinished areas:

   a. Locate luminaires to avoid either conflict with other building systems or blockage of luminaires light output.

      1) Provide flanged beam clips and straight or angled hangers for attachment steel beams.

      2) Provide stainless steel expansion bolts for attachment to concrete ceilings and walls.

B. Ballasts and LED Driver Installation:

1. Install in accordance with manufacturer's recommendations.

2. Utilize all ballast mounting holes to fasten securely within luminaires.

3. Replace noisy or defective ballasts.

C. Lamp Installation: Provide number and type of lamp for which the fixture is designed, unless otherwise noted.

3.03 FIELD QUALITY CONTROL AND TESTING

A. Perform field inspection and testing to ensure proper operation.

B. Adjusting and Cleaning: Adjust operating mechanisms for free mechanical movement.

C. Grounding:

1. Provide equipment grounding in accordance with Section 16450, Grounding.

2. Tighten connections to comply with tightening torques specified by the manufacturers and UL Standard 486A to assure permanent and effective grounding.

3.04 MANUFACTURER'S FIELD SERVICES

A. Provide services in accordance with Section 01900, Special Conditions. Manufacturer's field services shall respond to the County's request for correction of problems during startup and warranty power within 4 hours.

B. Training:

1. Provide training to instruct representatives of the County and Engineer as follows:

a. Lighting Fixtures: 2 hours.

END OF SECTION

**SECTION 16950**

**TESTING**

PARAGRAPH INDEX

## SECTION 16950

## TESTING

**PART 1 -** GENERAL

1.01 DESCRIPTION

A. Section Includes: Requirements for performing, recording, and completing electrical and mechanical equipment field testing program.

B. Procedures Contained in Section 01400, Quality Control: Applicable as specified.

1.02 QUALITY ASSURANCE

A. Testing Procedures: Follow Section 01400, Quality Control and engage NETA accredited independent testing agency to perform all electrical testing and submit data as specified herein.

1. Preliminary Test:

a. Demonstrate that equipment and connections, when energized, perform functions required by Contract Documents, approved Contractor's Submittals, and approved Operation and Maintenance Manuals for each item of equipment or system.

b. Have quality of workmanship and installation examined for deficiencies and listed on punch list for repair prior to Prefinal Test.

c. Obtain approval and inspection of work by other agencies or organizations before installation or operation, when required by local codes or laws.

d. Submit to Engineer: 1 signed original and 3 copies of approvals.

e. Following Construction Schedule and with Engineer’s approval, schedule Preliminary Tests minimum of 10 days before Prefinal Tests are scheduled.

f. Ensure performance and recording of Contractor’s tests and independent testing company tests before Preliminary Tests to avoid delays of scheduled testing procedures.

2. Prefinal Testing: Enables unanimous, satisfactory acceptance for on line use by Inspector by demonstrating that:

a. Equipment has been installed following Contract Documents and approved Contractor's Drawings.

b. Project phases have been completed.

c. Integrated equipment and systems operate as complete units.

d. Punch list items developed in Preliminary Tests have been corrected.

3. Final Test: Precedes scheduling of Certificate of Final Acceptance and verifies that:

a. Outstanding items of punch lists have been corrected.

b. Project work is ready to be placed in service and turned over to the County.

B. Inspections and Tests: Follow latest edition of applicable test procedures of these standards associations:

1. American National Standards Institute (ANSI).

2. American Water Works Association (AWWA).

3. Insulated Cable Engineers Association (ICEA).

4. Institute of Electrical and Electronics Engineers (IEEE).

5. National Electrical Code (NEC).

6. National Electrical Manufacturers Association (NEMA).

7. InterNational Electrical Testing Association (NETA).

C. Coordinate tests with data, instructions, and recommendations specified in Section 16396, Electrical System Study, and approved before testing.

1.03 SUBMITTALS

A. Data, Certificates, and Record Drawings: Submit following Section 01330, Submittal Procedures.

B. Schedule of Dates and Times for Testing: Include description of equipment and systems to be tested and testing sequence.

C. Short Circuit Calculations and Coordination, Study, and Arc Flash Analysis: Submit complete study in booklet form at shop drawing phase for electrical equipment in accordance with Section 16396, Electrical System Study.

D. Record Forms:

1. Submit test data record forms for each system and item of equipment tested in preapproved form and format.

2. Neatly print or type test form to permit photocopying without loss of clarity to include.

a. Project identification.

b. Test stage identification: Preliminary or prefinal.

c. Sequence Number of Test: First test, second test, and final test.

d. Beginning and ending test dates.

e. Identification of testing facility: Contractor, independent testing company, or manufacturer.

f. Signature of person conducting tests or chief of test team on test data record forms or title sheet of multiple page test report, typewritten or neatly printed name to permit photocopy without loss of clarity.

1.04 TEST EQUIPMENT

A. Test Instruments, Meters, and Auxiliary Equipment: Tested and calibrated within 6 months of use on this contract and provided by Contractor and independent testing companies and by manufacturers' field service personnel where required.

B. Temporary Portable Testing Power Source: Capable of employing 3 individually selectable sequences of 120V ac phase voltage (A-B, B-C, C-A) to power testing of protective relay test sets and properly relate phase of test set circuitry to phase rotation of potential and current transformers associated with protective relays.

1. Use 5 conductor flexible cable Type S or So, minimum No. 12 AWG, of sufficient length to make connection to equipment under test.

a. Connect 3 conductors in cable to breaker pole on each phase, or to phase buses by temporary 3-pole, 4-wire fused safety switch.

2. Use 3-gang receptacle box with 3 single receptacles; connect receptacle box to flexible cable.

a. Phase out conductors and label receptacles Phase A, Phase B, and Phase C.

b. Neatly coil and tie cable and receptacle box and tie and turn over to Engineer at test conclusion.

1.05 TESTING AGENCY

A. NETA accredited independent testing agency tasked perform all electrical testing shall be as follows:

1. Potomac Testing Inc.

2. ABM Testing

3. Harford Testing

1.06 DEFINITIONS

A. Prerequisites: Items of work or submittals required before requirements of this section.

**PART 2 -** PRODUCTS (NOT USED)

**PART 3 -** EXECUTION

3.01 TESTS, ELECTRICAL WIRES AND CABLES (SECTION 16120)

A. Prerequisites:

1. As specified in Article Definitions.
2. Inspect Each Individual Exposed No. 6 and Larger Power Cable for:
    a. Physical damage.
    b. Proper connections in accordance with single-line diagram.
    c. Cable bends not in conformance with manufacturer's minimum allowable bending radius where applicable.
    d. Color coding in conformance with specifications.
    e. Proper circuit identification.
3. Inspect Mechanical Connections for:
    a. Proper lug type for conductor material.
    b. Proper lug installation.
    c. Bolt torque level in accordance with NETA ATS-2013, Table 100.12.1, unless otherwise specified by manufacturer.
4. Inspect Shielded Instrumentation Cables for:
    a. Proper shield grounding.
    b. Proper terminations.
    c. Proper circuit identification.
5. Inspect Control Cables for:
    a. Proper termination.
    b. Proper circuit identification.
6. Inspect Cables Terminated Through Window Type CTs: Verify that neutrals and grounds are terminated for correct operation of protective devices.

B. Preliminary Test:

1. As specified in Article Quality Assurance.
2. Insulation Resistance Tests:

a. Utilize 1,000V dc megohmmeter for 600-volt insulated conductors and 500V dc megohmmeter for 300-volt insulated conductors.

b. Test each conductor with respect to ground and to adjacent conductors in accordance with IEEE 118 procedures for 1 minute.

c. Evaluate ohmic values by comparison with conductors of same length and type. Investigate values which deviate by more than 50 percent of the lowest value.

d. Investigate values less than specified by NETA ATS-2013, Table 100.1. Any conductor with reading less than 5 megohms shall be replaced.

e. Continuity test by ohmmeter method to ensure proper cable connections.

f. Verify uniform resistance of paralleled conductors. Deviations in resistance between parallel conductors shall be investigated.

C. Prefinal Test: As specified in Article Quality Assurance.

3.02 TESTS, MEDIUM VOLTAGE CABLES (SECTION 16121)

A. Prerequisites

1. As specified in Article Definitions.

2. Inspect Each Individual Exposed Cable for:

a. Physical damage plus jacket and insulation condition.

b. Proper connections in accordance with single-line diagram.

c. Proper shield grounding.

d. Proper cable support.

e. Proper cable termination.

f. Cable bends not in conformance with manufacturer's minimum allowable bending radius.

g. Proper arc and fireproofing in common cable areas.

h. Proper circuit and phase identification.

i. If cables are terminated through window-type current transformers, inspect to verify that neutral and ground conductors are correctly placed and that shields are correctly terminated for operation of protective devices.

3. Inspect Mechanical Connections for:

a. Proper lug type for conductor material.

b. Proper lug installation.

c. Bolt torque level in accordance with NETA ATS-2013, Table 100.12.1, unless otherwise specified by manufacturers.

4. Inspect Conductors Terminated Through Window Type CTs: Verify that neutrals and grounds are terminated for correct operation of protective devices.

B. Preliminary Test

1. As specified in Article Quality Assurance.

2. Insulation Resistance Tests

a. Test each cable individually with remaining cables and shields grounded.

b. Test each conductor with respect to ground and to adjacent conductors in accordance with IEEE 118 procedures for 1 minute.

c. Evaluate ohmic values by comparison with conductors of same length and type.

d. Investigate values less than specified by NETA ATS-2013, Table 100.1. Any cable with less than minimum specified value shall be replaced.

3. Shield Continuity Tests:

a. By ohmmeter method on each section of conductor.

b. Investigate values in excess of 10 ohms per 1,000 feet of conductors.

4. High Potential DC Tests:

a. In accordance with NETA ATS-2013, Table 100.6.

b. Each conductor section tested with:

1) Splices and terminations in-place but disconnected from equipment.

2) Remaining conductors and shields grounded in accordance with IEEE 400.

c. Measure only the leakage current associated with conductor.

d. Utilize guard ring or field reduction sphere to suppress corona at disconnected terminations.

e. Maximum test voltage shall not exceed limits for terminators specified in IEEE 48 or manufacturer's specifications.

f. Apply test voltage in a minimum of five equal increments until maximum acceptable test voltage is reached.

1) Increments not to exceed ac voltage rating of conductor.

2) Record dc leakage current at each step after a constant stabilization time consistent with system charging current.

g. Raise conductor to specified maximum test voltage and hold for 15 minutes, or as specified by conductor manufacturer. Record dc leakage current at 30 seconds and 1 minute and at 1-minute intervals, thereafter. Compute polarization index (PI). Replace cables if PI is less than one.

h. Immediately following test, ground conductor for adequate time period to drain insulation stored charge.

i. Test results evaluated on a pass/fail basis.

5. New Conductors Spliced to Existing Conductors:

a. Prior to performing splices, high potential dc test new conductor sections.

b. After splicing new conductors to existing conductors, disconnect the existing conductors and perform the following tests:

1) Shield continuity test.

2) Insulation resistance test.

3) High potential dc test with test voltage not to exceed 60 percent of applied dc test voltage.

C. Prefinal Test: As specified in Article Quality Assurance.

3.03 TESTS, CIRCUIT BREAKERS (SECTIONS 16050, 16400)

A. Performed by Contractor

1. Prerequisites: As specified in Article Definitions.

2. Preliminary Test:

a. As specified in Article Quality Assurance.

b. Operate all circuit breakers to assure free operation.

3. Prefinal Test: As specified in Article Quality Assurance.

B. Tests Performed By Independent Testing Company

1. Prerequisites:

a. Inspect all new low voltage circuit breakers 100 amperes and larger operating at 480 volts and below as follows.

1) Operate circuit breaker to insure smooth operation.

2) Inspect case for cracks or other defects.

2. Preliminary Test:

a. As specified in Article Quality Assurance.

b. Perform the following tests on all new low voltage circuit breakers 100 amperes and larger operating at 480 volts and below:

1) Contact resistance shall be measured. Contact resistance shall be compared to adjacent poles and to similar breakers. Deviations of more than 50 percent shall be not be permitted.

2) Time-current characteristic tests shall be performed by passing 300 percent rated current through each pole separately. Trip time shall be determined. All trip times shall fall within manufacturer's time current curves for breaker tested.

3) Instantaneous pickup current shall be determined by run-up or pulse method. Clearing times shall be within four cycles or less. Instantaneous pickup current levels should be within 20 percent of manufacturer's published values.

4) Insulation resistance shall be determined pole to pole, across pole and pole to ground. Test voltage shall be 1,000V dc. Insulation resistance shall not be less than 50 megohms.

3. Prefinal Test:

a. As specified in Article Quality Assurance.

b. Perform operating tests in accordance with NETA-ATS-2013.

3.04 TESTS, MEDIUM VOLTAGE DISCONNECT SWITCHES (SECTION 16330)

A. Prerequisites

1. As specified in Article Definitions.

2. Compare equipment nameplate information with single-line diagram.

3. Check for proper anchorage and required area clearances.

4. Verify that fuse sizes and types correspond to drawings.

5. Perform mechanical operator tests in accordance with manufacturer's instructions.

6. Check blade alignment and are interrupter operation.

7. Verify that expulsion limiting devices are in place on all holders having expulsion-type elements.

8. Check each fuse holder for adequate mechanical support for each fuse.

9. Inspect all bus connections for tightness of bolted bus joints by using calibrated torque wrench. Refer to manufacturer's instructions or Table 10.1 for proper torque levels.

10. Test all electrical and mechanical interlock systems for proper operation and sequencing.

11. Clean entire switch using approved methods and materials.

12. Verify proper phase barrier materials and installation.

13. Lubricate as required.

14. Check switch blade clearances with manufacturer's published data.

15. Inspect all indicating devices for proper operation.

B. Preliminary Test

1. As specified in Article Quality Assurance.

2. Perform insulation-resistance tests on each pole, phase-to-phase and phase-to-ground, for 1 minute. Minimum test voltage shall be 2500V ac or 5000V dc.

3. Perform ac over-potential test on each pole with switch closed. Test each pole-to-ground with other poles grounded for 1 minute at 27 kV ac or manufacturer's recommended values, whichever is greater.

4. Perform contact-resistance test across each switch blade and fuse holder:

C. Prefinal Test:

1. As specified in Article Quality Assurance.

2. Verify operation of interlocks, controls and switches.

3.05 TESTS, PROTECTIVE DEVICES (SECTION 16050, 16396, 16400, 16481)

A. Tests shall be performed by independent testing company.

B. Prerequisites:

1. As specified in Article Definitions.

2. Inspect relays for physical damage and compliance with manufacturer's specifications.

3. Inspect cover gasket, cover glass, presence of foreign material, moisture, condition of spiral spring, disc clearance, rust and contacts.

4. Check mechanically for freedom of movement, proper travel and alignment, and tightness of mounting hardware and tap screws.

5. Adjust all settings in accordance with Short Circuit and Coordination Study.

6. Microprocessor Relays: Verify configuration settings shown in the study report with the actual existing configuration settings.

C. Preliminary Test:

1. As specified in Article Quality Assurance.

2. Perform insulation resistance test on each circuit branch to frame.

3. Perform following tests on settings as adjusted in accordance with Short Circuit and Coordination Study:

a. Pick-up parameters on each operating element.

b. Timing test at 3 points on time dial curve.

c. Pick-up target and seal in units.

d. Special tests as required to check operation of restraint, directional and other elements per manufacturer's instruction manual.

e. Perform phase angle and magnitude contribution tests on all differential and directional type relays after energization to vectorially prove proper polarity and connection.

4. Prefinal Test: As specified in Article Quality Assurance.

3.06 TESTS, GROUNDING SYSTEM (SECTION 16450)

A. Prerequisites:

1. As specified in Article Definitions.

2. Inspect exposed Connections for:

a. Proper lug type for conductor material.

b. Proper lug installation.

c. Proper Exothermic welds installation.

3. Before underground or embedded connections are covered, they shall be physically inspected to insure tightness and continuity.

B. Preliminary Test:

1. As specified in Article Quality Assurance.

2. After installation is complete, measure and record resistance between building grounding system and earth. Grounding system to earth resistance shall measure less than 5 ohms for 600-volt systems. For 2400V motor control center, the ground resistance shall be no greater than 1 ohm.

3. Measurements shall be made with a vibro ground or ground megger, using three-probe method.

C. Prefinal Test: As specified in Article Quality Assurance.

3.07 TESTS, POWER FACTOR CORRECTION CAPACITORS (SECTION 16280)

A. Performed by Contractor

1. Prerequisites: As specified in Article Definitions.

2. Preliminary Test:

a. As specified in Article Quality Assurance.

b. Operate power factor correction capacitor to assure proper operation.

3.08 TESTS, MOTOR CONTROL CENTER MODIFICATIONS (SECTION 16481)

A. Prerequisites:

1. As specified in Article Definitions.

2. Verify that all push-to-test indicating lights are operational by manually initiating each.

B. Preliminary Test by Independent Testing Company:

1. As specified in Article Quality Assurance.

2. All thermal overload heaters shall be current tested by primary injection.

3. Check equipment grounding.

4. Check all connections.

5. Field megger breakers and bus.

6. Check polarity on CTs and PTs.

7. All protective devices shall be set according to the short circuit coordination study.

8. All protective devices shall be inspected, adjusted, tested and calibrated.

9. Manually and electrically close each relay's contact and verify that the contact closes.

10. Check that each overload reset arm is properly installed and aligned.

11. Calibrate all power transducers for proper output. Record full scale output in engineering units.

12. Record nameplate date and check for accuracy.

13. Check that all remote signals are received.

14. Check that all outputs to remote devices are functional.

15. Complete all punch list items on motor control centers and appurtenances.

C. Prefinal Test:

1. As specified in Article Quality Assurance.

2. Verify all punch list items have been corrected.

3.09 TESTS, LIGHTING (SECTION 16500)

A. Prerequisites: As specified in Article Definitions.

B. Preliminary Test:

1. As specified in Article Quality Assurance.

2. All Buildings and Structures:

a. Verify lighting is functional and as shown on the Drawings.

b. Verify lighting panels are identified and lighting circuits identified within the panels.

c. Verify emergency lighting.

3. Site Lighting:

a. Verify relocated lighting and new lighting are functional and as shown on the Drawings.

b. Verify lighting panels are identified and lighting circuits identified in the panels.

C. Prefinal Test: As specified in Article Quality Assurance.

3.10 TESTS, INSTRUMENT TRANSFORMERS (SECTIONS 16481)

A. Prerequisites:

1. As specified in Article Definitions.

2. Verify correct connection of transformers with system requirements.

3. Verify that adequate clearances exist between primary and secondary circuit wiring.

4. Inspect all bolted electrical conditions, verify tightness of accessible bolted electrical connections.

5. Verify that all required grounding and shorting connections provide contact.

6. Verify correct primary and secondary fuse sizes for potential transformers.

7. Verify correct current and voltage ratings and ratios.

B. Preliminary Test:

1. As specified in Article Quality Assurance.

2. Current Transformers:

a. Perform insulation resistance test of the current transformer and winding-to-ground at 1,000V dc.

b. Perform a polarity test of each current transformer.

c. Perform a ratio-verification test.

3. Voltage Transformers:

a. Perform insulation resistance test winding-to-winding and each winding-to-ground with test voltage in accordance with table below.

| Transformer Insulation Resistance Test Voltages | |
|---|---|
| Transformer Winding Rated Voltage | Minimum dc Test Voltage |
| 0 to 600 | 1,000 |
| 601 to 5,000 | 2,500 |
| > 5000 | 5,000 |

b. Perform polarity test on each transformer to verify the polarity marks or H1-X1 relationship as applicable.

c. Perform a turns-ratio test on all tap positions.

C. Prefinal Test: As specified in Article Quality Assurance.

3.11 TESTS, METERING (SECTIONS 16481)

A. Prerequisites: As specified in Article Definitions.

B. Preliminary Test:

1. As specified in Article Quality Assurance.

2. Tighten case connections. Inspect shorting hardware and knife switches.

3. Set meters in accordance with GE Multilin's requirements.

4. Verify correct VT and CT ratios and connections.

C. Prefinal Test: As specified in Article Quality Assurance.

3.12 TESTS, THERMOGRAPHIC SURVEY (SECTIONS 16170, 16225, 16280, 16323, 16330, 16400, 16481)

A. Visual and Mechanical Inspection:

1. Perform thermographic survey when load is applied to the system.

2. Remove all necessary covers prior to thermographic inspection. Use appropriate caution, safety devices, and personal protective equipment.

3. Perform a follow-up thermographic survey within 12 months of final acceptance by the County.

B. Report:

1. Provide a report which includes the following:

a. Description of equipment to be tested.

b. Discrepancies.

c. Temperature difference between the area of concern and the reference area.

d. Probable cause of temperature difference.

e. Areas inspected. Identify inaccessible and unobservable areas and equipment.

f. Identify load conditions at time of inspection.

g. Provide photographs and/or thermograms of the deficient area.

h. Recommended action.

C. Test Parameters:

1. Inspect distribution systems with imaging equipment capable of detecting a minimum temperature difference of 1 degree C at 30 degrees C.

2. Equipment shall detect emitted radiation and convert detection radiation to visual signal.

3. Thermographic surveys should be performed during periods of maximum possible loading. Refer to ANSI/NFPA 70B, 2013 Edition, Section 21.17.

D. Corrective Actions: Provide corrections in accordance with NETA ATS-2013, Table 100.18.

3.13 TESTS, THREE-PHASE ELECTRIC MOTORS (SECTION 16225)

A. Prerequisites:

1. As specified in Article Definitions.
2. Verify:
    a. Proper electrical and grounding connections.
    b. Shaft alignment.
    c. Operate motor and check for:
        1) Excessive mechanical and electrical noise.
        2) Overheating.
        3) Correct rotation.
        4) Check vibration detectors, resistance temperature detectors, or motor inherent protectors for functionability and proper operation.
        5) Excessive vibration.
    d. Check operation of space heaters.

B. Preliminary Test:

1. As specified in Article Quality Assurance.
2. Electrical Test:
    a. In accordance with IEEE 43 at test voltages established by NETA ATS, Table 100.2 for:
        1) Motors 200 hp and less for 1 minute duration with resistances tabulated at 30 and 60 seconds.
    b. Insulation resistance values equal to, or greater than, ohm values established by manufacturers.
3. Calculate polarization index ratios for motors greater than or equal to 200 hp. Investigate index ratios less than 1.5 for Class A insulation and 2.0 for Class B insulation.
4. Insulation resistance test on insulated bearings in accordance with manufacturer's instructions.
5. Measure running current and voltage, and evaluate relative to load conditions and nameplate full-load amperes.
6. Complete all punch list items on motors.

C. Prefinal Test: As specified in Article Quality Assurance.

3.14 TESTS, DRY-TYPE TRANSFORMERS (SECTION 16323)

A. Prerequisites: As specified in Article Definitions.

B. Preliminary Test:

1. As specified in Article Quality Assurance.

2. Measure insulation resistance of transformer windings and busses. Take measurements before external connections to high and low voltage transformers bushings are completed.

3. Verify transformer ratings on tap positions for transformers. Set tap changer on transformers on positions required to give desired secondary operating voltage.

4. Adjust transformer taps so that average operating voltages at terminals of utilizing equipment shall match nameplate voltage of that equipment as closely as possible. The objective shall be to maintain equipment terminal voltage at less than 10 percent above nameplate rating at no-load and less than 5 percent below nameplate rating at full-load.

C. Prefinal Test: As specified in Article Quality Assurance.

3.15 TESTS, DISCONNECT SWITCHES (SECTION 16170)

A. Provide visual and mechanical inspection to ensure proper connections and installation of cables, fuse holders, barriers.

B. Check blade alignments. Perform mechanical operation tests. Verify that fuse sizes and types are in accordance with approved coordination study.

C. Test all electrical and mechanical interlock systems for proper operation.

D. Perform electrical tests, including insulation resistance tests on each pole, phase-to-phase and phase-to-ground for 1 minute and contact resistance test across each switch blade and fuse holder. Test values shall be in accordance with NETA ATS-2013 requirements, unless otherwise specified by manufacturer.

END OF SECTION

# Limited Hazardous Materials Survey

## Towson Water Pumping Stations No.2 & No.3
## 401 Hillen Road
## Towson, MD 21286

*Prepared for:*

**Whitman Requardt and Associates, LLP**
801 South Caroline Street
Baltimore, MD 21231

*Prepared by:*

**EBA Engineering, Inc.**
4813 Seton Drive | Baltimore, MD 21215
(410) 358-7171 | www.ebaengineering.com

Project No. 3212-15-000

**August 13, 2012**

# LIMITED HAZARDOUS MATERIALS SURVEY

## Towson Water Pumping Stations No.2 & No.3
## 401 Hillen Road
## Towson, MD 21286

**PROJECT NO. 3212-15-000**

**August 13, 2012**

*Submitted To:*

Mr. Louis Klinefelter
**Whitman Requardt and Associates, LLP**
801 South Caroline Street
Baltimore, MD 21231

*Submitted By:*

Kelly J. Ridgel
Environmental Specialist
**EBA Engineering, Inc.**
4813 Seton Drive
Baltimore, Maryland 21215

*Reviewed By:*

Mr. James P. Sines, CHMM
**EBA Engineering, Inc.**

# Limited Hazardous Materials Survey
# Towson Water Pumping Station No 2. & No. 3

# Acronyms

| | |
|---|---|
| AC | Air Conditioner |
| ACBM | Asbestos Containing Building Materials |
| ACM | Asbestos Containing Material |
| AHERA | Asbestos Hazard Emergency Response Act |
| AMA | AMA Analytical Inc |
| AST | Aboveground Storage Tank |
| C&D | Construction & Debris |
| CAA | Clean Air Act |
| CFCs | Chlorofluorocarbons |
| CFR | Code of Federal Regulation |
| COMAR | Code of Maryland Regulations |
| CT | Ceiling Tile |
| DPSCS | Department of Public Safety and Correctional Services |
| EBA | EBA Engineering, Inc |
| EMSL | EMSL Analytical Services, Inc |
| EPA | Environmental Protection Agency |
| FT | Floor Tile |
| HCFC | Hydro Chlorofluorocarbons |
| HID | High Intensity Discharge |
| LBP | Lead-Based Paint |
| LF | Linear Feet |
| LHMS | Limited Hazardous Materials Survey |
| M | Miscellaneous |
| MDE | Maryland Department of the Environment |
| MM | Miscellaneous Materials |
| NESHAP | National Emission Standards for Hazardous Air Pollutants |
| NVLAP | National Voluntary Laboratory Accreditation Program |
| ODC | Ozone Depleting Compounds |
| OSHA | Occupational Safety & Health Administration |
| PACM | Presumed Asbestos Containing Material |
| PCB | Polychlorinated Biphenyl |
| PLM | Polarized Light Microscopy |
| PPM | Parts Per Million |
| RACM | Regulated Asbestos Containing Materials |
| S | Surfacing Materials |
| SF | Square Feet |
| TEM | Transmission Electron Microscopy |
| TSCA | Toxic Substance Control Act |
| TSI | Thermal System Insulation |
| UST | Underground Storage Tank |
| UW | Universal Waste |
| XRF | X-Ray Fluorescent |

# Executive Summary

EBA Engineering, Inc. (EBA) was retained by Whitman Requardt and Associates, LLP (WRA) to perform a Limited Hazardous Materials Survey (LHMS) of the Towson Water Pumping Stations No 2. and No 3. (herein referred to as the Subject Property) located at 401 Hillen Road Towson, MD 21286.

Pump Station No. 2 consists of one improvement containing a First Floor (FF) which provides access to the (SL1) and Sub-Level 1 (SL1). SL1 contains the stations controls, sludge motors, pumps, and associated piping. Pump Station No. 3 consists of one improvement containing a First Floor (FF) and one Sub-Level 1 (SL1). The FF contains one office, a bathroom, the stations controls, and provides access to SL1. SL1 contains the sludge motors, pumps, and associated piping.

This hazardous materials survey was performed to identify hazardous materials that may be impacted during renovation activities. The hazardous materials of concern include Asbestos Containing Building Materials (ACBM), Lead Based Paint (LBP), liquid phase Polychlorinated Biphenyls, Ozone-Depleting Compounds, Universal Wastes and Miscellaneous Materials.

The results of the survey have identified hazardous materials located within the Subject Property. These materials are summarized below:

**Asbestos Containing Building Materials**

The results of the survey show that asbestos containing building materials are present at the Subject Property. 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 the following items identified in the building are considered Class II asbestos work by the OSHA regulation:

- Electrical Wire Insulation
- Valve Packings
- Exterior Window Glazing, White

Class II asbestos work must be performed by trained employees using work practices required by the OSHA standard.

Electrical wire insulation and valve packings were assumed to contain asbestos because of risks associated with sampling these materials. It may be cost effective to have these materials sampled and analyzed at an appropriate time to allow for them to be definitively categorized.

All of these materials are non-friable asbestos containing. EPA regulations do not apply to non-friable asbestos containing materials unless they will be made friable during construction.

A summary of ACBM are shown in the **table** below.

| Quantities for Positive ACBMs | | |
|---|---|---|
| **Material Type** | **Quantity** | **Unit of Measure** |
| **Pump Station No. 2** | | |
| Electrical Wire Insulation | Unknown | Linear Feet (LF) |
| Valve Packings | Unknown | Each |
| **Pump Station No. 3** | | |
| Electrical Wire Insulation | Unknown | LF |
| Valve Packings | Unknown | Each |
| Exterior Window Glazing White | 36 | LF |

## Lead-Based Paint

Lead based paints were identified in Pump Station No. 2 atop the door jambs located on the interior stairwell. In addition, LBP was identified in Pump Station No. 3 atop the door frames of the access doors located at grade. The presence of LBP triggers EPA and OSHA regulatory standards (29 CFR 1926.62).

Demolition debris with LBP flooring may be disposed of in a Construction and Debris (C&D) landfill 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 containing LBP can be recycled.

## Polychlorinated Biphenyls

EBA identified equipment suspected of containing liquid PCB at the Subject Property as in the table below.

| Quantities for PCBs | | |
|---|---|---|
| **Equipment Type** | **Quantity** | **Unit of Measure** |
| **Pump Station No. 2** | | |
| Ballasts | 17 | Each |
| **Pump Station No. 3** | | |
| Ballasts | 19 | Each |
| Leaking Ballasts | 4 | Each |

PCB containing ballasts become a concern if they are leaking or they will be removed and disposed of as hazardous waste. According to EPA Toxic Substances Control

regulations (TSCA) in 40 CFR Part 761, the material must be incinerated. The entire lighting fixture does not need special handling and disposal as long as the ballast is not

leaking. The non-leaking ballasts can be removed and recycled or disposed of properly. Ballasts that have been removed from service and the containers that they are stored in must be labeled according to EPA labeling requirements specified in 40 CFR Part 262 Subpart C. Leaking PCB ballasts, if present, shall be disposed of at an approved EPA incinerator.

## Ozone-Depleting Compounds

EBA did not identify equipment suspected of containing Ozone Depleting Compounds (ODCs) at the Subject Property.

## Universal Wastes

Universal wastes were identified in the form of High-Intensity Discharge (HID) bulbs, mercury containing fluorescent light tubes, and batteries.

| Quantities for Universal Waste | | |
|---|---|---|
| **Equipment Type** | **Quantity** | **Unit of Measure** |
| **Pump Station No. 2** | | |
| 4' Fluorescent light tubes | 32 | Each |
| 1' Fluorescent light tubes | 1 | Each |
| Batteries Lead Acid | 4 | Each |
| **Pump Station No. 3** | | |
| HID Light Bulbs | 14 | Each |
| 4' Fluorescent light tubes | 41 | Each |
| 2' Fluorescent light tubes | 1 | Each |
| Batteries Lead Acid | 2 | Each |

All waste is to be placed in a container that: is structurally sound, will prevent damage to the contents, is compatible with its contents, and kept closed at all times (except when adding to or removing from the container). The container must be without damage, or evidence of spillage, that could lead to leakage of the waste contained inside. Disposal of controlled hazardous waste is outlined in Title 26, Subtitle 13 in the Code of Maryland Regulations (COMAR 26.13).

## Miscellaneous Materials

Miscellaneous Materials include pressurized cylinders, paints, lubricants, degreasers and other potentially hazardous materials in quantities greater than 5-gallons.

| Quantities for MM | | |
|---|---|---|
| **Equipment Type** | **Quantity** | **Unit of Measure** |
| **Pump Station No. 2** | | |
| Fire Extinguishers | 1 | Each |
| D-Chlor | 1 | 5 Gallon |
| Gasoline | 1 | 5 Gallon |
| **Pump Station No. 3** | | |
| Fire Extinguishers | 2 | Each |
| D-Chlor | 1 | 5 Gallon |
| Hydrocide | 1 | 5 Gallon |

Fire extinguishers were observed at the Subject Property. Should these fire extinguishers be permanently removed from service during renovation activities, It is recommended to dispose of fire extinguishers in accordance with "Guide to the Disposal of Condemned Fire Extinguishers" published by the Fire Extinguishing Trades Association, Fact File No. 108 dated February 2004.

Coatings in the form of Hydrocide 700B, water conditioner in the form of D-Chlor, and petroleum products in the form of gasoline were noted at the subject property. If these products are not utilized for day to day maintenance activities, it is recommended that they be collected, separated, and categorized in accordance with the hazardous and non-hazardous waste regulations. The disposal of hazardous waste is regulated by the EPA in 40 CFR 266. Non-hazardous materials can be disposed of in a municipal C&D facility.

**END OF SECTION**

# 1.0 Introduction

Interior and exterior areas at the Subject Property were inspected to identify certain potentially hazardous materials that may be affected by demolition and/or renovation activities. Specifically the hazardous materials of concern include Asbestos Containing Building Materials, Lead-Based Paints, Liquid Polychlorinated Biphenyls, Ozone-Depleting Compounds, Universal Wastes, and Miscellaneous Materials. Photographs obtained 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. ACBM means any material or product, which contains greater than one percent (1%) asbestos. ACBM is divided into three categories in the OSHA regulation. These categories are thermal system insulation, surfacing materials, and miscellaneous materials. Each shall be discussed in turn:

- Thermal System Insulation (TSI) materials are those materials applied to pipes, fittings, boilers, breeching tanks, duct, 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 Materials include interior/exterior building material on structural or interior/exterior components, such as fixtures, floor and ceiling tiles, interior plasters, and does not include surfacing material or thermal system insulation.

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 61 and COMAR 26.11.21.

RACM includes the following:

- Friable ACM
- Category I non-friable ACM (flooring, asphalt roofing, packing’s, gaskets) that becomes friable
- Category I non-friable ACM that will be or has been subjected to sanding, grinding, cutting, or abrading
- Category II non-friable ACM (non-friable other than Cat. I) that has a high probability of becoming or has become crumbled, pulverized, or reduced to powder by demolition activities.

Asbestos is further classified as either 'Friable' or 'Non-Friable'. Friable asbestos material is defined as more than 1% asbestos that, when dry, can be crumbled, pulverized or reduced to powder by hand pressure. Non-friable asbestos materials are also subcategorized as Category I and Category II where Category I includes resilient floor covering, mastic, asphalt roofing, packing, and gaskets. Category II includes all other non-friable asbestos materials.

## 1.2 Lead Based Paints

The Maryland Department of Environment (MDE) definition of LBP is used as the basis for this screening. Lead-based paint is defined as paint or coating that contains lead 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 level 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% by weight, as determined through laboratory analysis Method SW846-7420. Since removal of paint chips is required, this method is considered a destructive testing technique.

## 1.3 Liquid Polychlorinated Biphenyls Containing Equipment

PCB are mixtures of synthetic organic chemicals with the same basic chemical structure and similar physical properties ranging from oily liquids to waxy solids. They are produced by attaching one or more chlorine atoms to a biphenyl molecule. Due to their non-flammability, chemical stability, high boiling point and electrical insulating properties, PCB were used in hundreds of industrial and commercial applications including electrical, heat transfer, and hydraulic equipment; as plasticizers in paints, plastics and rubber products; in pigments, dyes and carbonless copy paper and many other applications. More than 1.5 billion pounds of were manufactured in the United States prior to cessation of production in 1977 (EPA, 2005)

Concern over the toxicity and occurrence in the environment of PCB led Congress in 1976 to enact §6(e) of the Toxic Substances Control Act that included among other things, prohibitions on the manufacture, processing, and distribution in commerce of

PCB. Thus, TSCA legislated true "cradle to grave" (i.e., from manufacture to disposal) management of PCB in the United States (EPA, 2005).

PCB contaminated material is defined by the EPA as containing greater than 50 parts per million (>50 ppm). PCB was commonly sold in the United States of America under the trade name "Arocolor." However, companies that used PCB in the manufacture of transformers and capacitors often used other trade names. According to the U.S. EPA, all ballasts manufactured prior to July 1978 have a greater than 50% chance of containing PCB at 50 ppm or greater. Ballasts manufactured after July 1978 are required to bear a “No PCB” label indicating they do not contain PCB.

This study did not test for non-liquid PCB.

## 1.4 Ozone-Depleting Compounds

ODC are generally small organic molecules (less than 3 carbons) that contain chlorine, fluorine, or bromine. Some uses of ODC 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 (most harmful) and Class II (less harmful).

Class I substances are those with an ozone-depletion potential of 0.2 or higher. Class I substances identified in Title VI are chlorofluorocarbons (CFCs), halons, carbon tetrachloride and 1,1,1-trichloroethane (methyl chloroform). These chlorine-based chemicals account for about 80 percent of ozone depletion.

Class II substances are those with an ozone-depletion potential less than 0.2. Currently, all of the hydro chlorofluorocarbons (HCFCs or HFCs), which are replacing the more ozone-depleting compounds, are listed as Class II substances.

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. The refrigerants currently used for reefer containers comprise mostly R-22, R-134a, R-404a and R-409a which fall under HFC or HCFC.

This study investigated the presence of refrigerants that would be impacted by construction.

## 1.5 Universal Wastes

A UW is a common product, found in considerable quantities, that exhibits low-level hazards. UW includes batteries, pesticides, thermostats, and mercury containing equipment. All UW must be handled in a way as to prevent the release of the hazardous

waste 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.

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).

A universal waste lamp is a bulb/tube containing mercury that is part of an electric lighting device, including fluorescent, neon, mercury vapor, metal halide, and a variety of other lamps.

Pesticides are any substance/chemical designed to control and manage pests.

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 about 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.

## 1.6 Miscellaneous Materials

Other hazardous materials that may be present include aboveground and underground storage tanks, pressurized cylinders, paints, lubricants, degreasers, and other potentially hazardous materials in quantities greater than 5-gallons.

## 1.7 Limitations and Exclusions

Limitations:

- Areas above and behind fixed substrates (plaster, drywall, masonry block, concrete, etc.) were not accessed as the survey was limited to non-intrusive measures.
- Sampling of energized components was not performed due to risk of electrical hazards.
- Quantities of hazardous materials are valid at the time of this report. Quantities may change in the future due to daily operations of the Subject Property.

**END OF SECTION**

# 2.0 Asbestos Containing Materials

The National Emission Standard for Hazardous Air Pollutants (NESHAP) requires the building owner/operator to perform an asbestos inspection of affected portion(s) of facilities prior to demolition or renovation.

Asbestos Hazard Emergency Response Act (AHERA) accredited Asbestos Inspectors performed asbestos inspections 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 a non-intrusive investigation to identify suspect asbestos-containing building materials in accessible building areas.

### 2.1.1 Records Review

Records review consists of reviewing previous asbestos inspections, reports, abatement records and/or site drawings if any are available that are associated with the facility.

### 2.1.2 Onsite Investigation

The onsite investigation involved a combination of visual assessments and destructive sampling methodologies. Visual assessments primarily focused on identifying materials to be assessed. Destructive sampling was only employed where suspect ACBM was identified. Samples from non-friable materials were taken from inconspicuous locations. Samples from suspect friable materials were patched in a manner to limit the release of potential asbestos fibers.

### 2.1.3 Sample Collection and Analysis

EBA collected samples of materials that were suspected of containing asbestos in accordance to 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 **Table 1**.

| Table 1 – AHERA Asbestos Sampling Protocol Per Category | | |
|---|---|---|
| **Surfacing Materials** | **Thermal System Insulation** | **Miscellaneous Materials** |
| 3 samples per area ≤ 1,000 $ft^2$ | 3 samples for each TSI material | Sample in a manner sufficient to determine (Note – EBA's Standard Operating Procedure is to collect at least 2 samples per homogenous area) |
| 5 samples per area > 1,000 $ft^2$ | 1 sample per area of patched insulation (<6 linear or squared feet) | |
| 7 samples per area > 5,000 $ft^2$ | 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 | |

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 airborne asbestos by TEM and for the analysis of bulk asbestos by PLM.

## 2.2 Results

### 2.2.1 Records Review-As - Builts

Markups of County Record Drawings were made available for review. A copy of these records is included in **Appendix H**.

### 2.2.2 Suspect Samples Collected & Analyzed

Asbestos Containing Building Materials were identified at the Subject Property during the survey. **Table 2** provided below denotes all of the positive ACBM materials while **Appendix C** provides a listing of all samples collected at the Subject Property.

| Table 2 – Summary Laboratory Analytical Results | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Sample ID** | **Material Description** | **Color** | **Location** | **Category** | **Friable (Yes or No)** | **PLM Analysis** | **RACM** |
| 3212-15-000-17 | Exterior Window Glazing | White | Exterior window, Wall B | M | No | 2% Chrysotile | No |

ND=Non-Detect; M=Miscellaneous; TSI=Thermal System Insulation

### 2.2.3 Presumed Asbestos Containing Materials

Presumed Asbestos Containing Materials (PACM) as defined by OSHA includes thermal system insulation and surfacing material found in a building constructed no later than 1980. In addition, OSHA standards also require asphalt and vinyl flooring material installed no later than 1980 to be "considered" and "treated" as asbestos containing until specific testing is performed to disprove its presence. PACM were not observed on the Subject Property.

### 2.2.4 Assumed Asbestos Containing Materials

Assumed ACM includes any material that is suspected to contain asbestos and that was not sampled. The following type of building materials could not be sampled:

- Electrical Wire Insulation
- Valve Packings

### 2.2.5 Quantities for ACBM

Quantities for ACBM are listed by material type in the **Table** below.

| **Quantities for Positive ACBMs** | | |
|---|---|---|
| **Material Type** | **Quantity** | **Unit of Measure** |
| **Pump Station No. 2** | | |
| Electrical Wire Insulation | Unknown | Linear Feet (LF) |
| Valve Packings | Unknown | Each |
| **Pump Station No. 3** | | |
| Electrical Wire Insulation | Unknown | LF |
| Valve Packings | Unknown | Each |
| Exterior Window Glazing White | 36 | LF |

**END OF SECTION**

# 3.0 Lead Based Paint

Lead Based Paint Inspector(s), as certified through Maryland Department of Environment, performed LBP inspections of accessible interior and exterior portions of the Subject Property. Certificates of the inspector(s) are included in **Appendix D.**

## 3.1 Inspection and Analytical Methodology

EBA performed a limited (screening) survey to identify locations of LBP that may be disturbed by demolition activities. The survey was intended to determine:

- Whether lead-based paint is present in the structure including the exterior surfaces; and,
- If present, which building components contain lead-based paint?

Subject Property areas and components that appear to have a similar painting history and substrate shall be grouped together for sampling purposes. This survey was not intended to be comprehensive surface-by-surface inspection (i.e. HUD level inspection) survey 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: facing North is Wall A, facing East is Wall B, facing South is Wall C, and facing West is Wall D.

### 3.1.1 Records Review

Records review consists of reviewing previous lead inspections, reports, abatement records and/or site drawings if any are available that are 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. Surface coatings were considered LBP if the XRF result exceeds the State of Maryland definition of LBP of 0.7 milligrams per square centimeter (> 0.7mg/cm$^2$). An XRF performance characteristic sheet is included in **Appendix E**. The performance characteristic sheet specifies calibration tolerances, XRF indices for positive, negative, and inclusive 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% by weight, as determined through laboratory analysis Method SW846-7420. In the event readings from the XRF were reported as inconclusive, paint chip samples were collected and analyzed. Paint chip samples were also collected in the event there was limited access to or irregular shaped surfaces of the substrate. Paint chip analysis is considered the most accurate method for measuring lead in paint.

## 3.2 Results

### 3.2.1 Records Review

Markups of County Record Drawings were made available for review. A copy of these records is included in **Appendix H**.

### 3.2.2 XRF Results

Lead-based paints were identified at the Subject Property during the survey atop following substrates:

- Pump Station No. 2
  - Interior - Stairwell
    - Door frame, Metal, Tan
    - Door jamb, Metal, Tan

- Pump Station No. 3
  - Interior - SL1
    - Support Pipe, Metal, Red
  - Exterior
    - Door, Metal, Grey

See **Appendix A** for photos of components containing lead-based paint. **Appendix F** contains the XRF data sheets from all suspect LBP materials.

### 3.2.3 Paint Chip Analysis

EBA collected a total of four (4) paint chip samples at the Subject Property. Paint chip samples were submitted to AMA Analytical Inc (AMA), an EPA National Lead Laboratory Accreditation Program (NLLAP) accredited laboratory.

Results of the AMA analysis indicated that lead-based paints were identified at the Subject Property during the survey as noted in **Table 3** provided below. AMA paint chip laboratory analytical results are included in **Appendix G.**

| Table 3 – Summary Laboratory Analytical Results | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Component** | **Member** | **Substrate** | **Side** | **Color** | **Floor** | **Room** | **% Weight** |
| **Pump Station No. 2** | | | | | | | |
| **Door** | **Jamb** | **Metal** | **B** | **Tan** | **Stairwell** | **Stairwell** | **1.5** |
| Door | Frame | Metal | B | Tan | Stairwell | Stairwell | 0.084 |
| **Pump Station No. 3** | | | | | | | |
| **Door** | **Frame** | **Metal** | **C** | **Grey** | **1** | **Exterior** | **0.51** |
| Column | Support | Metal | West Wall | Red | SL1 | Pump Rm | 0.06 |

As previously mentioned, paint chip analysis is considered the most accurate method for measuring lead in paint. The results of the paint chip analysis confirm the following:

- Door jambs of Pump Station No.2 contain LBP.
- Door frames of Pump Station No.2 do not contain LBP.
- Door frames of Pump Station No.3 contain LBP.
- Column supports of Pump Station No.3 do not contain LBP.

**END OF SECTION**

# 4.0 Liquid Polychlorinated Biphenyl Containing Equipment

The onsite inspectors investigated the Subject Property for equipment containing liquid PCB during the course of the survey.

## 4.1 Inspection and Analytical Methodology

The Subject Property was inspected for equipment that may have contained liquid PCB. Such equipment commonly includes light ballasts located within fluorescent light fixtures, electrical transformers, and hydraulic equipment. No analysis was performed in association with PCB containing equipment. Inspection for materials containing non-liquid PCB was not included.

### 4.1.1 Records Review

Records review consists of reviewing previous PCB containing equipment inspections, reports, abatement records and/or site drawings if any are available that are associated with the facility.

### 4.1.2 Onsite Investigation

The onsite investigation involved a visual assessment of suspect equipment. The visual assessment focused on identifying suspected equipment that may contain PCB. If required, EBA performed limited dismantling of the equipment in order to visually confirm the presence or absence of oil suspected of containing PCB. Representative (5% to 10% of total) fluorescent light fixtures were disassembled and inspected.

### 4.1.3 Manufacturer and Utility Review

If the presence or absence of suspected PCB containing 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 suspected equipment.

## 4.2 Results

### 4.2.1 Records Review

Markups of County Record Drawings were made available for review. A copy of these records is included in **Appendix H**.

### 4.2.2 Onsite Investigation

EBA identified equipment suspected of containing liquid PCB in the following forms:

Ballasts suspected of containing PCB at the Subject Property as these ballasts did not contain a "No-PCB" stamp. An approximate number of ballasts are listed in the table below.

| Lighting Ballast Quantity and Type | | | | |
|---|---|---|---|---|
| **Manufacturer** | **Type** | **"No-PCB" Label (Y/N)** | **Quantity Surveyed** | **Unit of Measure** |
| Jefferson Ballast | 300-701-799 | N | 5 | Each |
| Unknown | Unknown | Unknown | 35 | Each |

EBA identified five suspect transformers as follows:

**Pump Station No. 2**

- One (1) transformer manufactured by Westinghouse was determined to be of DRY-TYPE.
- One (1) transformer manufactured by Eaton was determined to be of DRY-TYPE.

**Pump Station No. 3**

- Two (2) General Electric pad mounted transformers were determined to be of DRY-TYPE.
- One (1) transformer (manufacturer unknown) was determined to be of Dry-Type

Example photos of the suspected PCB are included in **Appendix A**.

### 4.2.3 Manufacturers Review

EBA did not identify any liquid PCB containing equipment at the Subject Property that required this type of review.

### 4.2.4 Quantities for Liquid PCB

| Quantities for PCBs | | |
|---|---|---|
| **Equipment Type** | **Quantity** | **Unit of Measure** |
| **Pump Station No. 2** | | |
| Ballasts | 17 | Each |
| **Pump Station No. 3** | | |
| Ballasts | 19 | Each |
| Leaking Ballasts | 4 | Each |

**END OF SECTION**

# 5.0 Ozone-Depleting Compounds

The onsite inspectors investigated the Subject Property for equipment historically known to contain ODC during the course of the survey. ODC contain molecules of chlorine, fluorine, or bromine. Title VI of the United States Clean CAA of 1990 has defined ozone-depleting substances as belonging to Class I (most harmful) and Class II (less harmful).

## 5.1 Inspection and Analytical Methodology

The Subject Property was inspected for historically known ODC containing equipment. Such equipment commonly includes CFCs within refrigerators, window air conditioning units, water fountains, and chillers. No analysis was performed in association with equipment containing ODC.

### 5.1.1 Records Review

Records review consists of reviewing previous ODC containing equipment inspections, reports, abatement records and/or site drawings if any are available that are associated with the facility.

### 5.1.2 Onsite Investigation

The onsite investigation involved a visual assessment of suspect equipment. The visual assessment focused on identifying suspected equipment that may contain ODC. If required, EBA performed limited dismantling of the equipment that was not currently in operation in order to visually confirm the presence or absence of ODC.

### 5.1.3 Manufacturer and Utility Review

If the presence or absence of suspected ODC containing 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 suspected equipment.

## 5.2 Results

### 5.2.1 Records Review

Markups of County Record Drawings were made available for review. A copy of these records is included in **Appendix H**.

### 5.2.2 Onsite Investigation

ODCs were not identified on the Subject Property.

### 5.2.3 Manufacturers Review

EBA did not identify any ozone depleting chemicals at the Subject Property that required this type of review.

### 5.2.4 Quantities for Ozone Depleting Compounds

None.

**END OF SECTION**

# 6.0 Universal Wastes

The onsite inspector investigated the Subject Property for items classified as UW during the course of the survey.

## 6.1 Inspection and Analytical Methodology

The Subject Property was inspected for equipment classified as UW. Such equipment commonly includes mercury containing light fixtures, mercury containing thermostats, batteries and pesticides. No analysis was performed in association with UW.

### 6.1.1 Records Review

Records review consists of reviewing previous UW inspections, reports, abatement records and/or site drawings if any are available that are associated with the facility.

### 6.1.2 Onsite Investigation

The onsite investigation involved a visual assessment that focused on identifying suspected equipment that may contain UW. EBA performed limited dismantling of the equipment to confirm the presence or absence of a UW.

### 6.1.3 Manufacturer Review

If the presence or absence of suspected UW could not be confirmed in the field, EBA conducted additional research by contacting the manufacturer and obtaining information on the suspected equipment.

## 6.2 Results

### 6.2.1 Records Review

Markups of County Record Drawings were made available for review. A copy of these records is included in **Appendix H**.

### 6.2.2 Onsite Investigation

The results of the on-site investigation confirmed UW was present in the following forms:

- HID light bulbs
- Fluorescent light bulbs
- Batteries

Example photos of the equipment or items containing UW are included in **Appendix A**.

### 6.2.3 Manufacturer Review

EBA did not identify any UW at the Subject Property that required this type of review.

### 6.2.4 Quantities for Universal Waste

| Quantities for Universal Waste | | |
|---|---|---|
| **Equipment Type** | **Quantity** | **Unit of Measure** |
| **Pump Station No. 2** | | |
| 4' Fluorescent light tubes | 32 | Each |
| 1' Fluorescent light tubes | 1 | Each |
| Batteries Lead Acid | 4 | Each |
| **Pump Station No. 3** | | |
| HID Light Bulbs | 14 | Each |
| 4' Fluorescent light tubes | 41 | Each |
| 2' Fluorescent light tubes | 1 | Each |
| Batteries Lead Acid | 2 | Each |

**END OF SECTION**

# 7.0 Miscellaneous Materials

The onsite inspector investigated the Subject Property for items classified as MM during the course of the survey.

## 7.1 Inspection and Analytical Methodology

The Subject Property was inspected for items that may be hazardous but not necessarily fit into prior classifications. Such MM include aboveground and underground storage tanks, pressurized cylinders, paints, lubricants, degreasers and other potentially hazardous materials in quantities greater than 5-gallons were documented. No analysis was performed in association with MM.

### 7.1.1 Records Review

Limited As-Builds titled “Towson Water Pumping Station” a copy of these records are included in **Appendix H**.

### 7.1.2 Onsite Investigation

The onsite investigation involved a visual assessment that focused on identifying MM of concern.

### 7.1.3 Manufacturer Review

If the presence or absence of suspected MM of concern could not be confirmed in the field, EBA conducted additional research by contacting the manufacturer and obtaining information on the suspected materials.

## 7.2 Results

### 7.2.1 Records Review

Limited As-Builds titled “Towson Water Pumping Station” were made available for review. A copy of these records is included in **Appendix H**.

### 7.2.2 Onsite Investigation

Miscellaneous materials were observed at the Subject Property in the following forms:

- Fire Extinguishers
- Gasoline/ Petroleum Products
- Water Treatment Chemicals (D-Chlor)
- Coatings (Hydrocide 700B)

### 7.2.3 Manufacturer Review

EBA did not identify any miscellaneous materials exhibiting other hazardous characteristics at the Subject Property that required this type of review.

### 7.2.4 Quantities for Miscellaneous Materials

| Quantities for MM | | |
|---|---|---|
| **Equipment Type** | **Quantity** | **Unit of Measure** |
| **Pump Station No. 2** | | |
| Fire Extinguishers | 1 | Each |
| D-Chlor | 1 | 5 Gallon |
| Gasoline | 1 | 5 Gallon |
| **Pump Station No. 3** | | |
| Fire Extinguishers | 2 | Each |
| D-Chlor | 1 | 5 Gallon |
| Hydrocide | 1 | 5 Gallon |

Example photos of the equipment or items containing MM are included in **Appendix A**.

**END OF SECTION**

# 8.0 Recommendations/Conclusions

The results of the survey indicate hazardous materials do exist within the limits of the Subject Property and will trigger Federal, State, and Local regulations during future demolition activities.

## 8.1 Asbestos Containing Building Materials

The results of the survey show that ACBM are present at the Subject Property. 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 the following items identified in the building are considered Class II asbestos work by the OSHA regulation:

- Electrical Wire Insulation
- Valve Packings
- Exterior Window Glazing, White

Class II asbestos work must be performed by trained employees using work practices required by the OSHA standard.

Electrical wire insulation and valve packings were assumed to contain asbestos because of risks associated with sampling these materials. It may be cost effective to have these materials sampled and analyzed at an appropriate time to allow for them to be definitively categorized.

All of these materials are non-friable asbestos containing material EPA regulations do not apply to non-friable asbestos containing materials unless they will be made friable during construction.

## 8.2 Lead-Based Paint

Lead based paints were identified in Pump Station No. 2 atop the door jambs located on the interior stairwell. In addition, LBP was identified in Pump Station No. 3 atop the door frames of the access doors located at grade. The presence of LBP triggers EPA and OSHA regulatory standards (29 CFR 1926.62).

Demolition debris with LBP may be disposed of in a C&D landfill 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 containing LBP can be recycled.

## 8.3 Liquid Polychlorinated Biphenyl Containing Equipment

Liquid Polychlorinated Biphenyl (PCB) containing equipment was identified in the form of ballasts.

PCB containing ballasts become a concern if they are leaking or they will be removed and disposed of as hazardous waste. According to EPA TSCA in 40 CFR Part 761, the material must be incinerated. The entire lighting fixture does not need special handling and disposal as long as the ballast is not leaking. The non-leaking ballasts can be removed and recycled or disposed of properly. Ballasts that have been removed from service and the containers that they are stored in must be labeled according to EPA labeling requirements specified in 40 CFR Part 262 Subpart C (Jacobson, 2006). Leaking PCB ballasts, if present, shall be disposed of at an approved EPA incinerator.

## 8.4 Universal Wastes

Universal wastes were identified in the form of mercury containing fluorescent light tubes, High-Intensity Discharge (HID) bulbs, and batteries.

All waste is to be placed in a container that: is structurally sound, will prevent damage to the contents, is compatible with its contents, and kept closed at all times (except when adding to or removing from the container). The container must be without damage, or evidence of spillage, that could lead to leakage of the waste contained inside. Disposal of controlled hazardous waste is outlined in COMAR 26.13 and EPA's regulations at 40 CFR 273.10 through 273.20.

## 8.5 Miscellaneous Materials

Fire extinguishers were observed at the Subject Property. Should these fire extinguishers be permanently removed from service during renovation activities, It is recommended to dispose of fire extinguishers in accordance with "Guide to the Disposal of Condemned Fire Extinguishers" published by the Fire Extinguishing Trades Association, Fact File No. 108 dated February 2004.

Coatings in the form of Hydrocide 700B, water conditioner in the form of D-Chlor, and petroleum products in the form of gasoline were noted at the subject property. If these products are not utilized for day to day maintenance activities, it is recommended that they be collected, separated, and categorized in accordance with the hazardous and non-hazardous waste regulations. The disposal of hazardous waste is regulated by the EPA in 40 CFR 266. Non-hazardous materials can be disposed of in a municipal C&D facility.

**END OF SECTION**

# Appendix A – Photographs

**Photo 1**

Overview of Building Pump Station No. 2 facing North (Wall C).

**Photo 2**

Overview of Building Pump Station No. 2 facing West (Wall B).

**Photo 3**

Overview of Building Pump Station No. 2 facing South (Wall A).

**Photo 4**

Overview of Building Pump Station No. 2 facing East (Wall D).

**Photo 5**

Overview of Building Pump Station No. 3 facing North (Wall C).

**Photo 6**

Overview of Building Pump Station No. 3 facing West (Wall B).

**Photo 7**

Overview of Building Pump Station No. 3 facing South (Wall A).

**Photo 8**

Overview of Building Pump Station No. 2 facing East (Wall D).


**Photo 9**

Exterior White Window Glazing sampled along Wall C contains asbestos.


**Photo 10**

Tan, Metal, Door Jamb, Pump Station No. 2 located on the Interior Stairwell. Door Jamb was positive via XRF and paint chip analysis.

**Photo 11**

Grey, Door Frame, Exterior, Wall C, Pump Station No. 3 tested positive for lead via XRF and paint chip analysis.

**Photo 12**

Leaking light Ballast, Pump Station No. 3, does not have a “NO PCB” label.


**Photo 13**

One of Five Lead Acid battery (typical).

**Photo 14**

One of three different types of light fixtures containing fluorescent light bulbs.

**Photo 15**

High-intensity Discharge light bulb Pump Station No. 3 (typical)

**Photo 16**

One of (3) fire extinguishers observed.


**Photo 17**

Five (5) Gallon bucket of D-Chlor water conditioner found in both Pump Station No. 2 and Pump Station No. 3.

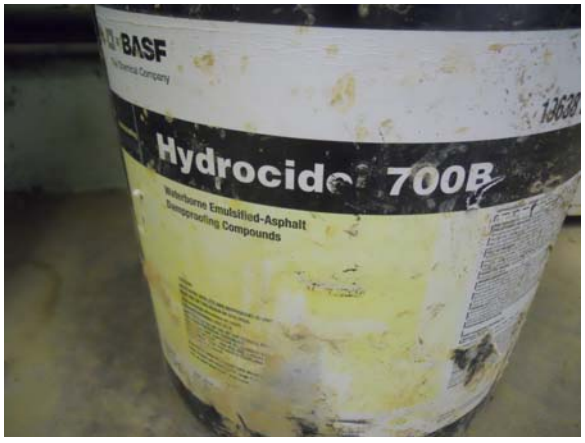



**Photo 18**

Five (5) Gallon bucket of Hydrocide coating found in Pump Station No. 3.

# Appendix B – Certificates of AHERA Inspectors

# AEROSOL MONITORING & ANALYSIS, INC.

*This is to certify that*

## KELLY RIDGEL

*has met the attendance requirements and successfully completed the course entitled*

### 4-Hour EPA AHERA Inspector Refresher

*For Accreditation Under TSCA Title II*

975

| 05/09/2012 | 05/09/2012 | 5/9/2013 | DAVID TRUMAN | David Truman |
|---|---|---|---|---|
| ***Course Date*** | ***Exam Date*** | ***Expiration Date*** | ***Principal Instructor*** | |
| 117353 | VA117353 | | E. Rush Barnett | E. Rush Barnett |
| ***Certification No.*** | ***Virginia Certification No.*** | | ***Course Director*** | |


*P.O.Box 646* *Hanover, MD 21076* *P: 410-684-3327* *F: 410-684-3724*

***www.amatraining.com***

# AEROSOL MONITORING & ANALYSIS, INC.

*This is to certify that*

## JAMES SINES

*has met the attendance requirements and successfully completed the course entitled*

*8-Hour EPA AHERA Insp/Mgmt Planner Refresher*

*For Accreditation Under TSCA Title II*

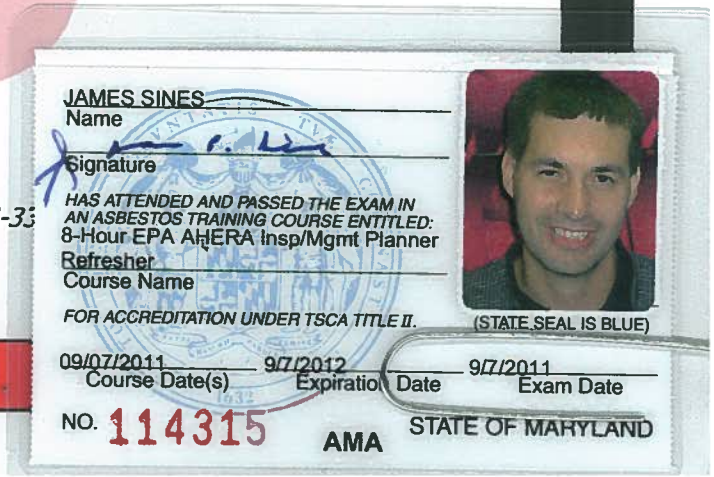
976

| 09/07/2011 | 09/07/2011 | 9/7/2012 | MIKE DRABO |
|---|---|---|---|
| ***Course Date*** | ***Exam Date*** | ***Expiration Date*** | ***Principal Instructor*** |

| 114315 | VA114315 | E. Rush Barnett |
|---|---|---|
| ***Certification No.*** | ***Virginia Certification No.*** | ***Course Director*** |

*1331 Ashton Road* *P.O.Box 646* *Hanover, MD 21076* *P: 410-684-33*

***www.amatraining.com***



# Appendix C – AMA Asbestos Laboratory Results

**AMA Analytical Services, Inc.**

*A Specialized Environmental Laboratory*

# CERTIFICATE OF ANALYSIS

NVLAP 101143-0

| | | | | | |
|---|---|---|---|---|---|
| **Client:** | EBA Engineering, Inc | **Job Name:** | Towson Reservoir Pumping Stations | **Chain Of Custody:** | 513235 |
| **Address:** | 4813 Seton Drive | **Job Location:** | Pumping Station 2, 3 and Storage Shed | **Date Analyzed:** | 7/2/2012 |
| | Baltimore, Maryland 21215 | **Job Number:** | 3212-15-000 | **Person Submitting:** | Kelly Ridgel |
| | | **P.O. Number:** | Not Provided | | |
| **Attention:** | Kelly Ridgel | | | | |



## Summary of Polarized Light Microscopy

| AMA Sample Number | Client Sample # | Total Asbestos | Chrysotile Percent | Amosite Percent | Crocidolite Percent | Other Asbestos Percent | Mineral Wool Percent | Fiberglass Percent | Organic Percent | Synthetic Percent | Other Percent | Particulate Percent | Sample Type | Sample Color | Homogeneity | Analyst ID | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12071969 | 3212-15-000-01 | NAD | -- | -- | -- | -- | -- | -- | -- | -- | -- | 100 | GK | Gray | Homogeneous | PC | |
| 12071970 | 3212-15-000-02 | NAD | -- | -- | -- | -- | -- | -- | -- | -- | -- | 100 | GK | Brown | Homogeneous | PC | |
| 12071971 | 3212-15-000-03 | NAD | -- | -- | -- | -- | -- | -- | 60 | -- | -- | 40 | GK | Brown | Homogeneous | PC | |
| 12071972 | 3212-15-000-04 | NAD | -- | -- | -- | -- | -- | -- | -- | -- | -- | 100 | GK | Brown | Homogeneous | PC | |
| 12071973 | 3212-15-000-05 | NAD | -- | -- | -- | -- | -- | -- | TR | -- | -- | 100 | GK | Brown | Homogeneous | PC | |
| 12071974 | 3212-15-000-06 | NAD | -- | -- | -- | -- | -- | -- | 10 | -- | -- | 90 | GK | Black | Homogeneous | PC | |
| 12071975 | 3212-15-000-07 | NAD | -- | -- | -- | -- | -- | -- | 10 | -- | -- | 90 | GK | Black | Homogeneous | PC | |
| 12071976 | 3212-15-000-08 | NAD | -- | -- | -- | -- | -- | -- | -- | -- | -- | 100 | GK | Black | Homogeneous | PC | |
| 12071977 | 3212-15-000-09 | NAD | -- | -- | -- | -- | -- | -- | -- | -- | -- | 100 | GK | Black | Homogeneous | PC | |
| 12071978 | 3212-15-000-10 | NAD | -- | -- | -- | -- | -- | 20 | -- | -- | -- | 80 | VIB | Black | Homogeneous | PC | |

**AMA Analytical Services, Inc.**

*A Specialized Environmental Laboratory*

# CERTIFICATE OF ANALYSIS

NVLAP 101143-0

| | | | | | |
|---|---|---|---|---|---|
| **Client:** | EBA Engineering, Inc | **Job Name:** | Towson Reservoir Pumping Stations | **Chain Of Custody:** | 513235 |
| **Address:** | 4813 Seton Drive | **Job Location:** | Pumping Station 2, 3 and Storage Shed | **Date Analyzed:** | 7/2/2012 |
| | Baltimore, Maryland 21215 | **Job Number:** | 3212-15-000 | **Person Submitting:** | Kelly Ridgel |
| | | **P.O. Number:** | Not Provided | | |

**Attention:** Kelly Ridgel



## Summary of Polarized Light Microscopy

| AMA Sample Number | Client Sample # | Total Asbestos | Chrysotile Percent | Amosite Percent | Crocidolite Percent | Other Asbestos Percent | Mineral Wool Percent | Fiberglass Percent | Organic Percent | Synthetic Percent | Other Percent | Particulate Percent | Sample Type | Sample Color | Homogeneity | Analyst ID | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12071979 | 3212-15-000-11 | NAD | -- | -- | -- | -- | -- | -- | -- | -- | -- | 100 | CK | Beige | Homogeneous | PC | |
| 12071980 | 3212-15-000-12 | NAD | -- | -- | -- | -- | -- | 50 | -- | -- | -- | 50 | CT | Multi | Layered | PC | |
| 12071981 | 3212-15-000-13 | NAD | -- | -- | -- | -- | -- | 50 | -- | -- | -- | 50 | CT | Multi | Layered | PC | |
| 12071982 | 3212-15-000-14 | NAD | -- | -- | -- | -- | -- | -- | -- | -- | -- | 100 | CK | Gray | Homogeneous | PC | |
| 12071983 | 3212-15-000-15 | NAD | -- | -- | -- | -- | -- | -- | -- | -- | -- | 100 | CK | Gray | Homogeneous | PC | |
| 12071984 | 3212-15-000-16 | NAD | -- | -- | -- | -- | -- | -- | -- | -- | -- | 100 | GZ | Gray | Homogeneous | PC | |
| 12071985 | 3212-15-000-17 | 2 | 2 | -- | -- | -- | -- | -- | -- | -- | -- | 98 | GZ | Off-White | Homogeneous | PC | |
| 12071986 | 3212-15-000-18 | NAD | -- | -- | -- | -- | -- | -- | TR | -- | -- | 100 | GZ | Gray | Homogeneous | PC | |
| 12071987 | 3212-15-000-19 | NAD | -- | -- | -- | -- | -- | -- | TR | -- | -- | 100 | GZ | Gray | Homogeneous | PC | |
| 12071988 | 3212-15-000-20 | NAD | -- | -- | -- | -- | -- | -- | -- | -- | -- | 100 | GK | Red | Homogeneous | PC | |

979

**AMA Analytical Services, Inc.**

*A Specialized Environmental Laboratory*

# CERTIFICATE OF ANALYSIS

NVLAP 101143-0

| | | | | | |
|---|---|---|---|---|---|
| **Client:** | EBA Engineering, Inc | **Job Name:** | Towson Reservoir Pumping Stations | **Chain Of Custody:** | 513235 |
| **Address:** | 4813 Seton Drive | **Job Location:** | Pumping Station 2, 3 and Storage Shed | **Date Analyzed:** | 7/2/2012 |
| | Baltimore, Maryland 21215 | **Job Number:** | 3212-15-000 | **Person Submitting:** | Kelly Ridgel |
| | | **P.O. Number:** | Not Provided | | |

**Attention:** Kelly Ridgel



## Summary of Polarized Light Microscopy

| AMA Sample Number | Client Sample # | Total Asbestos | Chrysotile Percent | Amosite Percent | Crocidolite Percent | Other Asbestos Percent | Mineral Wool Percent | Fiberglass Percent | Organic Percent | Synthetic Percent | Other Percent | Particulate Percent | Sample Type | Sample Color | Homogeneity | Analyst ID | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12071989 | 3212-15-000-21 | NAD | -- | -- | -- | -- | -- | -- | 40 | -- | -- | 60 | GK | Gray | Homogeneous | PC | |
| 12071990 | 3212-15-000-22 | NAD | -- | -- | -- | -- | -- | -- | -- | -- | -- | 100 | GK | Red | Homogeneous | PC | |
| 12071991 | 3212-15-000-23 | NAD | -- | -- | -- | -- | -- | -- | -- | -- | -- | 100 | FT | Beige | Homogeneous | PC | |

980

**AMA Analytical Services, Inc.**

*A Specialized Environmental Laboratory*

# CERTIFICATE OF ANALYSIS

NVLAP 101143-0

| | | | | | |
|---|---|---|---|---|---|
| **Client:** | EBA Engineering, Inc | **Job Name:** | Towson Reservoir Pumping Stations | **Chain Of Custody:** | 513235 |
| **Address:** | 4813 Seton Drive | **Job Location:** | Pumping Station 2, 3 and Storage Shed | **Date Analyzed:** | 7/2/2012 |
| | Baltimore, Maryland 21215 | **Job Number:** | 3212-15-000 | **Person Submitting:** | Kelly Ridgel |
| | | **P.O. Number:** | Not Provided | | |

**Attention:** Kelly Ridgel



## Summary of Polarized Light Microscopy

| AMA Sample Number | Client Sample # | Total Asbestos | Chrysotile Percent | Amosite Percent | Crocidolite Percent | Other Asbestos Percent | Mineral Wool Percent | Fiberglass Percent | Organic Percent | Synthetic Percent | Other Percent | Particulate Percent | Sample Type | Sample Color | Homogeneity | Analyst ID | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

The following footnotes only apply to those samples which the total asbestos result is flagged with a note number.

981 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 Chaikeenee **Analyst(s)** Peerawut Chaikeenee

# EBA Engineeering Asbestos Sample Data Sheet

| | | | |
|---|---|---|---|
| Project Name: | Towson Reservoir Pumping Stations | Inspector(s): | Kelly Ridgel |
| Project Location: | Pumping House 2 & 3 | Project Manager: | James Sines |
| Project Number: | 3212-15-000 | Date Sampled: | June 18-19, 2012 |

| Sample Number or ID | Material Description (Use FT-Floor Tile, CT-Ceiling Tile, PF-Pipe Fitting) | Color | Sample Location (Floor, Room) | ACBM Type (TSI or S or M) | Quantity | Friable (Y or N) |
|---|---|---|---|---|---|---|
| 3212-15-000-01 | Gasket Pump | Brn | Pumphouse #2 Pump D | M | | N |
| 3212-15-000-02 | Gasket Pump | Brn | Pumphouse #2 Pump C | M | | N |
| 3212-15-000-03 | Gasket Pump | Brn | Pumphouse #3 Pump E | M | | N |
| 3212-15-000-04 | Gasket Pump | Brn | Pumphouse #3 Pump F | M | | N |
| 3212-15-000-05 | Gasket Pump | Brn | Pumphouse #3 Pump G | M | | N |
| 3212-15-000-06 | Gasket 20" | Blk | Pumphouse #2 Pump D | M | | N |
| 3212-15-000-07 | Gasket 20" | Blk | Pumphouse #2 Pump C | M | | N |
| 3212-15-000-08 | Gasket 20" | Blk | Pumphouse #3 Pump E | M | | N |
| 3212-15-000-09 | Gasket 20" | Blk | Pumphouse #3 Pump F | M | | N |
| 3212-15-000-10 | Vibration Dampner | Blk | Pumphouse #2 south west wall | M | | N |
| 3212-15-000-11 | Caulking (wall) | White | Pumphouse #2 subsurface stairwell NW hall | M | | N |
| 3212-15-000-12 | CT | White | Pumphouse #3 Office | M | | N |
| 3212-15-000-13 | CT | White | Pumphouse #3 Office | M | | N |
| 3212-15-000-14 | Window Caulk | Grey | Pumphouse #3 Office south window | M | | N |
| 3212-15-000-15 | Window Caulk | Grey | Pumphouse #3 Office south window | M | | N |
| 3212-15-000-16 | Window Glazing | White | Pumphouse #3 Office south window | M | | N |
| 3212-15-000-17 | Window Glazing | White | Pumphouse #3 Office south window | M | | N |
| 3212-15-000-18 | Window Glazing | Grey | Pumphouse #3 Office south window | M | | N |
| 3212-15-000-19 | Window Glazing | Grey | Pumphouse #3 Office south window | M | | N |
| 3212-15-000-20 | Gasket 30" | Red | Pumphouse #3 Pump G | M | | N |
| 3212-15-000-21 | Gasket 48" | Blk | Pumphouse #3 Pump F | M | | N |
| 3212-15-000-22 | Gasket 48" | Red | Pumphouse #3 Pump G | M | | N |
| 3212-15-000-23 | Ft 12x12 | Tan | Storage Shed | M | | N |
| | **Homogeneous area** = Suspect Materials of one type and color | | **Samples required TSI** not assumed = 3 Patched <6 lf = 1 **Surfacing** ≤ 1000 sf = 3 > 1000 ≤ 5000 = 5 < 5000 = 7 EPA recs 9 **Misc.** = at least 3 | **TSI** = Thermal System Insulation **S** = Surface Material **M** = any other building material or structural component | | |

**AMA Analytical Services, Inc.**
Focused on Results www.amalab.com
AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

# CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 513235

**Mailing/Billing Information:**

1. Client Name: EBA Engineering, Inc.
2. Address 1: 4813 Seton Dr.
3. Address 2: Baltimore, MD 21215
4. Address 3:
5. Phone #: 410-358-7171 Fax #: 410-358-7213

**Submittal Information:**

1. Job Name: Towson Reservoir Pumping Stations
2. Job Location: Pumping Station 2, 3 and Storage Shed
3. Job #: 3212-15-000 P.O. #:
4. Contact Person: Kelly Ridgel @ phone # 410-504-6115
5. Submitted by: Kelly J Ridgel Signature:

**Reporting Information (Results will be provided as soon as technically feasible):**

**AFTER HOURS (must be pre-scheduled)**
❑ Immediate Date Due:
❑ 24 Hours Time Due:
Comments:

**NORMAL BUSINESS HOURS**
❑ Immediate ❑ 3 Day
❑ Next Day ☒ 5 Day + Date Due: 7/2/12
❑ 2 Day
~~❑~~ Results Required By Noon (Every Attempt Will Be Made to Accomodate)

**REPORT TO:**
❑ Include COC/Field Data Sheets with Report
❑ Email: @
❑ Fax:
❑ Verbals:

**Asbestos Analysis**
PCM Air – Please Indicate Filter Type:
❑ NIOSH 7400 (QTY)
❑ Fiberglass (QTY)
TEM Air – Please Indicate Filter Type:
❑ AHERA (QTY)
❑ NIOSH 7402 (QTY)
❑ Other (specify ) MRM (QTY)
PLM Bulk
☒ EPA 600 – Visual Estimate 4 23 (QTY)
❑ EPA Point Count (QTY)
❑ NY State Friable 198.1 (QTY)
❑ Grav. Reduction ELAP 198.6 (QTY)
❑ Other (specify ) (QTY)
MISC
❑ Vermiculite
❑ Asbestos Soil PLM (Qual) PLM (Quan) PLM/TEM (Qual) PLM/TEM (Quan)

TEM Bulk
❑ ELAP 198.4/Chatfield (QTY)
❑ NY State PLM/TEM (QTY)
❑ Residual Ash (QTY)
TEM Dust
❑ Qual. (pres/abs) Vacuum/Dust (QTY)
❑ Quan. (s/area) Vacuum D5755-95 (QTY)
❑ Quan. (s/area)Dust D6480-99 (QTY)
TEM Water
❑ Qual. (pres/abs) (QTY)
❑ ELAP 198.2/EPA 100.2 (QTY)
❑ EPA 100.1 (QTY)

A ☒ All samples received in good condition unless otherwise noted. (TEM Water samples °C)

**Metals Analysis**
❑ Pb Paint Chip (QTY)
❑ Pb Dust Wipe (wipe type ) (QTY)
❑ Pb Air (QTY)
❑ Pb Soil/Solid (QTY)
❑ Pb TCLP (QTY)
❑ Drinking Water ❑ Pb (QTY) ❑ Cu (QTY) ❑ As (QTY)
❑ Waste Water ❑ Pb (QTY) ❑ Cu (QTY) ❑ As (QTY)
❑ Pb Furnace (Media ) (QTY)
**Fungal Analysis**
Collection Apparatus for Spore Traps/Air Samples:
Collection Media
❑ Spore-Trap (QTY) ❑ Surface Vacuum Dust (QTY)
❑ Surface Swab (QTY) ❑ Culturable ID Genus (Media ) (QTY)
❑ Surface Tape (QTY) ❑ Culturable ID Species (Media ) (QTY)
❑ Other (Specify ) (QTY)

| SAMPLE INFORMATION: CLIENT ID NUMBER | SAMPLE LOCATION/ IDENTIFICATION | DATE | VOLUME (LITERS) | WIPE AREA | ANALYSIS: TEM | PCM | PLM | LEAD | MOLD | MATRIX: AIR | BULK | DUST | WATER/ LIQUID OTHER | SPORE TRAP | TAPE | SWAB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Please see attached field form | | | | | | | X | | | | X | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |

**CLIENT CONTACT** (LABORATORY STAFF ONLY)

| Date/Time: | Contact: | By: |
|---|---|---|
| | | |
| | | |
| | | |
| Date/Time: | Contact: | By: |
| | | |
| | | |
| | | |
| Date/Time: | Contact: | By: |
| | | |
| | | |
| | | |

**LABORATORY STAFF ONLY: (CUSTODY)**

1. Date/Time RCVD: 6/25/12 @800 Via: FEDEX SAT By (Print): MRM Sign:
2. Date/Time Analyzed: 7/2/12 @ By (Print): Peerawut Chaikeeree Sign: P. Cha
3. Results Reported To: Via: Fax Date: 7/2/12 Time: Initials: PC
4. Comments:

983

**AMA Analytical Services, Inc.**

*A Specialized Environmental Laboratory*

# CERTIFICATE OF ANALYSIS

NVLAP® 101143-0

| | | | | | |
|---|---|---|---|---|---|
| **Client:** | EBA Engineering, Inc | **Job Name:** | Towson Reservoir Pumping Stations | **Chain Of Custody:** | 513257 |
| **Address:** | 4813 Seton Drive | **Job Location:** | Pumping Station 2, 3 and Storage Shed | **Date Analyzed:** | 7/5/2012 |
| | Baltimore, Maryland 21215 | **Job Number:** | 3212-15-000 | **Person Submitting:** | Kelly J. Ridgel |
| | | **P.O. Number:** | Not Provided | | |
| **Attention:** | Kelly Ridgel | | | | |



## Summary of Polarized Light Microscopy

| AMA Sample Number | Client Sample # | Total Asbestos | Chrysotile Percent | Amosite Percent | Crocidolite Percent | Other Asbestos Percent | Mineral Wool Percent | Fiberglass Percent | Organic Percent | Synthetic Percent | Other Percent | Particulate Percent | Sample Type | Sample Color | Homogeneity | Analyst ID | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12072147 | 3212-15-000-24 | NAD | -- | -- | -- | -- | -- | -- | -- | -- | -- | 100 | CK | Gray | Homogeneous | LBP | |

984

The following footnotes only apply to those samples which the total asbestos result is flagged with a note number.

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 Chaikeenee **Analyst(s)** Lom Butruk

# EBA Engineeering Asbestos Sample Data Sheet

| | | | | | | |
|---|---|---|---|---|---|---|
| Project Name: | Towson Reservoir Pumping Stations | | | Inspector(s): | Kelly Ridgel | |
| Project Location: | Pumping House 2 & 3 | | | Project Manager: | James Sines | |
| Project Number: | 3212-15-000 | | | Date Sampled: | June 18-19, 2012 | |
| | | | | | | |
| **Sample Number or ID** | **Material Description (Use FT-Floor Tile, CT-Ceiling Tile, PF-Pipe Fitting)** | **Color** | **Sample Location (Floor, Room)** | **ACBM Type (TSI or S or M)** | **Quantity** | **Friable (Y or N)** |
| 3212-15-000-24 | Door Caulk | Grey | Pumphouse #3 West Doors | M | | N |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | **Homogeneous area** = Suspect Materials of one type and color | | **Samples required** TSI not assumed = 3 Patched <6 If = 1 **Surfacing** ≤ 1000 sf = 3 > 1000 ≤ 5000 = 5 < 5000 = 7 EPA recs 9 **Misc.** = at least 3 | **TSI** = Thermal System Insulation **S** = Surface Material **M** = any other building material or structural component | | |

**AMA Analytical Services, Inc.**
Focused on Results www.amalab.com
AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

# CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) **513257**

**Mailing/Billing Information:**
1. Client Name: EBA Engineering, Inc.
2. Address 1: 4813 Seton Dr.
3. Address 2: Baltimore, MD 21215
4. Address 3:
5. Phone #: 410-358-7171 Fax #: 410-358-7213

**Submittal Information:**
1. Job Name: Towson Reservoir Pumping Stations
2. Job Location: Pumping Station 2, 3 and Storage Shed
3. Job #: 3212-15-000 P.O. #:
4. Contact Person: Kelly Ridgel @ phone # 410-504-6115
5. Submitted by: Kelly J Ridgel Signature:

**Reporting Information (Results will be provided as soon as technically feasible):**

| AFTER HOURS (must be pre-scheduled) | NORMAL BUSINESS HOURS | REPORT TO: |
|---|---|---|
| ☐ Immediate Date Due: | ☐ Immediate ☐ 3 Day | ☐ Include COC/Field Data Sheets with Report |
| ☐ 24 Hours Time Due: | ☐ Next Day ☒ 5 Day + | ☐ Email: @ |
| Comments: | ☐ 2 Day Date Due: 7/5/12 | ☐ Fax: |
| | ☐ Results Required By Noon (EveryAttempt Will Be Made to Accomodate) | ☐ Verbals: |

**Asbestos Analysis**
PCM Air – Please Indicate Filter Type:
- ☐ NIOSH 7400 (QTY)
- ☐ Fiberglass (QTY)

TEM Air – Please Indicate Filter Type:
- ☐ AHERA (QTY)
- ☐ NIOSH 7402 (QTY)
- ☐ Other (specify) NEM (QTY)

PLM Bulk
- ☒ EPA 600 – Visual Estimate 1 (QTY)
- ☐ EPA Point Count (QTY)
- ☐ NY State Friable 198.1 (QTY)
- ☐ Grav. Reduction ELAP 198.6 (QTY)
- ☐ Other (specify) (QTY)

MISC
- ☐ Vermiculite
- ☐ Asbestos Soil PLM (Qual) PLM (Quan) PLM/TEM (Qual) PLM/TEM (Quan)

TEM Bulk
- ☐ ELAP 198.4/Chatfield (QTY)
- ☐ NY State PLM/TEM (QTY)
- ☐ Residual Ash (QTY)

TEM Dust
- ☐ Qual. (pres/abs) Vacuum/Dust (QTY)
- ☐ Quan. (s/area) Vacuum D5755-95 (QTY)
- ☐ Quan. (s/area)Dust D6480-99 (QTY)

TEM Water
- ☐ Qual. (pres/abs) (QTY)
- ☐ ELAP 198.2/EPA 100.2 (QTY)
- ☐ EPA 100.1 (QTY)

☒ All samples received in good condition unless otherwise noted. (TEM Water samples °C)

**Metals Analysis**
- ☐ Pb Paint Chip (QTY)
- ☐ Pb Dust Wipe (wipe type ) (QTY)
- ☐ Pb Air (QTY)
- ☐ Pb Soil/Solid (QTY)
- ☐ Pb TCLP (QTY)
- ☐ Drinking Water ☐ Pb (QTY) ☐ Cu (QTY) ☐ As (QTY)
- ☐ Waste Water ☐ Pb (QTY) ☐ Cu (QTY) ☐ As (QTY)
- ☐ Pb Furnace (Media ) (QTY)

**Fungal Analysis**
Collection Apparatus for Spore Traps/Air Samples:
Collection Media
- ☐ Spore-Trap (QTY) ☐ Surface Vacuum Dust (QTY)
- ☐ Surface Swab (QTY) ☐ Culturable ID Genus (Media ) (QTY)
- ☐ Surface Tape (QTY) ☐ Culturable ID Species (Media ) (QTY)
- ☐ Other (Specify ) (QTY)

| SAMPLE INFORMATION: CLIENT ID NUMBER | SAMPLE LOCATION/ IDENTIFICATION | DATE | VOLUME (LITERS) | WIPE AREA | ANALYSIS: TEM | PCM | PLM | LEAD | MOLD | MATRIX: AIR | BULK | DUST | WATER AND OTHER | SPORE TRAP | TAPE | SWAB | CLIENT CONTACT (LABORATORY STAFF ONLY) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Please see attached field form | | | | | | | X | | | | X | | | | | | Date/Time: Contact: By: |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | Date/Time: Contact: By: |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | Date/Time: Contact: By: |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |

**LABORATORY STAFF ONLY: (CUSTODY)**
1. Date/Time RCVD: 6/27/12 @1000 Via: FEDEX By (Print): Chris Nicodemus Sign:
2. Date/Time Analyzed: 7/5/12 @ 17:45 By (Print): Lom Butruk Sign: Lom Butruk
3. Results Reported To: Kelly Ridgel Via: Email Date: 7/5/12 Time: Initials: LBR
4. Comments: 5146 0990 7702 Fax

986

# Appendix D – Certificates of LBP Inspectors

# *THIS IS TO CERTIFY THAT*

## *Kelly Jean Ridgel*

# *HAS MET THE LEAD PAINT SERVICES ACCREDITATION REQUIREMENTS FOR*

## Inspector Technician

988

EXPIRATION DATE 05 / 26 / 2014

TRAINING PROVIDER Aerosol Monitoring & Analysis, Inc.

ADMINISTRATOR, LEAD PAINT ACCREDITATION
MARYLAND DEPARTMENT OF THE ENVIRONMENT

7/13/12
DATE

COURSE DATE 01 / 03 / 2012

# STATE OF MARYLAND

Certificate # 12492

**Application for reaccreditation shall be submitted to MDE 30 days prior to accreditation expiration indicated on this certificate.**

# *THIS IS TO CERTIFY THAT*

## *James Patrick Sines*

# *HAS MET THE LEAD PAINT SERVICES ACCREDITATION REQUIREMENTS FOR*

## Risk Assessor

689

EXPIRATION DATE 11 / 19 / 2013

TRAINING PROVIDER Aerosol Monitoring & Analysis, Inc.

ADMINISTRATOR, LEAD PAINT ACCREDITATION
MARYLAND DEPARTMENT OF THE ENVIRONMENT

DATE 12/2/11

COURSE DATE 10 / 31 / 2011

# STATE OF MARYLAND

Certificate # 10535

**Application for reaccreditation shall be submitted to MDE 30 days prior to accreditation expiration indicated on this certificate.**

# Appendix E – XRF Performance Characteristic Sheet

# Performance Characteristic Sheet

**EFFECTIVE DATE:** **September 24, 2004** **EDITION NO.: 1**

**MANUFACTURER AND MODEL:**

Make: *Niton LLC*
Tested Model: *XLp 300*
Source: $^{109}Cd$
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.
XLp 700A, XLp 701A, XLp 702A, and XLp 703A.

Note: The XLi and XLp versions refer to the shape of the handle part of the instrument. The differences in the model numbers reflect other modes available, in addition to Lead-in-Paint modes. The manufacturer states that specifications for these instruments are identical for the source, detector, and detector electronics relative to the Lead-in-Paint mode.

## FIELD OPERATION GUIDANCE

**OPERATING PARAMETERS**:

Lead-in-Paint K+L variable reading time mode.

**XRF CALIBRATION CHECK LIMITS**:

| |
|---|
| 0.8 to 1.2 mg/cm$^2$ (inclusive) |

The calibration of the XRF instrument should be checked using the paint film nearest 1.0 mg/cm$^2$ in the NIST Standard Reference Material (SRM) used (e.g., for NIST SRM 2579, use the 1.02 mg/cm$^2$ 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:**

| K+L MODE READING DESCRIPTION | SUBSTRATE | THRESHOLD (mg/cm$^2$) |
|---|---|---|
| Results not corrected for substrate bias on any substrate | Brick | 1.0 |
| | Concrete | 1.0 |
| | Drywall | 1.0 |
| | Metal | 1.0 |
| | Plaster | 1.0 |
| | Wood | 1.0 |

## 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.

| **Testing Times Using K+L Reading Mode (Seconds)** | | | | | | |
|---|---|---|---|---|---|---|
| | All Data | | | Median for laboratory-measured lead levels ($mg/cm^2$) | | |
| Substrate | $25^{th}$ Percentile | Median | $75^{th}$ Percentile | Pb < 0.25 | 0.25 ≤ Pb<1.0 | 1.0 ≤ Pb |
| Wood Drywall | 4 | 11 | 19 | 11 | 15 | 11 |
| Metal | 4 | 12 | 18 | 9 | 12 | 14 |
| Brick Concrete Plaster | 8 | 16 | 22 | 15 | 18 | 16 |

**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 F – XRF Lead Based Paint Data Sheets

Towson Reservoir Pumping Station No. 2

XRF Results

| Index | Component | Member | Substrate | Type | Side | Condition | Color | Floor | Room | Results | PbC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | SHUTTER_CAL | | | | | | | | | | 2.74 |
| 2 | Cal Standard | | | Paint | | | | | | Positive | 0.8 |
| 3 | Cal Standard | | | Paint | | | | | | Positive | 0.8 |
| 4 | Cal Standard | | | Paint | | | | | | Positive | 0.7 |
| 5 | Wall | M Ctr | Concrete | Paint | B | Fair | Tan | SL1 | Pump Rm | Negative | 0.03 |
| 6 | Stairs | Riser | Metal | Paint | B | Fair | Tan | SL1 | Pump Rm | Negative | 0.01 |
| 7 | Pipe | 20" | Metal | Paint | D | Fair | Blue | SL1 | Pump Rm | Negative | 0 |
| 8 | Pipe | 20" | Metal | Paint | D | Fair | Blue | SL1 | Pump Rm | Negative | 0 |
| 9 | Pipe | 20" | Metal | Paint | D | Fair | Blue | SL1 | Pump Rm | Negative | 0 |
| 10 | Pipe | 20" | Metal | Paint | D | Fair | Grey | SL1 | Pump Rm | Negative | 0.1 |
| 11 | Column | Support | Concrete | Paint | D | Fair | Tan | SL1 | Pump Rm | Negative | 0.02 |
| 12 | Door | Jamb | Metal | Paint | B | Fair | Tan | Stairwell | Stairwell | Negative | 0 |
| 13 | Door | Frame | Metal | Paint | B | Fair | Tan | Stairwell | Stairwell | Positive | 1.7 |
| 14 | Door | Frame | Metal | Paint | B | Fair | Tan | Stairwell | Stairwell | Negative | 0.5 |
| 15 | Door | Frame | Metal | Paint | B | Fair | Tan | Stairwell | Stairwell | Negative | 0.4 |
| 16 | Door | Frame | Metal | Paint | B | Fair | Tan | Stairwell | Stairwell | Negative | 0.07 |
| 17 | Cal Standard | | | | | | | | | Positive | 0.7 |
| 18 | Cal Standard | | | | | | | | | Positive | 0.7 |
| 19 | Cal Standard | | | | | | | | | Positive | 0.7 |
| 20 | SHUTTER_CAL | | | | | | | | | | 2.33 |
| 21 | SHUTTER_CAL | | | | | | | | | | 2.44 |
| 22 | Cal Standard | | | | | | | | | Positive | 0.8 |
| 23 | Cal Standard | | | | | | | | | Positive | 0.8 |
| 24 | Cal Standard | | | | | | | | | Positive | 0.7 |
| 25 | Wall | M Ctr | Concrete | Paint | B | Fair | Tan | SL1 | Pump Rm | Negative | 0.03 |
| 26 | Stairs | Riser | Metal | Paint | B | Fair | Tan | SL1 | Pump Rm | Negative | 0.02 |
| 27 | Pipe | 20" | Metal | Paint | D | Fair | Grey | SL1 | Pump Rm | Negative | 0.05 |
| 28 | Pipe | 20" | Metal | Paint | D | Fair | Blue | SL1 | Pump Rm | Negative | 0.02 |
| 29 | Pipe | 20" | Metal | Paint | D | Fair | Blue | SL1 | Pump Rm | Negative | 0.02 |
| 30 | Pipe | 20" | Metal | Paint | D | Fair | Grey | SL1 | Pump Rm | Negative | 0.13 |
| 31 | Column | Support | Concrete | Paint | D | Fair | Tan | SL1 | Pump Rm | Negative | 0.03 |
| 32 | Door | Frame | Metal | Paint | B | Fair | Tan | Stairwell | Stairwell | Positive | 1 |
| 33 | Door | Jamb | Metal | Paint | B | Fair | Tan | Stairwell | Stairwell | Positive | 1.5 |

Towson Reservoir Pumping Station No. 2
XRF Results

| Index | Component | Member | Substrate | Type | Side | Condition | Color | Floor | Room | Results | PbC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 34 | Wall | M Ctr | Concrete | Paint | B | Fair | Tan | Stairwell | Stairwell | Negative | 0.1 |
| 35 | Wall | L Ctr | Concrete | Paint | B | Fair | Tan | Stairwell | Stairwell | Negative | 0.1 |
| 36 | Wall | R Ctr | Concrete | Paint | B | Fair | Tan | Stairwell | Stairwell | Negative | 0.04 |
| 37 | SHUTTER_CAL | | | | | | | | | | 2.45 |
| 38 | Cal Standard | | | | | | | | | Positive | 0.7 |
| 39 | Cal Standard | | | | | | | | | Positive | 0.7 |
| 40 | Cal Standard | | | | | | | | | Positive | 0.7 |

Towson Pumpng Station No. 3

XRF Results

| Index | Component | Member | Substrate | Type | Side | Condition | Color | Floor | Room | Results | PbC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | SHUTTER_CAL | | | | | | | | | | 2.45 |
| 2 | Cal Standard | Calibrate | | | | | | | | Positive | 0.7 |
| 3 | Cal Standard | Calibrate | | | | | | | | Positive | 0.7 |
| 4 | Cal Standard | Calibrate | | | | | | | | Positive | 0.7 |
| 5 | Door | Frame | Metal | Paint | C | Fair | Grey | First | Exterior | Positive | 0.8 |
| 6 | Wall | Wall | Concrete | Paint | A | Intact | Green | First | Office | Negative | 0 |
| 7 | Door | Door | Metal | Paint | B | Intact | Blue | First | Office | Negative | 0.01 |
| 8 | Crane | Center | Metal | Paint | Center | Intact | Green | First | CATWALK | Negative | 0.25 |
| 9 | Pump E | Center | Metal | Paint | Center | Intact | Blue | SL1 | Pump Rm | Negative | 0.06 |
| 10 | Pipe | 20" | Metal | Paint | Center | Intact | Red | SL1 | Pump Rm | Negative | 0 |
| 11 | Pipe | 30" | Metal | Paint | Center | Intact | Blue | SL1 | Pump Rm | Negative | 0 |
| 12 | Stairs | Riser | Metal | Paint | D | Intact | Blue | SL1 | Pump Rm | Negative | 0.11 |
| 13 | Column | Support | Metal | Paint | West Wall | Intact | Red | SL1 | Pump Rm | Negative | 0.22 |
| 14 | Column | Support | Metal | Paint | West Wall | Intact | Red | SL1 | Pump Rm | Negative | 0 |
| 15 | Column | Support | Metal | Paint | West Wall | Intact | Red | SL1 | Pump Rm | Positive | 15 |
| 16 | Column | Support | Metal | Paint | West Wall | Intact | Red | SL1 | Pump Rm | Negative | 0 |
| 17 | Column | Support | Metal | Paint | West Wall | Intact | Red | SL1 | Pump Rm | Negative | 0 |
| 18 | Column | Support | Metal | Paint | West Wall | Intact | Red | SL1 | Pump Rm | Positive | 15.3 |
| 19 | Column | Support | Metal | Paint | West Wall | Intact | Red | SL1 | Pump Rm | Negative | 0.06 |
| 20 | Column | Support | Metal | Paint | West Wall | Intact | Red | SL1 | Pump Rm | Positive | 0.9 |
| 21 | Pipe | 20" | Metal | Paint | A | Fair | Grey | SL1 | Pump Rm | Negative | 0.03 |
| 22 | Pipe | 20" | Metal | Paint | A | Fair | Grey | SL1 | Pump Rm | Negative | 0.23 |
| 23 | Pipe | 20" | Metal | Paint | A | Fair | Grey | SL1 | Pump Rm | Negative | 0 |
| 24 | SHUTTER_CAL | | | | | | | | | | 2.33 |
| 25 | Cal Standard | Calibrate | | | | | | | | | 0.7 |
| 26 | Cal Standard | Calibrate | | | | | | | | | 0.7 |
| 27 | Cal Standard | Calibrate | | | | | | | | | 0.7 |
| 28 | Door | Frame | Metal | Paint | C | Fair | Grey | First | Exterior | Positive | 3.7 |
| 29 | Column | Support | Metal | Paint | West Wall | Fair | Red | SL1 | Pump Rm | Negative | 0.4 |
| 30 | Column | Support | Metal | Paint | West Wall | Fair | Red | SL1 | Pump Rm | Negative | 0.24 |
| 31 | Column | Support | Metal | Paint | West Wall | Fair | Red | SL1 | Pump Rm | Negative | 0.17 |
| 32 | Column | Support | Metal | Paint | West Wall | Fair | Red | SL1 | Pump Rm | Negative | 0.11 |
| 33 | Column | Support | Metal | Paint | West Wall | Fair | Red | SL1 | Pump Rm | Negative | 0.08 |

Towson Pumpng Station No. 3

XRF Results

| Index | Component | Member | Substrate | Type | Side | Condition | Color | Floor | Room | Results | PbC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 34 | Column | Support | Metal | Paint | West Wall | Fair | Red | SL1 | Pump Rm | Negative | 0.13 |
| 35 | Column | Support | Metal | Paint | West Wall | Fair | Red | SL1 | Pump Rm | Negative | 0.09 |
| 36 | SHUTTER_CAL | | | | | | | | | | 1.94 |
| 37 | Cal Standard | Calibrate | | | | | | | | Positive | 0.7 |
| 38 | Cal Standard | Calibrate | | | | | | | | Positive | 0.7 |
| 38 | Cal Standard | Calibrate | | | | | | | | Positive | 0.7 |

# Appendix G – Paint Chip Analysis

# AMA Analytical Services, Inc.

*A Specialized Environmental Laboratory*

## CERTIFICATE OF ANALYSIS

AIHA LAP, LLC
ACCREDITED LABORATORY
INDUSTRIAL HYGIENE, ENVIRONMENTAL LEAD & ENVIRONMENTAL MICROBIOLOGY
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org
LAB #100470

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Client:** | EBA Engineering, Inc | **Job Name:** | WRA-Towson Reservoir Pumping Stations | **Chain Of Custody:** | 513548 | | |
| **Address:** | 4813 Seton Drive | **Job Location:** | Towson, MD | **Date Submitted:** | 8/2/2012 | | |
| | Baltimore, Maryland 21215 | **Job Number:** | 3212-15-000 | **Person Submitting:** | James Sines | | |
| | | **P.O. Number:** | Not Provided | **Date Analyzed:** | 8/3/2012 | **Report Date:** | 8/7/2012 |
| **Attention:** | Kelly Ridgel | | | **Revision Number:** | 1 | **Revised Date:** | 8/7/2012 |

## Summary of Atomic Absorption Analysis for Lead



| AMA Sample Number | Client Sample Number | Analysis Type | Sample Type | Air Volume (L) | Area Wiped (ft²) | Reporting Limit | | Total ug | Final Result | | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 12081234 | Door Frame Ext/PS3 | Flame | Paint Chip | **** | N/A | 0.011 | %Pb | | 0.51 | %Pb | |
| 12081235 | Support Column/PS3 | Flame | Paint Chip | **** | N/A | 0.038 | %Pb | | 0.06 | %Pb | Insufficient sample was submitted to meet recommended reporting limits. |
| 12081236 | Door Jam/PS2 | Flame | Paint Chip | **** | N/A | 0.0077 | %Pb | | 1.5 | %Pb | |
| 12081237 | Door Frame Int/PS2 | Flame | Paint Chip | **** | N/A | 0.0091 | %Pb | | 0.084 | %Pb | |

Analysis Method for Flame: Air, Wipes, Paints, and Soil/Solids: EPA 600/R-93/200(M)-7000B; Water: SM-3111B

Analysis Method For Furnace: Air, Wipes, Paints, and Soil/Solids : EPA 600/R-93/200(M)-7010; Water: SM-3113B

N/A = Not Applicable mg/Kg = parts per million (ppm) on a dry weight basis mg/L = parts per million (ppm)

%Pb = percent lead on a dry weight basis ug = micrograms ug/L = parts per billion (ppb)

Note: All samples were received in good condition unless otherwise noted.

Note: All results have two significant digits. Any additional digits shown should not be considered when interpreting the result.

Air and Wipe results are not corrected for any blank results

Final results for air and wipe samples are based on client supplied information nor verified by this laboratory.

All results are to be considered preliminary and subject to change unless signed by the Technical Director or Deputy.

See QC Summary for analytical results of quality control samples associated with these samples.

**Analyst:** Suphin Chinnapad

**Technical Manager:** G Edward Carney

**AMA Analytical Services, Inc.**
Focused on Results www.amalab.com
AIHA (#100470) NVLAP (#101143-0) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

# CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 513548

**Mailing/Billing Information:**
1. Client Name: EBA Engineering, Inc.
2. Address 1: 4813 Seton Dr.
3. Address 2: Baltimore, MD 21215
4. Address 3:
5. Phone #: 410-358-7171 Fax #: 410-358-7213

**Submittal Information:**
1. Job Name: WRA - Towson Reservoir Pumping Stations
2. Job Location: Towson, MD
3. Job #: 3212-15-000 P.O. #:
4. Contact Person: Kelly Ridgel @ phone # 410-504-6115
5. Submitted by: James Sines Signature: J. P. Sines

**Reporting Information (Results will be provided as soon as technically feasible):**

| AFTER HOURS (must be pre-scheduled) | NORMAL BUSINESS HOURS | REPORT TO: |
|---|---|---|
| ❑ Immediate Date Due: | ❑ Immediate ❑ 3 Day | ❑ Include COC/Field Data Sheets with Report |
| ❑ 24 Hours Time Due: | ❑ Next Day ❑ 5 Day + | ☒ Email: kelly.ridgel @ ebaengineering.com |
| Comments: | ☒ 2 Day Date Due: 8/6/12 | ❑ Fax: |
| | ❑ Results Required By Noon (EveryAttempt Will Be Made to Accomodate) | ❑ Verbals: |

**Asbestos Analysis**

PCM Air – Please Indicate Filter Type:
- ❑ NIOSH 7400 (QTY)
- ❑ Fiberglass (QTY)

TEM Air – Please Indicate Filter Type:
- ❑ AHERA (QTY)
- ❑ NIOSH 7402 (QTY)
- ❑ Other (specify) (QTY)

PLM Bulk
- ❑ EPA 600 – Visual Estimate (QTY)
- ❑ EPA Point Count (QTY)
- ❑ NY State Friable 198.1 (QTY)
- ❑ Grav. Reduction ELAP 198.6 (QTY)
- ❑ Other (specify) (QTY)

MISC
- ❑ Vermiculite
- ❑ Asbestos Soil PLM (Qual) PLM (Quan) PLM/TEM (Qual) PLM/TEM (Quan)

TEM Bulk
- ❑ ELAP 198.4/Chatfield (QTY)
- ❑ NY State PLM/TEM (QTY)
- ❑ Residual Ash (QTY)

TEM Dust
- ❑ Qual. (pres/abs) Vacuum/Dust (QTY)
- ❑ Quan. (s/area) Vacuum D5755-95 (QTY)
- ❑ Quan. (s/area)Dust D6480-99 (QTY)

TEM Water
- ❑ Qual. (pres/abs) (QTY)
- ❑ ELAP 198.2/EPA 100.2 (QTY)
- ❑ EPA 100.1 (QTY)

☒ All samples received in good condition unless otherwise noted. (TEM Water samples °C)

**Metals Analysis**
- ☒ Pb Paint Chip 4 (QTY)
- ❑ Pb Dust Wipe (wipe type ) (QTY)
- ❑ Pb Air (QTY)
- ❑ Pb Soil/Solid (QTY)
- ❑ Pb TCLP (QTY)
- ❑ Drinking Water ❑ Pb (QTY) ❑ Cu (QTY) ❑ As (QTY)
- ❑ Waste Water ❑ Pb (QTY) ❑ Cu (QTY) ❑ As (QTY)
- ❑ Pb Furnace (Media ) (QTY)

**Fungal Analysis**

Collection Apparatus for Spore Traps/Air Samples:
Collection Media
- ❑ Spore-Trap (QTY) ❑ Surface Vacuum Dust (QTY)
- ❑ Surface Swab (QTY) ❑ Culturable ID Genus (Media ) (QTY)
- ❑ Surface Tape (QTY) ❑ Culturable ID Species (Media ) (QTY)
- ❑ Other (Specify ) (QTY)

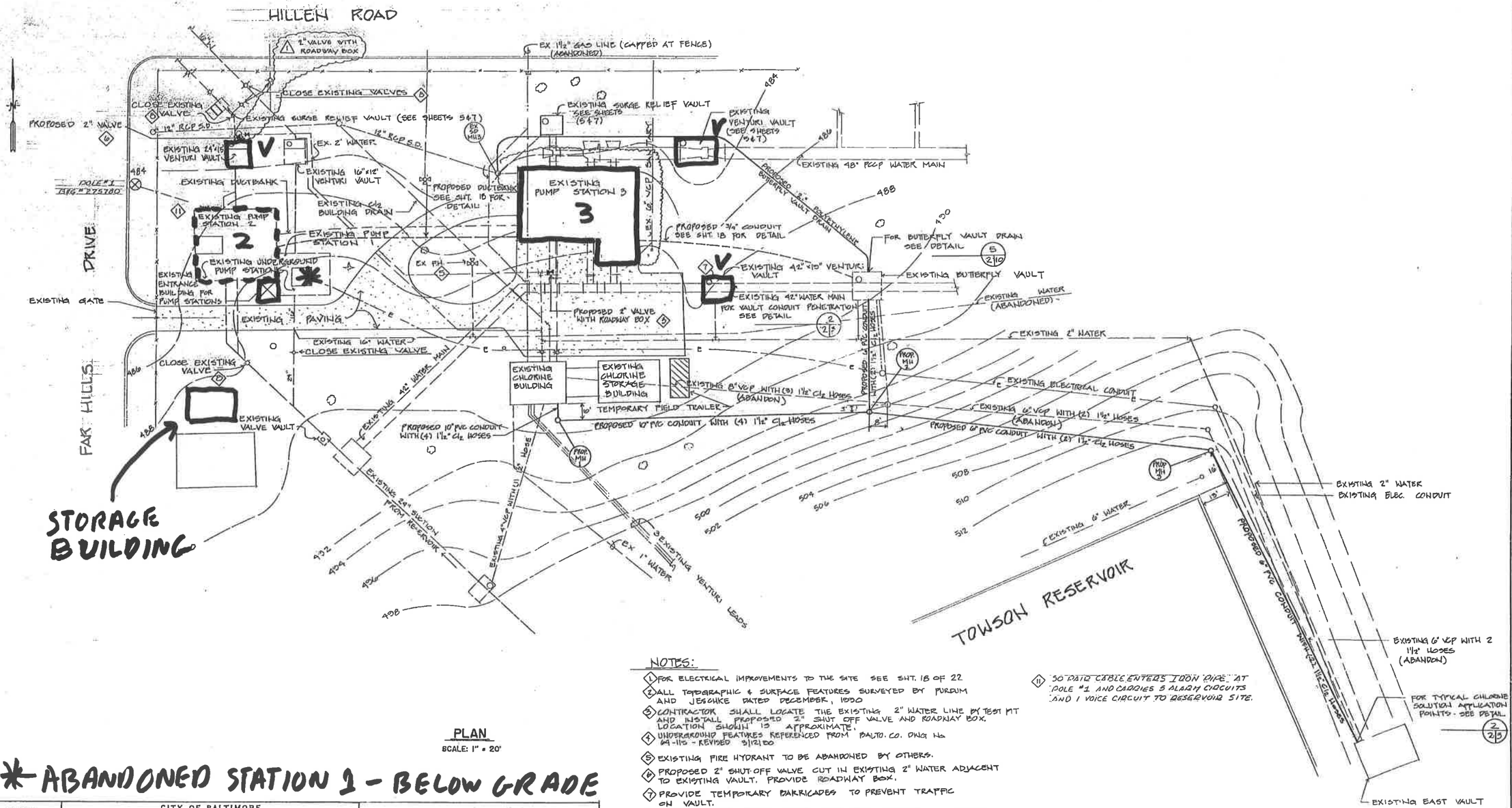
| CLIENT ID NUMBER | SAMPLE INFORMATION: SAMPLE LOCATION/ IDENTIFICATION | DATE | VOLUME (LITERS) | WIPE AREA | ANALYSIS: TEM | PCM | PLM | LEAD | MOLD | AIR | BULK | MATRIX: DUST | WATER AND OTHER | SPORE TRAP | TAPE | SWAB | CLIENT CONTACT (LABORATORY STAFF ONLY) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Door Frame Ext/PS3 | | | | | | | X | | | X | | | | | | Date/Time: Contact: By: |
| | Support Column/PS3 | | | | | | | X | | | X | | | | | | |
| | Door Jam/PS2 | | | | | | | X | | | X | | | | | | |
| | Door Frame Int/PS2 | | | | | | | X | | | X | | | | | | |
| | | | | | | | | | | | | | | | | | Date/Time: Contact: By: |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | Date/Time: Contact: By: |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |

**LABORATORY STAFF ONLY: (CUSTODY)**

1. Date/Time RCVD: 8 / 2 / 12 @ 1000 Via: FedEx By (Print): MBM Sign:
2. Date/Time Analyzed: / / @ By (Print): Sign:
3. Results Reported To: Via: Date: / / Time: Initials:
4. Comments:

# Appendix H – Client Provided Information

V = VENTURI VAULT, 3 TOTAL




PLAN
SCALE: 1" = 20'

NOTES:

1. FOR ELECTRICAL IMPROVEMENTS TO THE SITE SEE SHT. 1B OF 22
2. ALL TOPOGRAPHIC & SURFACE FEATURES SURVEYED BY PURDUM AND JESCHKE DATED DECEMBER, 1990
3. CONTRACTOR SHALL LOCATE THE EXISTING 2" WATER LINE BY TEST PIT AND INSTALL PROPOSED 2" SHUT OFF VALVE AND ROADWAY BOX. LOCATION SHOWN IS APPROXIMATE.
4. UNDERGROUND FEATURES REFERENCED FROM BALTO. CO. DWG No 69-115 - REVISED 3/12/80
5. EXISTING FIRE HYDRANT TO BE ABANDONED BY OTHERS.
6. PROPOSED 2" SHUT-OFF VALVE CUT IN EXISTING 2" WATER ADJACENT TO EXISTING VAULT. PROVIDE ROADWAY BOX.
7. PROVIDE TEMPORARY BARRICADES TO PREVENT TRAFFIC ON VAULT.
8. CLOSE THESE VALVES ONLY WHEN PUMP STATION 2 IS OUT OF SERVICE. RE-OPEN VALVES AFTER COMPLETING PIPING WORK IN STATION NO.s 1 & 2
9. CONTRACTOR SHALL NOTIFY MISS UTILITY AT 1-800-257-7777 4 DAYS PRIOR TO BEGINNING WORK.
10. LOCATION OF EXISTING UNDERGROUND UTILITIES / OBSTRUCTIONS IS NOT GUARANTEED CORRECT. CONTRACTOR TO VERIFY LOCATION / DEPTH OF ALL UNDERGROUND OBSTRUCTIONS BEFORE PROCEEDING WITH CONSTRUCTION.
11. 50 PAIR CABLE ENTERS 100N DUCT AT POLE #1 AND CARRIES 5 ALARM CIRCUITS AND 1 VOICE CIRCUIT TO RESERVOIR SITE.

* ABANDONED STATION 1 - BELOW GRADE

SITE PLAN

CITY OF BALTIMORE
DIRECTOR DEPT. OF PUBLIC WORKS — DATE 4/19/12
CHIEF UTILITY ENG. DIVISION BUR. OF WATER AND WASTEWATER — DATE 2/15/12

EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC.
15 Loveton Circle Sparks, Maryland 21152

| DATE | RIGHT OF WAY | REF. | ROAD PERMIT AND GRADES | P. W. A. DIR. NO. | CONTRACT NO. | REVISED AS PER RECORD PRINT J.O. | DRAFTSMAN | DATE |
|---|---|---|---|---|---|---|---|---|
| 7/21/82 | RW 62-159 | | PERMIT REQUESTED<br>PERMIT NUMBER<br>GRADE ESTABLISHED<br>PROFILE NUMBER | 8330 | 91292 WXO | EA Eng. | ⚠ As-Built | 2-15-96 |

SEAL

| | | BUREAU OF ENGINEERING | HIGHWAYS | STRUCTURES | STORM DRAINS | WATER | SEWER | FIELD ENGINEER |
|---|---|---|---|---|---|---|---|---|
| DESIGNED D.E.P | | | | | | | | |
| DRAWN G.B.L. | ENGINEER | REVIEWED | NEB | JWA | RAC | CWJ | P.Y.R. | ASE |
| CHECKED D.E.K. | DATE 1/6/92 LIC. NO. 13128 | DATE | 1/30/92 | 1/30/92 | 1/30/92 | 1/29/92 | 1/30/92 | 1/30/92 |

BUREAU OF ENGINEERING — APPROVED Paul R. Anderson CHIEF — DATE 1/31/92
DEPARTMENT OF PUBLIC WORKS — APPROVED Gene E. Bray DIRECTOR — DATE 2/18/92

| LEVEL BK. | KEY SHEET |
|---|---|
| | N NW |
| DETAIL BK. | POSITION SHEET |
| | 36NE5 |

| DATE | REVISION | BY |
|---|---|---|
| 12-26-91 | Eliminate Bypass. Cond. to 24" Water | USP |
| 1-28-92 | Added Note 9 | MJC |
| 5-10-92 | ADDED NOTES 10 & 11 | RAC |

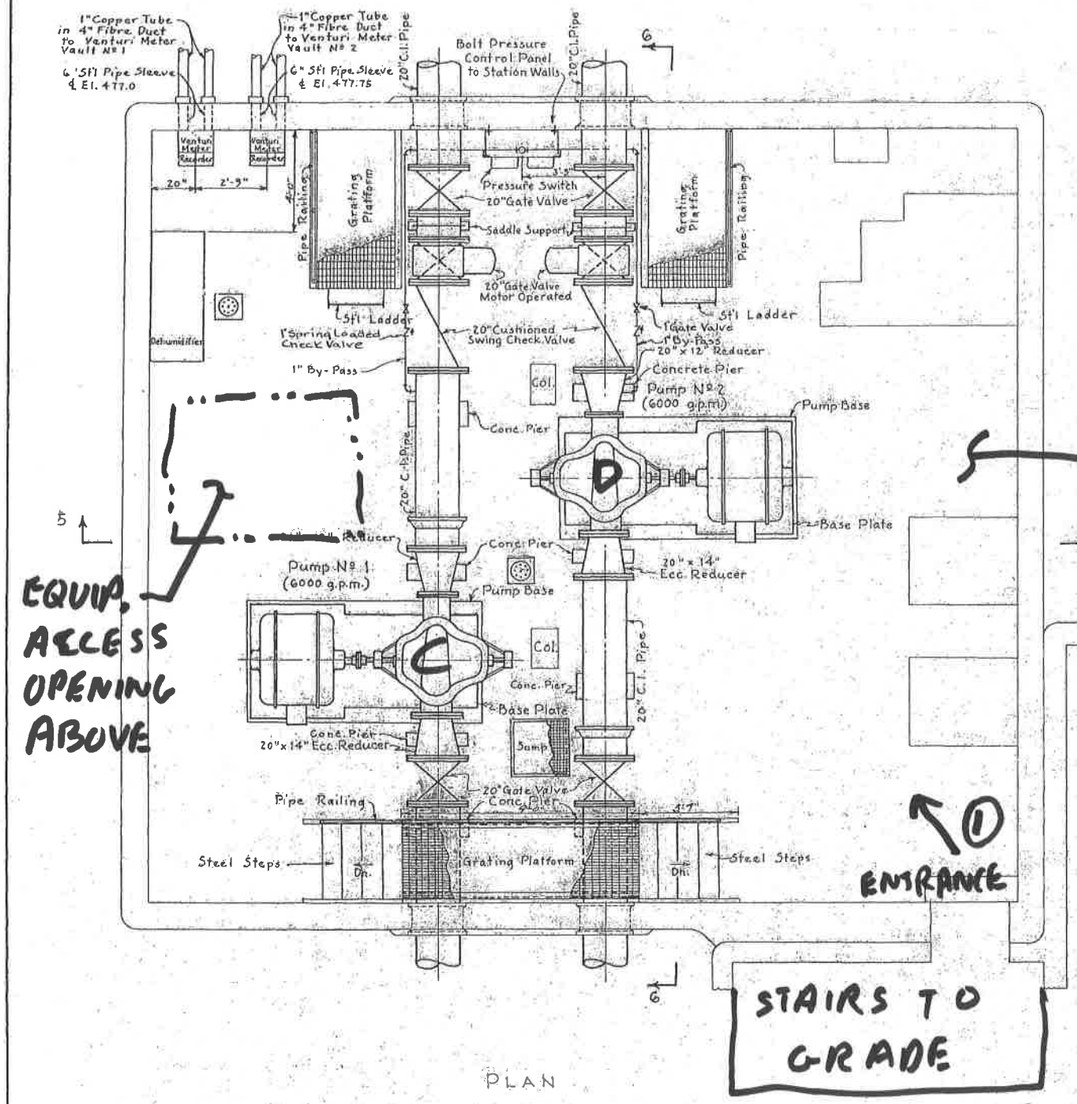
SCALE: PLAN 1" = 20' PROFILE HOR. VERT.

BALTIMORE COUNTY DEPARTMENT OF PUBLIC WORKS BUREAU OF ENGINEERING
IMPROVEMENTS TO THE TOWSON PUMPING STATION
SITE PLAN
SUBDIVISION TOWSON EL. DISTRICT NO. 9 C4
BALTIMORE COUNTY TYPE NUMBER 1

JOB ORDER NO. 3-6-26
SHEET 2 OF 22
DWG. NO. 91-17.2
FILE: 3

C.W.O. 46828

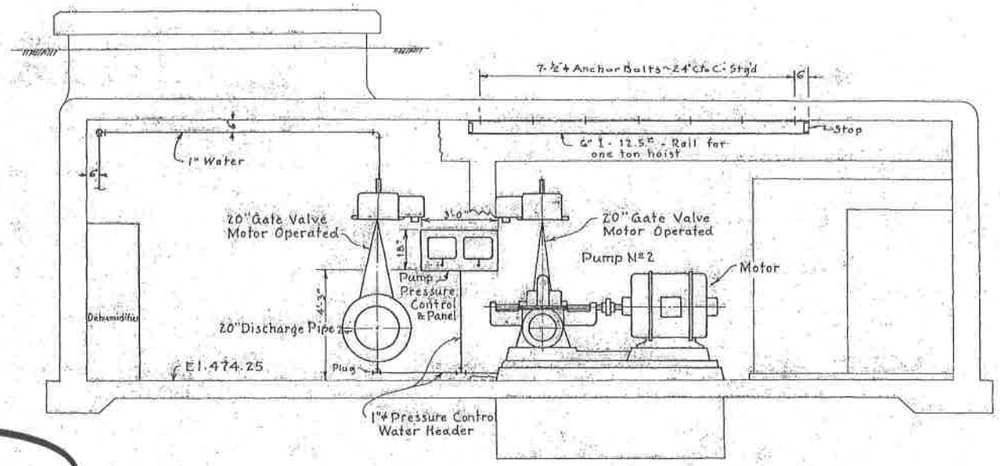
MICROFILMED




PLAN

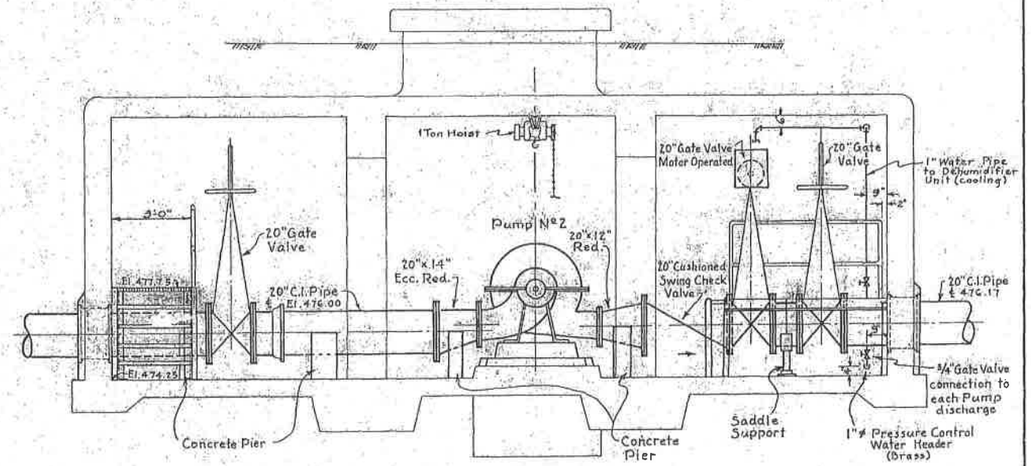
Note:
Small-end sizes of reducers shall suit pumps.
Minimum sizes are shown.

① = SEE PHOTO




SECTION 5-5

INNER DIMENSIONS = 29'-6" x 33'-0"




SECTION 6-6

#2

MICROFILMED

DATE RIGHT OF WAY SECURED REF:

BALTIMORE COUNTY HIGHWAYS
PERMIT REQUESTED
PERMIT NUMBER
GRADE ESTABLISHED
PROFILE NUMBER

LOCATION APPROVED

DRAWN:
TRACED:
CHECKED:
EXAMINED:

DEPARTMENT OF PUBLIC WORKS
BALTIMORE COUNTY
METROPOLITAN DISTRICT

APPROVED Dec 6, 1954
DATE
CHIEF ENGINEER BALTO. CO. METRO. DIST.

GRADE ESTABLISHED AND LOCATION APPROVED
DATE
ROADS ENGINEER BALTO. COUNTY

APPROVED 12/1/54
DATE
CHIEF ENGINEER BALTIMORE COUNTY

APPROVED FOR CITY OF BALTIMORE
Dec 7, 1954
DATE
WATER ENGINEER
ACT. DIR. OF PUBLIC WORKS

TOWSON WATER PUMPING STATION
WESTWARD ADDITION
MECHANICAL WORK - PLAN AND SECTIONS

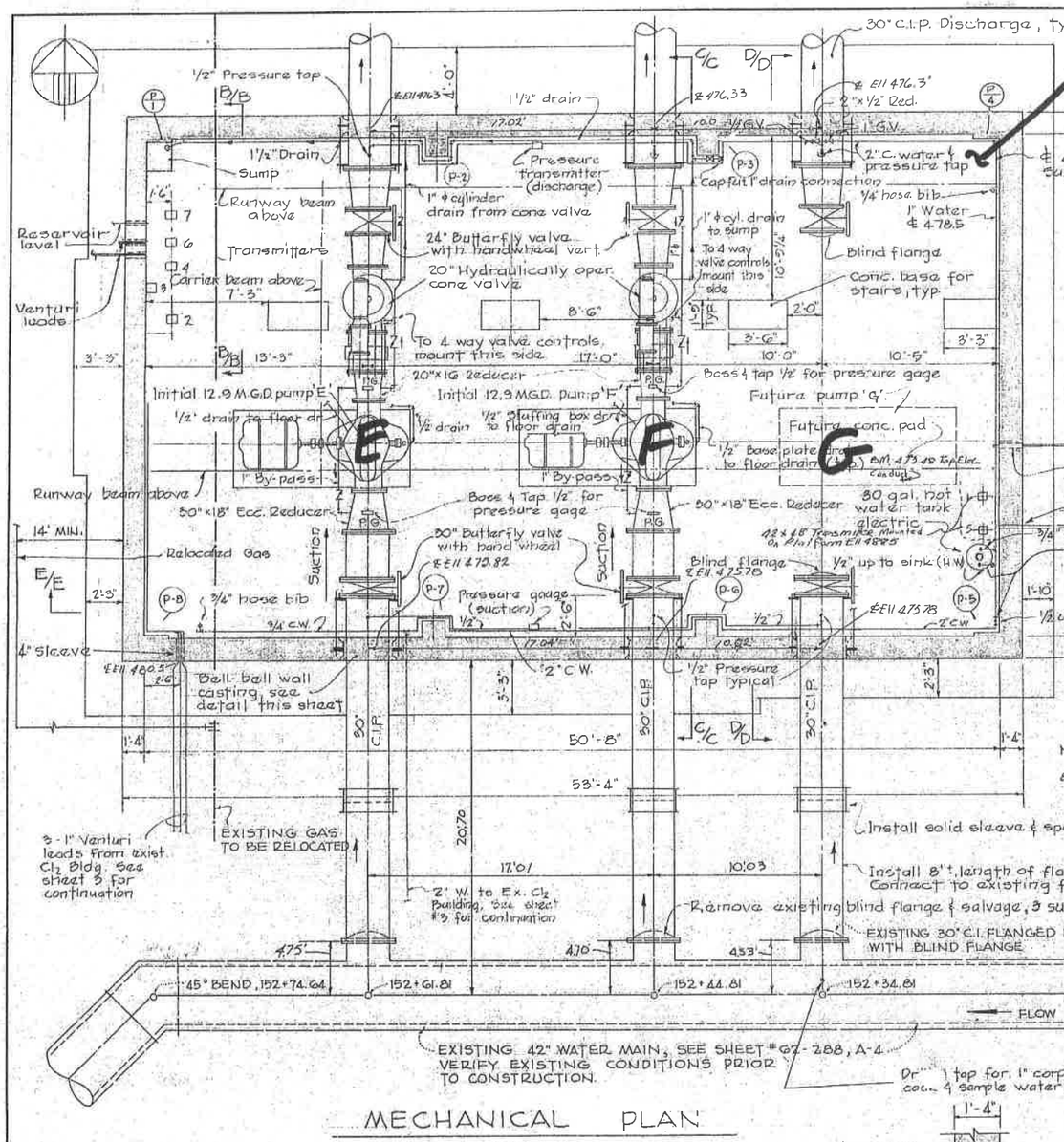
CONTRACT NO. 412-W
ELECTION DISTRICT NO. 9

ROBERT T. REGESTER
CONSULTING ENGINEER
BALTIMORE, MARYLAND

DRAWING NO. 4 OF 5
SCALE: 3/8" = 1'
J. O. 6751
54-1954
71.6 A-4
A.B. No. 5

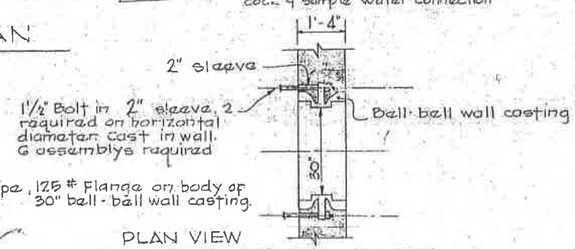
WATER MICROFILMED

INNER DIMENSIONS 30'x50'




## MECHANICAL PLAN

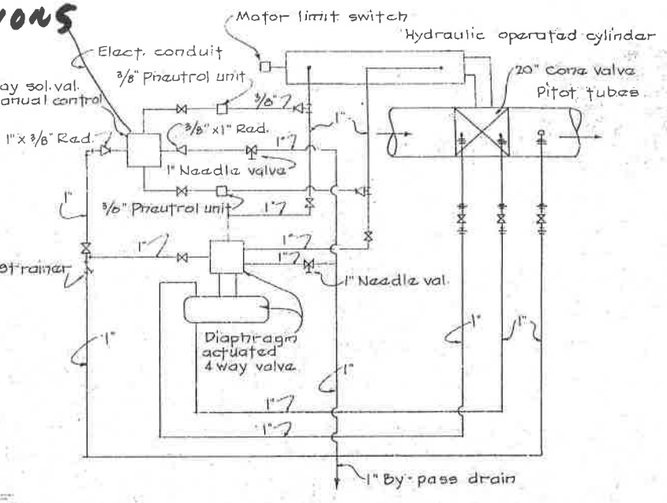
1/4" = 1'-0"




PLAN VIEW

## DETAIL-WALL CASTING

SCALE: 1/2" = 1'-0"

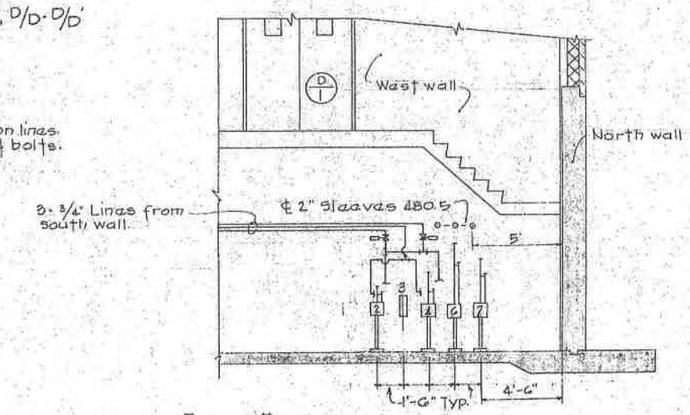



NOTE:
1. Use taps in cone valve for water supply system.
2. Provide unions adjacent to all valves, appurtenances & equipment.

SCHEMATIC

## HYDRAULICALLY OPERATED CONE VALVE

NOT TO SCALE




Transmitters:
1- 48" Venturi tube, station discharge mounted on Plat E11488.5
2- 36" Reverse flow Venturi - Influent
3- Flow sensing manometer
4- 36" Reverse flow venturi - Effluent
5- Existing 42" Venturi tube mounted on Plat E11488.5
6- 24" Nozzle
7- Reservoir level

## SECTION 'B/B - B/B'

1/4" = 1'-0"

MICROFILMED C.W.D. 35845

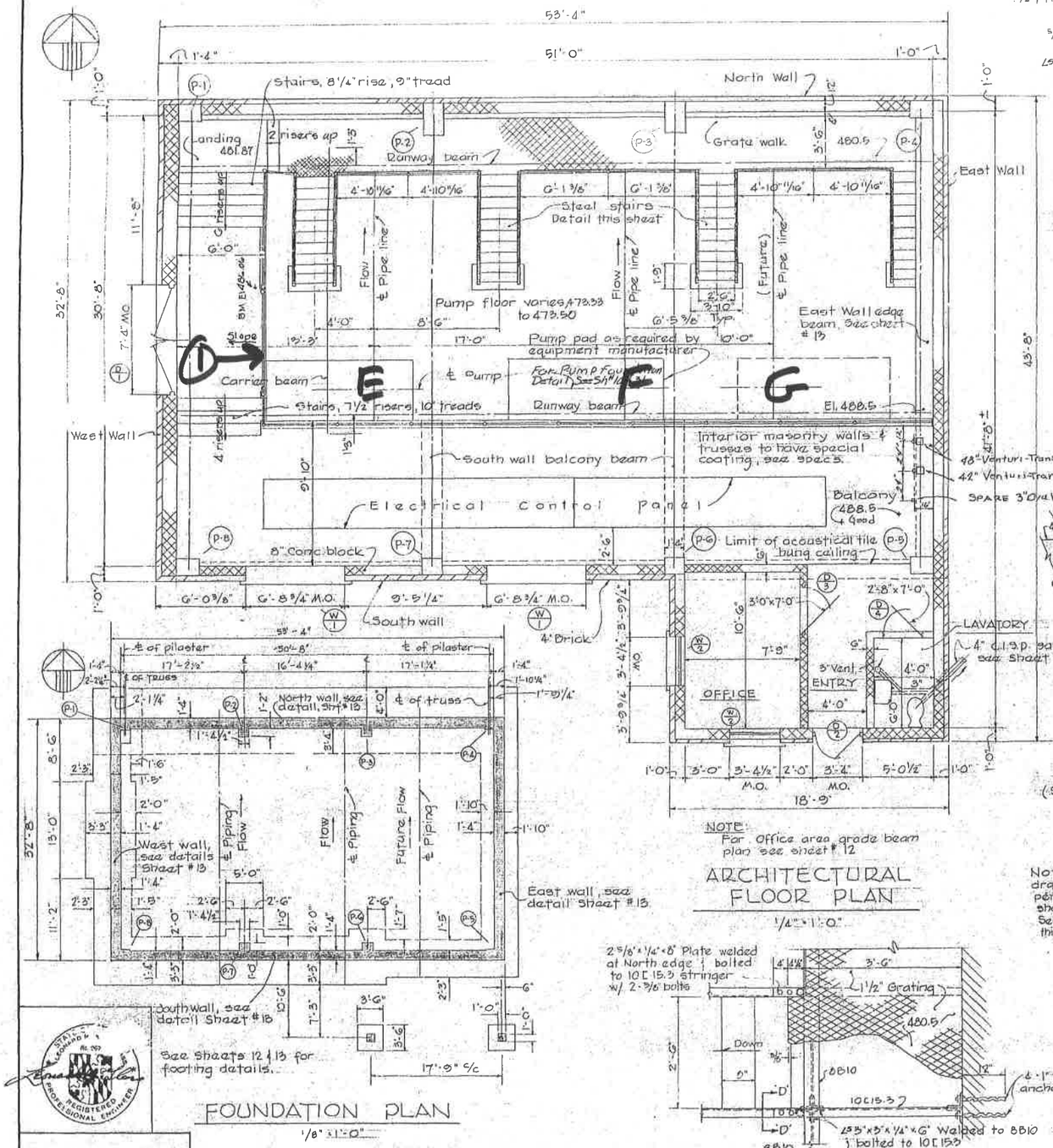
# 3 LOWER

STATE OF MARYLAND LEONARD MARVIN BLAU No. 6972 REGISTERED PROFESSIONAL ENGINEER

| ROAD PERMIT AND GRADES | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PERMIT REQUESTED | MATZ, CHILDS & ASSOC. INC CONSULTING ENGINEERS 2129 N. CHARLES ST. BALTO., MD. | APPROVED FOR CITY OF BALTIMORE | BUREAU OF ENGINEERING | | | | | | BALTIMORE COUNTY DEPARTMENT OF PUBLIC WORKS BUREAU OF ENGINEERING | SCALE | | |
| PERMIT NUMBER | | DATE 3-2-65 DIRECTOR OF PUBLIC WORKS | | STORM DRAINS | WATER | SEWER | HIGHWAYS | STRUCTURES | FIELD LOCATION | TOWSON PUMPING STATION AND OTHER MAJOR IMPROVEMENTS | AS SHOWN | KEY SHEET 'N' NEW |
| GRADE ESTABLISHED | | WATER ENGR. | APPROVED | | | | | | | PUMPING STATION—MECHANICAL PLANS | | SHEET NO. 14 |
| PROFILE NUMBER | | DEPARTMENT OF PUBLIC WORKS | APPROVED | | | | | | | ELECTION DISTRICT NO. 8 | | POSITION SHEET 35 & 36 NE 8 OF 31 |
| DATE RIGHT OF WAY REF. | ENGINEER LEONARD M. GLASS | APPROVED DIRECTOR & CHIEF SANITARY ENGINEER | CHIEF | | | | | | | TOWSON | | J.O. 3-66-1, 64-1108, FILE: A-4 |
| | REG. No. 2872 DESIGNED L.M.G. | DATE | DATE 12/22/64 | | | | | | | | | |
| | DATE Nov. 1964 DRAWN R.G.B. CHECKED L.M.G. | | | | | | | | | | | |

| DATE | REVISION | BY |
|---|---|---|
| DRAWING COMPLETED | | |

957-W




ROAD PERMIT AND GRADES
PERMIT REQUESTED
PERMIT NUMBER
GRADE ESTABLISHED
PROFILE NUMBER
DATE RIGHT OF WAY REF.

MATZ, CHILDS & ASSOC. INC
CONSULTING ENGINEERS
2129 N. CHARLES ST. BALTO., MD.
ENGINEER LEONARD M. GLASS
REG. NO. 2672
DATE Nov. 1964
DESIGNED R.G.B.
DRAWN R.G.B.
CHECKED L.M.G.

APPROVED FOR CITY OF BALTIMORE
DATE 2-23-65
DIRECTOR OF PUBLIC WORKS
WATER ENGR.

DEPARTMENT OF PUBLIC WORKS
APPROVED
DIRECTOR & CHIEF SANITARY ENGINEER
DATE 12/21/64

BUREAU OF ENGINEERING
APPROVED
CHIEF
DATE 12/21/64

| BUREAU OF ENGINEERING | STORM DRAIN | WATER | SEWER | HIGHWAYS | STRUCTURES | FIELD LOCATION |
|---|---|---|---|---|---|---|
| | DCB | | | | | |
| 6-22-65 | | | | | | |

| 6-22-65 | AS FOR RECORD PRINT | RLB |
|---|---|---|
| DATE | REVISION | BY |
| DRAWING COMPLETED | | |

BALTIMORE COUNTY DEPARTMENT OF PUBLIC WORKS BUREAU OF ENGINEERING
TOWSON PUMPING STATION AND OTHER MAJOR IMPROVEMENTS
PUMPING STATION - MISCELLANEOUS FLOOR PLANS
TOWSON ELECTION DISTRICT NO. 8

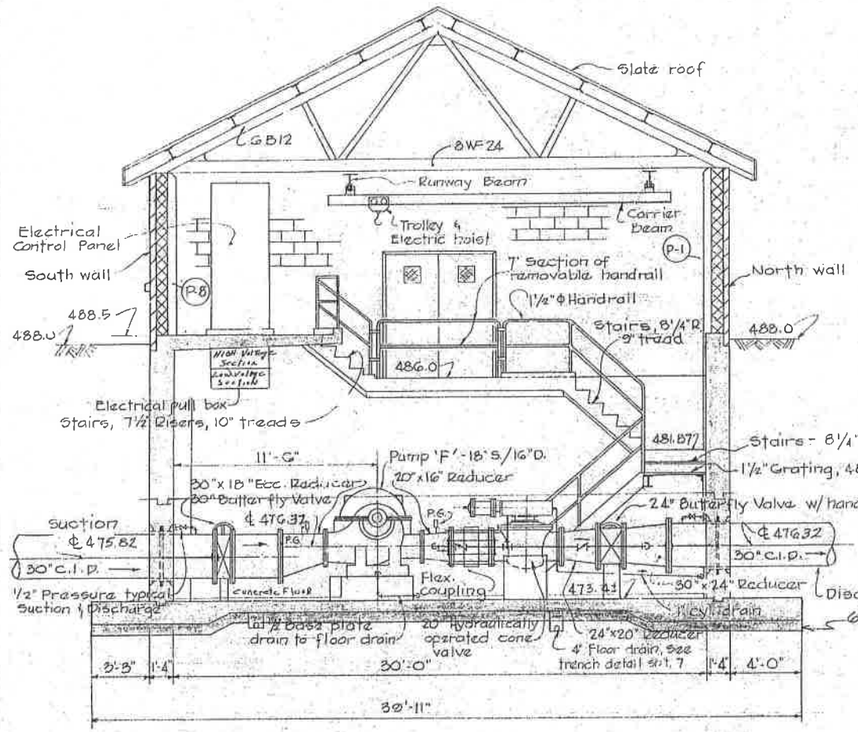
SCALE AS SHOWN
KEY SHEET N NE W
POSITION SHEET 35 & 36 NE 5
SHEET NO. 7 OF 31
J.O. 3-66-1, 64-1115
FILE: A-4

MICROFILMED C.W.O. 35845



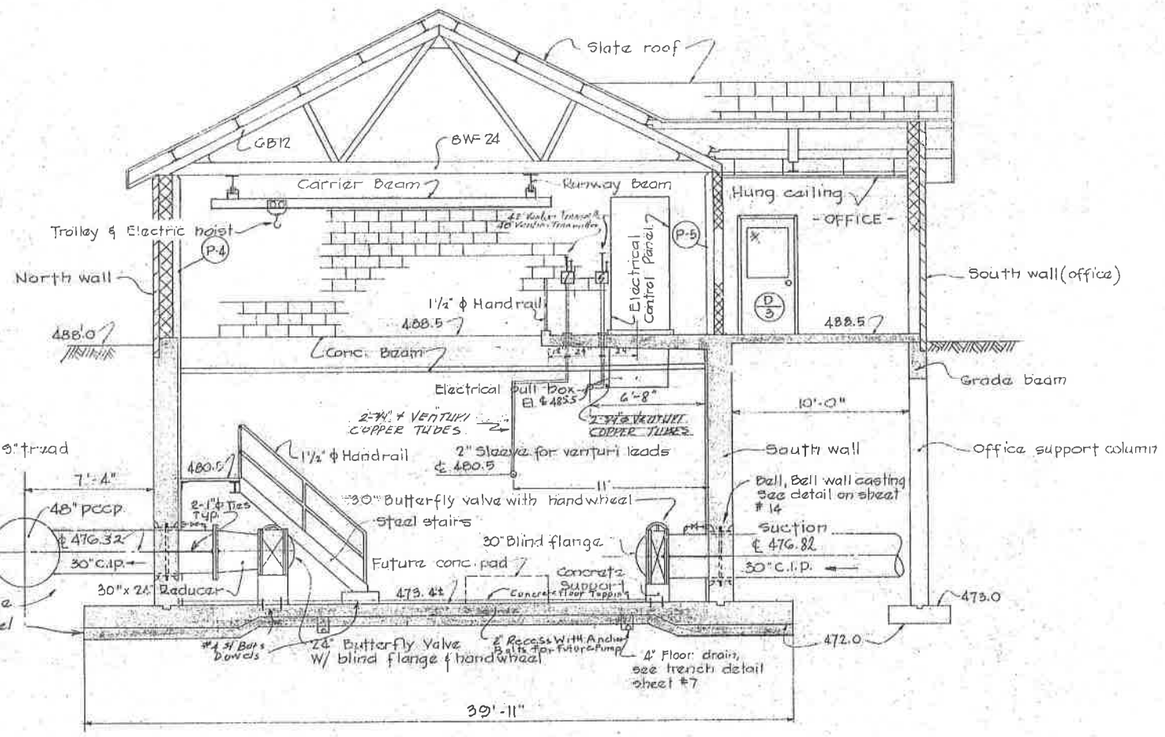
957-W

MICROFILMED



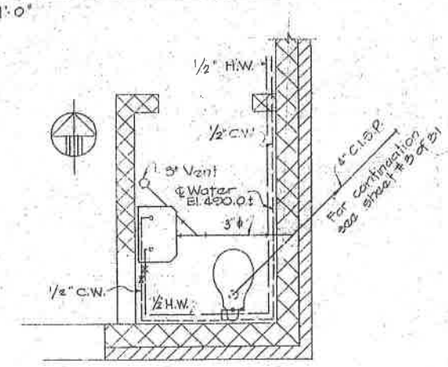

## MECHANICAL SECTION 'C/C-C/C'

1/4" = 1'-0"



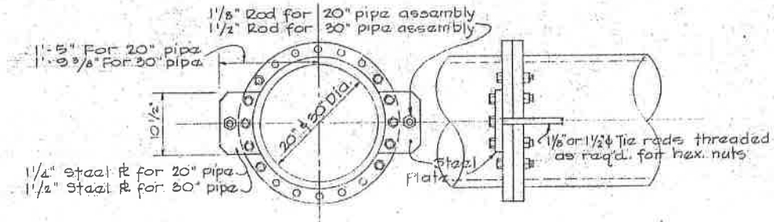

## MECHANICAL SECTION 'D/D-D/D'

1/4" = 1'-0"




## PLAN - TOILET PLUMBING

Scale: 1/2" = 1'-0"




## DRESSER COUPLING TIE RODS & WALL ANCHOR RODS

1" = 1'-0"

#3 SECTION

APPROVED
C.W.O. 35845

| ROAD PERMIT AND GRADES | | APPROVED FOR CITY OF BALTIMORE |
|---|---|---|
| PERMIT REQUESTED | MATZ, CHILTS & ASSOC. INC CONSULTING ENGINEERS 2129 N. CHARLES ST. BALTO., MD. | DATE 3-A-65 |
| PERMIT NUMBER | | DIRECTOR OF PUBLIC WORKS |
| GRADE ESTABLISHED | | WATER ENGR. |
| PROFILE NUMBER | | |
| DATE RIGHT OF WAY | ENGINEER LEONARD M. GLASS | DEPARTMENT OF PUBLIC WORKS |
| | REG. NO. 2672 DESIGNED LMG | APPROVED DIRECTOR & CHIEF SANITARY ENGINEER |
| | DATE 1 NOV. 1964 DRAWN MGB CHECKED LMG | DATE |

BUREAU OF ENGINEERING

APPROVED CHIEF

DATE 12/27/64

| | STORM DRAINS | WATER | SEWER | HIGHWAYS | STRUCTURES | FIELD LOCATION |
|---|---|---|---|---|---|---|
| DES | | | | | | |
| CHKD | | | | | | |

BALTIMORE COUNTY DEPARTMENT OF PUBLIC WORKS BUREAU OF ENGINEERING

TOWSON PUMPING STATION AND OTHER MAJOR IMPROVEMENTS

PUMPING STATION - MECHANICAL SECTIONS

TOWSON ELECTION DISTRICT NO. 9

SCALE: AS SHOWN

KEY SHEET: N/NW POSITION SHEET: 35 & 36 NE 5

SHEET NO. 15 OF 31

J.O. 3-66-1 64-1107

FILE: A-4

| DATE | REVISION | BY |
|---|---|---|
| DRAWING COMPLETED | | |

957-W

## SPECIAL PROVISIONS

Builder's Risk Insurance

A. The Contractor shall, at his/her own cost, insure the work and keep it insured at all times during the period of construction, and until final acceptance of it by the County against loss of damage covered by an "All Risk" Builders Risk type of policy. The amount of insurance shall be the 100% estimated replacement cost of the work.

B. The policies shall be made payable to the County and the Contractor, as their interest may appear, and the policies shall be left in the possession of the Engineer, prior to the start of construction.

# S E C T I O N  I V

## Permits

Baltimore County Soil Conservation District Sediment and Erosion Control Standard Plan
for Disturbance Not to Exceed 20,000 square feet (Not for Dwelling Construction)

Project Name/Location: 401 Hillen Road, Towson, MD 21286
Tax Map: 70 Block: _____ Parcel: 989
Road Map Coordinates Page: 7 Block: B / 2

Owners Name: Balt. Co. Dept. of Public Works Phone: 410-887-3300
Owners Address: 111 West Chesapeake Ave,
Towson, MD 21204
Contractors Name: TBD Phone: _____
Contractors Address: _____

Engineer/Land Surveyor/Landscape Architect's Name: Phoenix Engineering Inc. Phone: 410-329-1150

Total area of site: 217,800 square feet.
Total area of disturbance: 18,115 square feet.
Total volume of excavation or fill: 800 cubic yards.

Distance of disturbed area from the Mean High Water Line of any tidal water: N/A feet.
Distance of disturbed area from any nontidal wetland: N/A feet.
Distance of disturbed area from any nontidal wetland of special State concern: N/A feet.
Distance of disturbed area from any perennial stream and its associated 100-year floodplain: N/A feet.

Limitations:

A. This standard plan is valid only for construction projects which do not exceed any of the following limitations:
1. No more than 20,000 square feet of earth will be disturbed and no more than 1,000 cubic yards of cut or fill will occur.
2. No slope steeper than 2 horizontal to 1 vertical (2:1) for commercial land and 3 horizontal to 1 vertical (3:1) for all other land uses will be disturbed or created.
3. Cuts and/or fills will not exceed 10 feet in depth or height.
4. No earth disturbance shall occur within the limits of the 100-year floodplain of any stream, or 100 feet of any perennial stream, water body, Mean High Water Line of any water body affected by tidal action, or any tidal wetland.
5. No earth disturbance shall occur within 25 feet of any nontidal wetland or within 100 feet of any nontidal wetland of special State concern.
6. The proposed work does not require a State Waterway or Wetland 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.

Conditions:

A. Nothing herein relieves the applicant from complying with any and all Federal, State and local requirements. (e.g., Stormwater Management, Critical Area, Forest Conservation, Grading, etc.)
B. The applicant shall notify the Baltimore County Permits, Approvals and Inspections, Sediment Control Department (DPAI, SC) at 410-887-3226 at least 48 hours prior to starting site work.
C. The Baltimore County DPAI, SC shall have access to the property for inspection purposes.
D. If adequate erosion and sediment control measures are not provided in accordance with this plan, the Baltimore County DPAI, SC reserves the right to require corrective action.

Project Information:

A. The following information must be provided and attached to the standard plan:
1. Plat showing the dimensions of property lines and road frontage.
2. Location and dimensions of all existing and proposed structures (e.g., house, garage, driveway, utilities etc.)
3. If present, the location of the Critical Area buffer, nontidal wetlands and buffers, wetlands of special State concern, tidal wetlands and perennial streams and their associated floodplain.
4. Limits of disturbance.

5. Direction of surface water drainage and points of discharge.
6. Erosion and sediment control provisions to minimize on-site erosion and prevent off-site sedimentation.

Requirements:

A. All sediment control practices shall be installed and maintained according to the criteria contained in the current version of the Maryland Standards and Specifications for Soil Erosion and Sediment Control, or as amended by the District.
B. Erosion and sediment control measures shall be installed prior to any earth disturbance except that necessary for installation of the controls.
C. Building and/or Grading permits to be issued by Baltimore County Department of Permits, Approvals and Inspections, Division of Permits and Licenses at 410-887-3900, shall be required. (If disturbance is less than 5,000 square feet, no grading permit is required.)
D. Should you have any questions about this plan, please call Baltimore County Department of Permits, Approvals and Inspections, Sediment Control Department at 410-887-3226.
E. Following initial soil disturbance or re-disturbance, permanent or temporary stabilization must be completed within: a.) three (3) calendar days as to the surface areas of all sediment controls, stockpiles, and perimeter slopes; and seven (7) calendar days for all other disturbed or graded areas on the project site not under active grading.
F. Stockpiles will be within the limits of disturbance and the area downslope protected by silt fence.
G. 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 only.
    2. Install stabilized construction entrance, perimeter silt fence and any other sediment control practices.
    3. Clear, grub and grade the remainder of the site within the LOD. Construct any structures, utilities and paving. Stabilize any area not being actively graded within seven (7) calendar days.
    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.
    6. After the site has been completed and stabilized with established vegetation, and with the permission of the sediment control inspector, remove sediment control practices and stabilize remaining disturbed areas.
H. Access to the site will be available at all times to the District and Baltimore County Personnel.
I. All erosion and sediment control devices require continual maintenance. Any controls that are damaged or disturbed shall be restored or repaired before the end of each work day.
J. Development activities shall not impair any drainage, create an erosion hazard, or create a source of sediment to any adjacent watercourse, wetland, or property.
K. Pumping of sediment laden water offsite is illegal. Dewatering must be accomplished by use of an approved MDE dewatering device.

**I hereby certify that this project meets the specified limitations and that all requirements for this Standard Plan will be met and that all grading and construction will be done in accordance with the requirements and guidelines stated in this document.**

**Signature of Applicant:** Kevin Walker **Date:** 1/27/2023

**Printed Name of Applicant:** Kevin Walker

**Baltimore County Soil Conservation District**

**APPROVED FOR SEDIMENT CONTROL** December 20, 2022
DATE

John M. Mc[illegible]
DISTRICT OFFICIAL

157-COUNTY-22
PLAN NO.

**This plan approval will expire three (3) years from the approval date.**

This plan is not valid for issue after: 12-31-2023

**BALTIMORE COUNTY, MARYLAND**
**DEPARTMENT OF ENVIRONMENTAL PROTECTION AND SUSTAINABILITY**
**ENVIRONMENTAL AGREEMENT**

**All grading and stormwater management permit application numbers should be included on this Environmental Agreement (EA). Please return completed form with ORIGINAL signatures to EPS, 111 W. Chesapeake Avenue, Room 319, Towson, MD 21204.**

**ENVIRONMENTAL AGREEMENT** for:

Project Name: RENOVATIONS AT TOWSON PUMPING STATIONS
Plat Reference: N/A
Tax Acct. No.: 0913206031
Total Estimated Cost: N/A
(All Environmental Securities)

**Grading Permit #** CEN22-000089
**Stormwater Management Permit #** RECEIVED 5-24-21 EPS GRANTED 6-30-21
**EIR Plan #'s** M130289

THIS ENVIRONMENTAL AGREEMENT, NUMBER ★EA-2023-00033, made this 27 day of JANUARY 2023 by and between BALTIMORE COUNTY DPW, hereinafter referred to as the applicant, party of the first part, and BALTIMORE COUNTY, MARYLAND, a political subdivision of the State of Maryland, hereinafter referred to as the County, party of the second part.

WHEREAS, the applicant agrees to implement all environmental measures as set forth in this agreement, at no cost to the County, including:

| | AMOUNT | APPLICATION DATE |
|---|---|---|
| a. Grading, erosion and sediment control<br>Required performance security amount | N/A | ★ |
| b. Storm water management<br>Required performance security amount<br>(List facilities separately) | N/A | ★ |
| c. Forest conservation<br>Required performance security amount | N/A | ★ |
| d. Forest buffer mitigation<br>Required performance security amount | N/A | ★ |
| e. Wetland mitigation<br>Required performance security amount | N/A | ★ |
| f. Chesapeake Bay Critical Area mitigation<br>Required performance security amount | N/A | ★ |
| g. Other (Specify) ----------<br>Required performance security amount | N/A | ★ |

★ Applicant – please leave blank

Now, THEREFORE, THIS AGREEMENT WITNESSETH:
THAT, for and in consideration of the provisions and benefits herein contained, the parties do hereby agree as follows:

1. The applicant agrees:

a. To implement all required environmental measures for this project in accordance with applicable permits, plans and performance requirements.

b. To post security(ies) with the County as required in Baltimore County Code Section 32-4-312, in accordance with applicable time frames and procedures specified in the Baltimore County Code and the Department of Environmental Protection and Resource Management Policy, Rules and Regulations Manual.

c. To process any request(s) for reduction to security(ies) in accordance with Baltimore County Code Section 32-4-313 and the Department of Environmental Protection and Resource Management Policy, Rules and Regulations Manual.

WITNESS the signatures of:

Date: 2/10/2023 Signed: Erin McKenna-Streyle (Seal)

Printed Name: Erin McKenna-Streyle Title, if applicable: Chief, Water Design

Witness Signature:

Witness Printed Name: Annmarie Turner

Address: COUNTY OFFICE BLDG
111 W. CHESAPEAKE AVE
TOWSON MD 21204

Email: emckenna-streyle@baltimorecountymd.gov

Phone: 410-887-3783

APPROVED

By: ★ Director of Environmental Protection and Sustainability for

Date: ★ 2/13/23

Rev. 2, March 1, 2017
S>EPS>Shared>ReferenceMaterial

# Baltimore County, Maryland
# Department of Permits, Approvals, and Inspections
# BUILDING PERMIT

**Permit Number:** C23-00377

**Permit Type:** Commercial Alteration

**Sub Type:**

**Date Issued**: 04/18/2023

**Expiration Date:** 04/17/2024

## *Property Information*

**Property Address:** 401 HILLEN RD

**City, State, Zip:** TOWSON, MD, 21286

**Tax ID:** 0913206031

**District:** 09

**Existing Use:** Other

**Proposed Use:**

**Is this property located in a Floodplain:** NO

**Sprinkler to be Installed?:**

**Plumbing Work?:**

**Electrical Work?:**

## *Lot Size and Setbacks*

**Size:** 1,949.00

**Set Backs - Front Yard:** 605.00

**Set Backs - Rear Yard:** 41.00

**Set Backs - Right Side Yard:** 302.00

**Set Backs - Left Side Yard:** 172.00

## *Owner Information*

**Owner:** MAYOR & CITY COUNCIL OFBALTIMORE and CITY

**Owner Address:** 2331 N FULTON AVE, Baltimore, MD, 21217

**Tenant:**

**Applicant:** Tim Weaver

C. Pete Gutwald, AICP, Director

E. John Bryan, Building Engineer

***Please log into your account to get up-to-date information regarding the permit process and related inspections. Refer to the Permit Number when making inquires.**

# Baltimore County, Maryland
# Department of Permits, Approvals, and Inspections
# BUILDING PERMIT

**Permit Number:** C23-00377

**Permit Type:** Commercial Alteration

**Sub Type:**

**Date Issued**: 04/18/2023

**Expiration Date:** 04/17/2024

## *Building Permit Contractor*

**Name of Contractor:**

**Phone Number:**

**Address:**

**City, State, Zip:** , ,

**Is Owner Contractor?**:

## *Building Permit Information*

**Description of Work:** Int/Ex alterations to include: demo & const cmu, doors, hvac & duct, ceiling tile & grid, fixtures & finishes to the Towson Pump Station 2 and 3, remove & replacement of mechanical pumps, valves and piping within both buildings. Replacement of exterior yard piping and vaults. New external stairway into Pump Station 2. No Exterior building work on pump Station 3. Separate permit required for any additional work. 1,949sf See CEN22-000089

C. Pete Gutwald, AICP, Director

E. John Bryan, Building Engineer

***Please log into your account to get up-to-date information regarding the permit process and related inspections. Refer to the Permit Number when making inquires.**

# Baltimore County, Maryland
# Department of Permits, Approvals, and Inspections
# BUILDING PERMIT

**Permit Number:** CEN22-000089

**Permit Type:** Commercial Enviromental

**Sub Type:** Grading

**Date Issued**: 03/11/2023

**Expiration Date:** 03/10/2025

## *Property Information*

**Property Address:** 401 HILLEN RD

**City, State, Zip:** TOWSON, MD, 21286

**Tax ID:** 0913206031

**District:** 09

**Existing Use:**

**Proposed Use:**

**Is this property located in a Floodplain:** NO

**Sprinkler to be Installed?:**

**Plumbing Work?:**

**Electrical Work?:**

## *Lot Size and Setbacks*

**Size:**

**Set Backs - Front Yard:**

**Set Backs - Rear Yard:**

**Set Backs - Right Side Yard:**

**Set Backs - Left Side Yard:**

## *Owner Information*

**Owner:** John Krysztofiak

**Owner Address:** 111 W Chesapeake Ave #307, Towson, MD, 21204

**Tenant:**

**Applicant:** Tim Weaver

C. Pete Gutwald, AICP, Director

E. John Bryan, Building Engineer

***Please log into your account to get up-to-date information regarding the permit process and related inspections. Refer to the Permit Number when making inquires.**

# Baltimore County, Maryland
# Department of Permits, Approvals, and Inspections
# BUILDING PERMIT

**Permit Number:** CEN22-000089

**Permit Type:** Commercial Enviromental

**Sub Type:** Grading

**Date Issued**: 03/11/2023

**Expiration Date:** 03/10/2025

## *Building Permit Contractor*

**Name of Contractor:**

**Phone Number:**

**Address:**

**City, State, Zip:** , ,

**Is Owner Contractor?**:

## *Building Permit Information*

**Description of Work:** BALTIMORE COUNTY PROJECT FOR RENOVATIONS TO TOWSON WATER PUMPING STATION. JO #231-203-0035-0445, CONT #20203WXO. Grade 18,115SF for replacement of piping and vaults. Permit expires 2 years from date of issue. No construction to begin until pre-construction meeting. Failure to comply with result in penalties. schedule your preconstruction meeting in your portal.

C. Pete Gutwald, AICP, Director

E. John Bryan, Building Engineer

***Please log into your account to get up-to-date information regarding the permit process and related inspections. Refer to the Permit Number when making inquires.**

# SECTION V

## Proposal

This Section to be

Completed by Time of Bid

# SECTION - V
# PROPOSAL

## DESCRIPTION OF WORK

**Bid Opening via Teleconference WebEx:** Tuesday, October 31, 2023 @ 10:45 A.M. EST. via **WebEx Phone Number 1-415-655-0001, Access Code Number 2323 995 8543#.**

**Begin Work within Fifteen (15) Days after NOTICE TO PROCEED.**

**Working Days for Completion:** Six Hundred Fifty-Five (**655**) WORKING DAYS

**Liquidated and Other Damages:** FIVE HUNDRED DOLLARS ($500.00) PER WORKING DAY

**Cost Group** "G" ($10,000,001 to $15,000,000)" (Prequalified contractors with a Cost Group restriction must bid within the dollar amount stated on their Certificate of Prequalification)

**Work Classification: G2 with a prequalified F2, A2 & I8 subcontractors**

***TO BALTIMORE COUNTY, MARYLAND:*** Work includes, but is not limited to: mobilization; all related excavation, shoring and backfill; construction of the Renovations at: Pumping Station No. 2, Pumping Station No. 3, Station No. 2 Venturi Vault, Station No. 3 Venturi Vault, Bypass Venturi Vault, Station No. 2 Surge Valve Vault and No. 3 Surge Valve Vaults; replacement of finished water piping on the suction and discharge sides of Station No. 2; and all other work shown on the Contract Drawings and specified in the Contract Documents required to complete the Project in its entirety. Towson – ***District 9c5.***

**The following listed Drawing Number(s) are collectively the "Drawings", and are hereby incorporated in the Contract.**

| Job Order No./ Workday # | Drawing Number's |
|---|---|
| **231-203-0035-0445 / 030350445** | **2021 – 1700 thru 1817** |

A site visit will be held on Wednesday, October 11, 2023 @ 10:00 A.M. EST. Located at 7781 Far Hills Drive, Towson, Maryland 21286. A pre-bid meeting will be held on Wednesday, October 4, 2023 @ 11:00 A.M. EST. via WebEx. Phone-In (Audio Only) – 1-415-655-0001, Access Code 2323 399 2434#. Video Conference – WebEx link "signin.webex.com/join" Meeting Number 2323 399 2434##. Password: **Fw2guT3JYS6.**

**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

Renovations to Towson Water Pumping Stations
CONTRACT NUMBER 20203-WX0
WORKDAY NUMBER 030670754 Renovations to Towson Water Pumping Stations
JOB ORDER NUMBER 231-203-0035-0445
WORKING DAYS : 655

**CONTRACTOR:** _____
**ADDRESS:** _____
**PHONE:** _____

| BID ITEM | COMM. CODE | | DESCRIPTION | UNIT | ESTIMATED QUANTITY | UNIT PRICE | TOTAL AMOUNT |
|---|---|---|---|---|---|---|---|
| 1 | 0 | 0000 | CONSTRUCTION OF RENOVATIONS TO TOWSON WATER PUMPING STATIONS | LS | 1 | | $ |
| 2 | 800020 | F | CONTINGENT CLASS 3 EXCAVATION WITH SELECT BACKFILL | CY | 50 | $130.00 | $6,500.00 |
| 3 | 202070 | F | CONTINGENT BORROW MATERIAL, A-1, A- 2-4, OR A-2-6 | CY | 50 | $80.00 | $4,000.00 |
| 4 | 0 | C | CONTINGENT DG AGGREGATE MATERIAL, CR-6 | CY | 50 | | $ |
| 5 | 0 | C | CONTINGENT OGC AGGREGATE MATERIAL, MDSHA NO. 57 AGGREGATE | CY | 100 | | $ |
| 6 | 0 | F | CONTINGENT ALLOWANCE - PUMP CASING MACHINING | EACH | 3 | $25,000.00 | $75,000.00 |
| 7 | 0 | F | CONTINGENT ALLOWANCE - IMPELLER RECONSTRUCTION | EACH | 3 | $20,000.00 | $60,000.00 |
| 8 | 0 | F | CONTINGENT ALLOWANCE - REPLACEMENT OF PUMP SHAFT | EACH | 3 | $30,000.00 | $90,000.00 |
| 9 | 0 | F | CONTINGENT ALLOWANCE - REPLACEMENT OF IMPELLER | EACH | 3 | $50,000.00 | $150,000.00 |
| 10 | 0 | F | CONTINGENT ALLOWANCE - REPLACEMENT OF WEARING PARTS IN CONE VALVE OPERATOR MECHANISM | LS | 1 | $50,000.00 | $50,000.00 |
| 11 | 0 | C | POWER CABLES FOR STATION NO.2 PUMPS | LS | 1 | | $ |
| 12 | 0 | C | CONTINGENT CONCRETE REPAIR AND PATCHING WITH POLYMER – MODIFIED MORTAR | SF | 80 | | $ |
| **TOTAL COST FOR CONTRACT** | | | | | | | $ |

*TOTAL COST FOR CONTRACT IN WORDS*

OFFICER SIGNATURE

TITLE

## 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]:

_____

_____.

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.

l0. **CERTIFICATION OF CORPORATION REGISTRATION AND TAX PAYMENT**

I FURTHER AFFIRM THAT:

(1) The Business is a _____ (State) (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:

Name: _____
Address: _____
_____
(If none, so state).

(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.

(4) 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.

(5) 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.

(6) 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)

# 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** **$** **5% of Bid**
Penal Sum of Bond [shall be determined pursuant to latest revised Specification / G.P. 2.07 (2000 Ed.)]

**Towson Water Pumping Station Renovations**
**Contract Name**

**20203 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 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.

**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:** _____

**Corporate Principal**

**In Presence of:**

_____
(Name of Corporation)

**Witness:** _____ **By:** _____

**Print Name:** _____ **Print Name:** _____ **(SEAL)**

**Title:** _____

**Surety**

_____
(Name of Surety)

**Business Address:** _____

**Witness:** _____ **By:** _____ Affix

**Print Name:** _____ **Print Name:** _____ Corporate

**Title:** _____ Seal

**V-7**
**Revised**
**February 4, 2015**

# BALTIMORE COUNTY
# PREVAILING WAGE AND LOCAL HIRING

## *AFFIDAVIT*

***(Project Name)*** _____
**Proposal No.:** _____
**Project No.:** _____

On behalf of_____, I do solemnly declare and affirm,
*(Contractor)*
under penalty of perjury, that to the best of my knowledge, information, and belief:

1. I have submitted all documentation in accordance with Baltimore County Code §-10-2-506 and -§-10-2-507 regarding the prevailing wage and local hiring laws and requirements of the Prevailing Wage guidelines located at (Prevailing Wage Law), and that I have read and agree to all provisions of said law, as amended, and have a continuing obligation to be compliant with any changes to the law.

2. I shall not knowingly provide any false information relating to payroll documentation and or hiring of local employees for capital improvement contracts that are subject to the prevailing wage and/or local hiring laws of Baltimore County. I further attest and certify that all documentation relating to the same will be accurate and complete and will remain accurate and complete on an ongoing basis, and will reflect the payroll and/or local hiring status of contractors, subcontractors, apprentices, and independent contractors performing work for the Contract (contract number_____). I acknowledge that I have been informed and am aware of the foregoing requirements and that I am authorized to make this certification on behalf of myself and all subcontractors and parties performing work pursuant to this Contract.

3. I certify and attest that I am an officer or agent of the Contractor or subcontractor who supervises the payment of employees. I understand and agree that all documentation related to prevailing wages and/or local hiring required by law shall be submitted to Baltimore County's Prevailing Wage Administrator or designee before any surety is released or final payment due under the terms of the Contract is made.

4. I further certify and attest that I will have personal knowledge of the wages paid to all employees of_____for work performed on the Contract and of all of the hours worked, and that I am an authorized agent of the Contractor and assume responsibility for my actions.

5. I further certify and attest that_____will comply with prevailing wage rates set by the State of Maryland as the same apply to the Contract and are a part of the bid documents and Contract, and that_____will comply with applicable local hiring requirements.

6. I attest and certify that, if the Contract is subject to the local hiring requirement under 10-2-507 of the Baltimore County Code,_____will make best efforts to ensure that residents of Baltimore County constitute 51% of the new hires made for the Contract, subject to all exceptions allowable by law.

7. I certify and attest that, if the Contract is subject to prevailing wage requirements, no rebates or deductions will be made, directly or indirectly, from any wages paid in connection with the Contract, other than those provided for by law.

8. I certify and attest that, if awarded the Contract and if the Contract is subject to prevailing wage law, I will submit certified payroll to the County through its Prevailing Wage software, PRISM. (https://baltimorecounty.prismcompliance.com/)

_____
Contractor/Bidder/Offeror

_____
By

_____
Printed Name

_____
Printed Title

_____
Date

_____
Phone

_____
Email

_____
License Number

# BALTIMORE COUNTY, MARYLAND

## Prevailing Wage and Local Hiring Contract Requirements and Policies

The Contractor and all Subcontractors must comply with the Prevailing Wage Law and Local Hiring Requirements contained in Baltimore County Code § 10-2-506 and § 10-2-507, respectively, as amended. Prevailing wage means the wage rate paid by employers that is determined by a governmental authority, based upon a particular geographic area, for a given class of labor and type of project. The County will use the prevailing wage established by the State of Maryland Commissioner of Labor and Industry for state funded construction contracts in the county at the time of award. These rates include the basic hourly rate and fringe benefits. Apprentices must be paid at least the rate that the state's apprenticeship and training council sets for an apprentice in the trade involved, based on a percentage of the prevailing wage rate in that trade. Any Contractor that is subject to the prevailing wage or local hiring law will be required to agree to the below provisions:

For the purposes of these requirements, an employee means an apprentice, laborer or mechanic employed by a contractor or subcontractor on a capital improvement project with a value of over $300,000 and a County-subsidized capital project with a value over $5,000,000.

Capital Improvement Project does not include blanket order or open end agreements, capital improvement projects subject to a federal or state prevailing wage law, awarded without competition; with another governmental entity; to the extent the contractor is precluded from compliance by the terms of any federal or state law, contract or grant; entered into pursuant to Baltimore County Code § 10-2-310(e); entered into as a joint or cooperative purchase or entered into as an emergency purchase.

The purpose of a prevailing wage is to ensure that contractors institute local hiring practices for Capital Improvement contracts and Capital Projects under certain circumstances as required by law, and that the Contractor's employees who work on capital improvement contracts are paid the going rate for their services. The prevailing wage rates are established by the State of Maryland Department of Labor and apply to all of the Contractor's employees and any and all Subcontractors. The Contractor and all Subcontractors must comply with all of the requirements of the Prevailing Wage Law including, but not limited to, the following:

1. Pay employees the prescribed rate as annually established by the State of Maryland Commissioner of Labor and Industry; the prevailing wage rates in effect on the date a solicitation is issued will apply throughout the term of a contract resulting from that solicitation. . Contractor or subcontractor may NOT split or subdivide a capital improvement contract, pay an employee through a third party, treat an employee as a subcontractor or independent contractor to avoid any requirement of the County's prevailing wage law; or employ an individual classified as a helper or trainee to perform direct and measurable work on a capital improvement contract.

2. Pay employees at a rate equal to or more than the prevailing wage rate currently in effect for the type of work performed

3. Pay employees overtime for work (I) more than eight hours in any single calendar day; (II) more than 40 hours in a work week; or (III) on a Sunday or a legal holiday.

4. Classify employees in their proper work classification in conformance with the schedule established by the State of Maryland Commissioner of Labor and Industry.

5. May only make fair and reasonable deductions that are (1) required by law; (2) authorized in a written agreement between an employee and contractor or subcontractor signed at the beginning of employment that concerns food, sleeping quarters, or similar items; and submitted by the contractor or subcontractor to the Director of the County's Prevailing Wage Program; or required or allowed by a collective bargaining agreement between a bona fide labor organization and a contractor or subcontractor.

> Electronically submit a certified copy of payroll records through https://baltimorecounty.prismcompliance.com/within 14 days after the end of each payroll period, to verify that Prevailing Wage rates have been paid to employees.

6. Retain records for a period of five (5) years after the work is completed and permit the Director of the County Prevailing Wage Program, or his designee, to inspect the payroll records at a reasonable time and as often as necessary.

7. Payroll records shall contain a statement signed by the contractor or subcontractor certifying that the payroll records are complete and correct; the wage rates are not less than required by the Prevailing Wage law; and the rate of pay and classification for each employee accurately reflects the work the employee performed.

8. All payroll records shall include the name, address, telephone number and email address of the contractor or subcontractor; the name and location of the job; and each employee's name, current address, unless previously reported; specific work classification; daily basic time and overtime hours; total basic time and overtime hours for the payroll period; rate of pay; fringe benefits by type and amount; and gross wages. Late submission of copies of any payroll records may be deemed deficient by the County until the required records are provided, and the County may postpone processing payments due under the Contract or under an agreement to finance the Contract.

9. Submit to random or regular audits and investigation of any complaint of a violation of the County's prevailing wage and local hiring laws and requirements.

10. Make best efforts to fill at least 51% of new jobs required to complete the capital improvement contract or capital project with Baltimore County residents.

Submit monthly reports on the form designated by and to the Director of the Department of Economic and Workforce Development relating to local hiring with respect to a capital

improvement contract over $300,000 and County-subsidized capital project receiving assistance over $5,000,000 that includes 1) the number of new hires needed for the contract or project, 2) the number of County residents hired during the reporting period, 3) the total number of all employees hired during the contract period, 4) best efforts made to fill open positions with County residents, and 5) for new hires: name, last four (4) digits of the social security number, job title, hire date, address and referral source.

11. Agree that any and all disputes will be handled as set forth in the County's Prevailing Wage and Local Hiring laws. as a condition of award

12. In the event the County determines that a provision of the Prevailing Wage Law has been violated, the County shall issue a written decision, including appropriate sanctions, and may withhold payment due the Contractor in an amount sufficient to pay each employee of the Contractor or any Subcontractors the full amount of wages due under the Prevailing Wage Law, and an amount sufficient to satisfy a liability of a Contractor for liquidated damages as provided under the Prevailing Wage Law, pending a final decision on the violation by the County. The Contractor may appeal a written decision of the Director of Economic and Workforce Development to the Office of Administrative Hearings ("OAH"), that the Contractor violated a provision of the Prevailing Wage Law, within ten (10) working days after receiving a copy of the decision. OAH will conduct a hearing upon the receipt of a timely appeal. If no appeal, the decision of the Director of Economic and Workforce Development or his designee becomes final. A Contractor who is found to have violated the provisions of the Prevailing Wage or Local Hiring laws intentionally, may not be awarded a County contract or work on any County project for a period of one year from the date of the OAH determination..

13. May not discharge, or otherwise retaliate against, an employee for asserting any right under the Prevailing Wage Law or for filing a complaint of a violation;

14. An aggrieved employee is a third-party beneficiary of this Contract and may by civil action recover the difference between the prevailing wage for the type of work performed and the amount actually received, with interest and a reasonable attorney's fee.

15.Each Contract subject to the Prevailing Wage Law may specify the payment of liquidated damages to the County by the Contractor for any noncompliance with the Prevailing Wage Law. Liquidated damages are:

1) $10 for each calendar day that the payroll records are late; $20 for each day that an employee is misclassified and paid less than the prevailing wage rate; and a civil penalty $50 per violation of the requirement to post the prevailing wage rates at the work site.

These liquidated damages are solely related to prevailing wage and local hiring compliance and do not negate any other remedies available or set forth in the Contract, including delay damages or actual damages. These remedies are separate, in addition to, and not in lieu of any remedies available and set forth in the Contract for other breaches or defaults under the Contract.

16. Where the initial Contract Sum is $300,000 or below, but it is subsequently increased and exceeds $300,000 due to an approved Contract Modification, the amount of any such Contract Modification that causes the Contract Sum to exceed $300,000 is subject to the Prevailing Wage Law and Local Hiring requirements.

17. The Contractor and all Subcontractors must post a clearly legible statement of each prevailing wage rate in a prominent and easily accessible place at the Work Site during the entire time Work is being performed, in English and any other language that is primarily spoken by the employees, at the Work Site.

CONTRACT NUMBER: 20203 WX0

# BALTIMORE COUNTY PREVAILING WAGE RATES
## BUILDING CONSTRUCTION

Print Date 9/11/2023

| Classification | Modification Reason | Basic Hourly Rate | Borrowed From | Fringe Benefit Payment |
|---|---|---|---|---|
| BALANCING TECHNICIAN | AD | $31.26 | | $8.95 |
| BRICKLAYER | AD | $35.20 | | $13.14 |
| CARPENTER | AD | $31.40 | | $14.02 |
| CARPENTER - SHORING SCAFFOLD BUILDER | AD | $31.40 | | $14.02 |
| CARPET LAYER | AD | $32.08 | | $14.39 |
| CEMENT MASON | AD | $25.85 | 027 | $10.95 |
| COMMUNICATION INSTALLER TECHNICIAN | AD | $27.53 | | $16.06 |
| DRYWALL - SPACKLING, TAPING, & FINISHING | AD | $31.40 | | $14.02 |
| ELECTRICIAN | AD | $43.01 | | $19.25 |
| ELEVATOR MECHANIC | AD | $51.75 | | $41.62 |
| FIREPROOFER - SPRAYER | AD | $29.70 | 510 | $7.48 |
| FIRESTOPPER | AD | $29.41 | | $9.48 |
| GLAZIER | AD | $34.16 | | $13.50 |
| INSULATION WORKER | AD | $39.27 | | $19.42 |
| IRONWORKER - FENCE ERECTOR | AD | $28.23 | 510 | $19.64 |
| IRONWORKER - ORNAMENTAL | AD | $31.17 | | $24.38 |
| IRONWORKER - REINFORCING | AD | $29.20 | 510 | $21.42 |
| IRONWORKER - STRUCTURAL | AD | $31.17 | | $24.38 |
| LABORER - AIR TOOL OPERATOR | AD | $21.62 | | $3.89 |
| LABORER - ASPHALT PAVER | AD | $21.62 | | $3.89 |
| LABORER - ASPHALT RAKER | AD | $24.00 | | $3.16 |
| LABORER - BLASTER - DYNAMITE | AD | $21.62 | | $3.89 |
| LABORER - BURNER | AD | $21.62 | | $3.89 |
| LABORER - COMMON | AD | $24.00 | | $3.16 |
| LABORER - CONCRETE PUDDLER | AD | $24.00 | | $3.16 |
| LABORER - CONCRETE SURFACER | AD | $21.62 | | $3.89 |
| LABORER - CONCRETE TENDER | AD | $24.00 | | $3.16 |
| LABORER - CONCRETE VIBRATOR | AD | $24.00 | | $3.16 |
| LABORER - DENSITY GAUGE | AD | $24.00 | | $3.16 |
| LABORER - FIREPROOFER - MIXER | AD | $24.00 | | $3.16 |
| LABORER - FLAGGER | AD | $24.00 | | $3.16 |
| LABORER - GRADE CHECKER | AD | $24.00 | | $3.16 |
| LABORER - HAND ROLLER | AD | $24.00 | | $3.16 |
| LABORER - HAZARDOUS MATERIAL HANDLER | AD | $21.62 | | $3.89 |
| LABORER - JACKHAMMER | AD | $24.00 | | $3.16 |
| LABORER - LANDSCAPING | AD | $24.00 | | $3.16 |
| LABORER - LAYOUT | AD | $24.00 | | $3.16 |
| LABORER - LUTEMAN | AD | $24.00 | | $3.16 |
| LABORER - MASON TENDER | AD | $21.62 | | $3.89 |
| LABORER - MORTAR MIXER | AD | $24.00 | | $3.16 |
| LABORER - PIPELAYER | AD | $21.62 | | $3.89 |
| LABORER - PLASTERER - HANDLER | AD | $24.00 | | $3.16 |
| LABORER - SCAFFOLD BUILDER | AD | $21.62 | | $3.89 |
| LABORER - TAMPER | AD | $24.00 | | $3.16 |

| | | | | |
|---|---|---|---|---|
| MECHANICAL SYSTEMS SERVICE TECH-HVAC SYSTEMS | | $47.98 | 003 | $23.69 |
| MECHANICAL SYSTEMS SERVICE TECH-REFRIGERATION SYSTEMS | | $47.98 | 003 | $23.69 |
| MILLWRIGHT | AD | $34.90 | | $17.16 |
| PAINTER | AD | $25.86 | | $11.44 |
| PAINTER-INDUSTRIAL | AD | $33.05 | | $14.28 |
| PILEDRIVER | AD | $34.62 | | $16.51 |
| PLUMBER | AD | $42.62 | | $23.19 |
| POWER EQUIPMENT OPERATOR - ASPHALT DISTRIBUTOR | AD | $28.92 | 510 | $12.10 |
| POWER EQUIPMENT OPERATOR - BACKHOE | AD | $32.13 | | $13.67 |
| POWER EQUIPMENT OPERATOR - BOOM TRUCK | AD | $33.00 | 013 | $3.69 |
| POWER EQUIPMENT OPERATOR - BROOM / SWEEPER | AD | $30.18 | | $13.67 |
| POWER EQUIPMENT OPERATOR - BULLDOZER | AD | $32.13 | | $13.67 |
| POWER EQUIPMENT OPERATOR - CONCRETE PUMP | AD | $41.50 | | $0.25 |
| POWER EQUIPMENT OPERATOR - CRANE | AD | $38.70 | | $16.40 |
| POWER EQUIPMENT OPERATOR - CRANE - TOWER | AD | $38.70 | 510 | $16.40 |
| POWER EQUIPMENT OPERATOR - DRILL - RIG | AD | $32.13 | | $13.67 |
| POWER EQUIPMENT OPERATOR - EXCAVATOR | AD | $32.13 | | $13.67 |
| POWER EQUIPMENT OPERATOR - FORKLIFT | AD | $32.13 | | $13.67 |
| POWER EQUIPMENT OPERATOR - GRADALL | AD | $33.00 | | $5.87 |
| POWER EQUIPMENT OPERATOR - GRADER | AD | $38.33 | | $5.87 |
| POWER EQUIPMENT OPERATOR - HOIST | AD | $28.68 | 027 | $10.62 |
| POWER EQUIPMENT OPERATOR - LOADER | AD | $32.13 | | $13.67 |
| POWER EQUIPMENT OPERATOR - MECHANIC | AD | $32.13 | | $13.67 |
| POWER EQUIPMENT OPERATOR - MILLING MACHINE | AD | $37.11 | 510 | $4.85 |
| POWER EQUIPMENT OPERATOR - OILER | AD | $34.50 | 510 | $1.43 |
| POWER EQUIPMENT OPERATOR - PAVER | AD | $23.00 | 510 | $0.00 |
| POWER EQUIPMENT OPERATOR - ROCK / STUMP TUB GRINDER | AD | $29.05 | 003 | $12.10 |
| POWER EQUIPMENT OPERATOR - ROLLER - ASPHALT | AD | $23.50 | 510 | $2.50 |
| POWER EQUIPMENT OPERATOR - ROLLER - EARTH | AD | $26.55 | | $13.67 |
| POWER EQUIPMENT OPERATOR - SCRAPER | AD | $32.00 | | $9.55 |
| POWER EQUIPMENT OPERATOR - SCREED | AD | $30.93 | | $10.87 |
| POWER EQUIPMENT OPERATOR - SHOULDER MACHINE | AD | $26.09 | 003 | $12.10 |
| POWER EQUIPMENT OPERATOR - SKID STEER (BOBCAT) | AD | $30.18 | | $13.67 |
| POWER EQUIPMENT OPERATOR - SPREADER | AD | $33.27 | 003 | $15.82 |
| POWER EQUIPMENT OPERATOR - TRIMMER | AD | $27.21 | | $0.00 |
| POWER EQUIPMENT OPERATOR-VACUUM TRUCK | AD | $32.50 | 510 | $15.55 |
| RESILIENT FLOOR | AD | $32.08 | | $14.39 |
| ROOFER/WATERPROOFER | AD | $31.26 | | $14.71 |
| SHEETMETAL WORKER (INCLUDING METAL ROOFING) | AD | $44.37 | | $22.75 |
| LABORER - GRADE CHECKER | AD | $24.00 | | $3.16 |
| LABORER - HAND ROLLER | AD | $24.00 | | $3.16 |
| LABORER - HAZARDOUS MATERIAL HANDLER | AD | $21.62 | | $3.89 |
| LABORER - JACKHAMMER | AD | $24.00 | | $3.16 |
| LABORER - LANDSCAPING | AD | $24.00 | | $3.16 |
| LABORER - LAYOUT | AD | $24.00 | | $3.16 |
| LABORER - LUTEMAN | AD | $24.00 | | $3.16 |
| LABORER - MASON TENDER | AD | $21.62 | | $3.89 |

| | | | | |
|---|---|---|---|---|
| LABORER - MORTAR MIXER | AD | $24.00 | | $3.16 |
| LABORER - PIPELAYER | AD | $21.62 | | $3.89 |
| LABORER - PLASTERER - HANDLER | AD | $24.00 | | $3.16 |
| LABORER - SCAFFOLD BUILDER | AD | $21.62 | | $3.89 |
| LABORER - TAMPER | AD | $24.00 | | $3.16 |
| MILLWRIGHT | AD | $34.90 | | $17.16 |
| PAINTER | AD | $25.86 | | $11.44 |
| PAINTER-INDUSTRIAL | AD | $33.05 | | $14.28 |
| PILEDRIVER | AD | $34.62 | | $16.51 |
| PLUMBER | AD | $42.62 | | $23.19 |
| POWER EQUIPMENT OPERATOR - ASPHALT DISTRIBUTOR | AD | $28.92 | 510 | $12.10 |
| POWER EQUIPMENT OPERATOR - BACKHOE | AD | $32.13 | | $13.67 |
| POWER EQUIPMENT OPERATOR - BOOM TRUCK | AD | $33.00 | 013 | $3.69 |
| POWER EQUIPMENT OPERATOR - BROOM / SWEEPER | AD | $30.18 | | $13.67 |
| POWER EQUIPMENT OPERATOR - BULLDOZER | AD | $32.13 | | $13.67 |
| POWER EQUIPMENT OPERATOR - CONCRETE PUMP | AD | $41.50 | | $0.25 |
| POWER EQUIPMENT OPERATOR - CRANE | AD | $38.70 | | $16.40 |
| POWER EQUIPMENT OPERATOR - CRANE - TOWER | AD | $38.70 | 510 | $16.40 |
| POWER EQUIPMENT OPERATOR - DRILL - RIG | AD | $32.13 | | $13.67 |
| POWER EQUIPMENT OPERATOR - EXCAVATOR | AD | $32.13 | | $13.67 |
| POWER EQUIPMENT OPERATOR - FORKLIFT | AD | $32.13 | | $13.67 |
| POWER EQUIPMENT OPERATOR - GRADALL | AD | $33.00 | | $5.87 |
| POWER EQUIPMENT OPERATOR - GRADER | AD | $38.33 | | $5.87 |
| POWER EQUIPMENT OPERATOR - HOIST | AD | $28.68 | 027 | $10.62 |
| POWER EQUIPMENT OPERATOR - LOADER | AD | $32.13 | | $13.67 |
| POWER EQUIPMENT OPERATOR - MECHANIC | AD | $32.13 | | $13.67 |
| POWER EQUIPMENT OPERATOR - MILLING MACHINE | AD | $37.11 | 510 | $4.85 |
| POWER EQUIPMENT OPERATOR - OILER | AD | $34.50 | 510 | $1.43 |
| POWER EQUIPMENT OPERATOR - PAVER | AD | $23.00 | 510 | $0.00 |
| POWER EQUIPMENT OPERATOR - ROCK / STUMP TUB GRINDER | AD | $29.05 | 003 | $12.10 |
| POWER EQUIPMENT OPERATOR - ROLLER - ASPHALT | AD | $23.50 | 510 | $2.50 |
| POWER EQUIPMENT OPERATOR - ROLLER - EARTH | AD | $26.55 | | $13.67 |
| POWER EQUIPMENT OPERATOR - SCRAPER | AD | $32.00 | | $9.55 |
| POWER EQUIPMENT OPERATOR - SCREED | AD | $30.93 | | $10.87 |
| POWER EQUIPMENT OPERATOR - SHOULDER MACHINE | AD | $26.09 | 003 | $12.10 |
| POWER EQUIPMENT OPERATOR - SKID STEER (BOBCAT) | AD | $30.18 | | $13.67 |
| POWER EQUIPMENT OPERATOR - SPREADER | AD | $33.27 | 003 | $15.82 |
| POWER EQUIPMENT OPERATOR - TRIMMER | AD | $27.21 | | $0.00 |
| POWER EQUIPMENT OPERATOR-VACUUM TRUCK | AD | $32.50 | 510 | $15.55 |
| RESILIENT FLOOR | AD | $32.08 | | $14.39 |
| ROOFER/WATERPROOFER | AD | $31.26 | | $14.71 |
| SHEETMETAL WORKER (INCLUDING METAL ROOFING) | AD | $44.37 | | $22.75 |

# 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
400Washington 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)(l) All bidders shall submit a list of all subcontractors contacted in preparation of their bid package or proposal.*
*(2) The list shall include the service to be performed, bid amount, and the race/ethnicity/gender of the business owner(s).*
*(B)(l) All bidders shall submit a list of all subcontractors to be used on a county contract in the bid package.*
*(2) 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.**

**126**

**MINORITY BUSINESS ENTERPRISE AND WOMEN BUSINESS ENTERPRISE REQUIREMENTS (MBE/WBE):** The resulting minority and women business participation requirement for this contract is 20%.

_.1 Each Prime Contractor must comply with all Minority Business Enterprise and Women Business Enterprises (MBE/WBE) participation requirements. Included with this solicitation package are copies of the County's MBE/WBE policy and provisions and MBE/WBE participation schedule forms. All MBE/WBE participation forms must be completed, executed, and **returned with the bid, proposal or qualifications** if a goal has been assigned. MBE/WBE participation forms are available online at www.baltimorecountymd.gov/go/mwbe or you may contact the buyer on the solicitation.

_.2 The Prime Contractor shall comply with the required participation levels on a cumulative basis for the full term of the contract. The Prime Contractor shall estimate the participation level (for the full term of the contract) for each subcontractor and/or supplier listed on the participation schedule.

_.3 If no minimum participation level has been assigned, the Prime Contractor shall nevertheless make a genuine good faith effort to comply with the County's MBE/WBE minimum participation goal even if the Prime Contractor has the capability to complete the work with its own workforce. The Prime Contractor shall make a good faith effort to obtain MBE/WBE subcontractor participation. The selected MBE/WBE subcontractor(s) must perform a commercially useful function when it is responsible for execution of the work of the contract and is carrying out its responsibilities by actually performing, managing, and supervising the work involved.

Certified Minority-owned or Certified Women-owned Prime Contractors may count their participation for up to 50% of the solicitation goal. Certified firms must make a good faith effort to obtain MBE/WBE subcontractor participation for the remaining portion of the goal. Example: 20% MBE/WBE participation goal. Certified Minority-owned or Certified Women-owned firm bidding as the prime may count for 10% of the goal provided they are self-performing the work. The remaining 10% must be subcontracted to an MDOT and/or City of Baltimore certified firm.

If the materials or supplies are purchased from an MBE/WBE supplier, 60% of the cost of the materials or supplies from the certified MBE/WBE supplier will be counted toward the MBE/WBE goal.

**The failure of a Bidder/Offeror to properly complete and submit the appropriate MBE/WBE plan forms and, if applicable, required Good Faith Effort (GFE) documentation shall result in the bid/proposal being deemed as nonresponsive and not susceptible of being selected for award.**

x.x Within 10 working days of receiving notification that the Bidder/Offeror is the apparent awardee, the Bidder/Offeror shall provide the following documentation to the Buyer:

a. BCG FORM C-Subcontractor MBE-WBE SUBCONTRACTOR PARTICIPATION NOTICE OF INTENT TO AWARD accompanied by a fully executed copy of the subcontract for each subcontractor.

b. Any other documentation required by the Buyer to ascertain Bidder's/Offeror's susceptibility of being selected for award in connection with the certified MBE/WBE participation goal.

**NOTE: If the apparent awardee fails to return each completed document within the required time, THE PROCUREMENT OFFICER MAY DETERMINE THAT THE APPARENT AWARDEE IS NOT RESPONSIBLE AND THEREFORE NOT SUSPECTIBLE FOR CONTRACT AWARD.**

x.x Prospective Bidders/Offerors are advised to carefully review the Minority and Disadvantage Business Enterprise Package regarding MBE/WBE or DBE participation.

x.x **All MBE/WBE** subcontractors must be MDOT or Baltimore City certified at the time of bid/proposals submission to count towards the MBE/WBE solicitation subcontract goal.

x.x If the Bidder/Offeror is a certified Minority or Women Business Enterprise, it should be so indicated with the certification number in the Bid or Technical Proposal.

_4._ _Under circumstances where mobilization payments are issued to the Prime Contractor, the subcontractor shall be paid an amount equal to their participation percentage no later than five (5) business days before they are required to mobilize to perform the contracted work.

The Prime Contractor shall submit proof of mobilization payment to subcontractors when the subcontractor performs their initial item of work in the MBE/WBE Compliance portal.

_5. **Prompt Payment**

**The Prime Contractor agrees to pay each subcontractor under this contract for satisfactory performance of its responsibilities under the applicable subcontract within 30 days of the subcontractor's satisfactory completion of the work as accepted by Baltimore County, Maryland. The Prime Contractor agrees further to return retainage payments to each subcontractor within 30 days after the subcontractor's satisfactory completion of work.** Any delay or postponement of payment from the above referenced time frame may occur only for good cause

following written approval of Baltimore County, Maryland. This clause applies to both MBE/WBE and non-MBE/WBE subcontracts.

- The Prime Contractor shall report the subcontractor's mobilization cost as the initial payment in the PRiSM Compliance Portal found under Compliance Reporting for Prime and Sub-Contractors at www.baltimorecountymd.gov/go/MBE/WBE.

- The Prime Contractor must include in its subcontracts language providing that the Prime Contractor and the subcontractors will use appropriate alternative dispute resolution mechanisms to resolve payment disputes.

- The Prime Contractor will not be reimbursed for work performed by subcontractors unless and until the Prime Contractor ensures that the subcontractors are promptly paid for the work they have performed.

- Prime Contractors may be subject to liquidated damages pursuant to Maryland and/or Baltimore County law, to ensure that MBE/WBEs and other contractors are fully and promptly paid.

_.6 All Prime Contractors and MBE/WBE and/or DBE subcontractors are required to report monthly to the County through the online Compliance Portal (PRISM). The portal can be found under *Compliance Reporting for Prime and Sub-Contractors* at www.baltimorecountymd.gov/go/MBE/WBE. Prime Contractors must provide a contact person and contact information for the MBE/WBE compliance reporting. If the Prime Contractor cannot submit its report on time, it must notify the County MBE/WBE Office and request additional time to submit the report. Failure to report in a timely manner may result in a finding of noncompliance, and may result in a finding of default under the terms of the contract. The County, in its sole discretion, may require additional reports regarding MBE/WBE. Questions regarding the use of this system can be directed to the MBE/WBE Office at mwbe@baltimorecountymd.gov or call 410-887-3407.

Revised 4/5/2023

# BALTIMORE COUNTY, MARYLAND
# MBE/WBE PARTICIPATION SUMMARY

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 December 6, 2022, the County Executive adopted the EXECUTIVE ORDER No. 2022-005 addressing MBE/WBE participation in County contracts. The 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 bidders/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): **https://marylandmdbe.mdbecert.com/**
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.

**1.** Expenditures for Materials and Supplies: **REGULAR DEALER**: A firm that owns, operates, or maintains a store, warehouse, or other establishment in which the materials or supplies required for the performance of the contract are bought, kept in stock, and regularly sold to the public in the usual course of business. To be a regular dealer, the firm must engage in as its principal business and in its own name, the purchase and sale of the products in question. A regular dealer in such bulk items as cement, gravel, stone and petroleum need not keep such products in stock, if it owns or operates distribution equipment. Brokers and Packagers shall not be regarded as manufacturers or regular dealers within the meaning of this section.

A **Regular Deater** must be engaged in selling the product in question to the public. This is important in distinguishing a **Regular Dealer**, which has a regular trade with a variety of customers, from a firm which performs supply-like functions on an ad hoc basis or for any one or two contractors with whom it has a special relationship.

A business that simply transfers title of a product from manufacturer to ultimate purchaser (e.g. broker or sales representative who re-invoices a product from the producing company to the

recipient or contractor) or a firm that puts a product in a container for delivery **would not** be considered a **Regular Dealer**.

A supplier of bulk goods may qualify as a **Regular Dealer** if it either maintains an inventory or owns or operates distribution equipment. With respect to the distribution equipment (e.g., a fleet of trucks), the term "operates" is intended to cover a situation in which the supplier leases the equipment on a regular basis for its entire business. It is not intended to cover a situation in which the firm simply provides drivers for trucks owned or leased by another party, (e.g., a prime contractor) or leases such a party's trucks on an ad hoc basis for a specific job.

Any participating DBE/MBE must serve a commercially useful function on a contract and not function as a broker, unless certified as a broker (insurance, real estate, etc). A firm is considered to perform a commercially useful function when it executes a distinct element of work by actually performing, managing and supervising the work involved and/or negotiating the cost of, arranging and accepting delivery of, and paying for the materials or supplies required for the work of its contract. **A contractor may count toward its DBE/MBE goal 60 percent of its expenditures for materials and supplies required under the contract and obtained from a DBE/MBE, regular dealer and 100 percent of such expenditures to a DBE/MBE manufacturer.**[1]

2. Customary Fees: Fees may be counted by a contractor towards its DBE/MBE goals for the following expenditures to DBE/MBE firms that are not manufacturers or regular dealers:

    a. The fees or commissions charged for providing a bona fide service, such as professional, technical, consultant or managerial services and assistance in the procurement of essential personnel, facilities, equipment, materials or supplies required for performance of the contract, provided that the fee or commission is determined by the County to be reasonable and not excessive as compared with fees customarily allowed for similar services.

    b. The fees charged for delivery of materials and supplies required on a job site (but not the cost of the materials and supplies themselves) when the hauler, trucker, or delivery service is not also the manufacturer of or a regular dealer in the materials and supplies, provided that the fee is determined by the County to be reasonable and not excessive as compared with fees customarily allowed for similar services.

    c. The fees or commissions charged for providing any bonds or insurance specifically required for the performance of the contract, provided that the fee or commission is determined by the County to be reasonable and .not excessive as compared with fees customarily allowed for similar services.

Information to be supplied: All bidders/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.

[1] MDOT MBE Manual https://www.mdot.maryland.gov/MBE_DOCS/mbe_manual.pdf

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 (excepting 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.

   - 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. 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 an 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.

4. The County in its sole discretion and/or upon written request may require additional reports regarding MBE/WBE.

a. **Prompt Payment of Subcontractors**: It is the policy of the Baltimore County Government MWBE Office that a contractor shall promptly pay a subcontractor any undisputed amount to which a subcontractor is entitled under a procurement contract.

**The Prime Contractor agrees to pay each subcontractor under this contract for satisfactory performance of its responsibilities under the applicable subcontract within 30 days of the subcontractor's satisfactory completion of the work as accepted by Baltimore County, Maryland. The Prime Contractor agrees further to return retainage payments to each subcontractor within 30 days after the subcontractor's satisfactory completion of work.** Any delay or postponement of payment from the above referenced time frame may occur only for good cause following written approval of Baltimore County, Maryland. This clause applies to both MBE/WBE and non-MBE/WBE subcontracts.

1. The Prime Contractor must include in its subcontracts language providing that the Prime Contractor and the subcontractors will use appropriate alternative dispute resolution mechanisms to resolve payment disputes.

2. The Prime Contractor will not be reimbursed for work performed by subcontractors unless and until the Prime Contractor ensures that the subcontractors are promptly paid for the work they have performed.

3. Prime Contractors may be subject to liquidated damages pursuant to Maryland and/or Baltimore County law, to ensure that DBEs and other contractors are fully and promptly paid.

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.

**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 https://baltimorecounty.prismcompliance.com/

To ensure that reports are filed in a timely manner, and that MBE/WBE requirements are met, the County will assess penalties for non-compliance, as follows:

(a) For failure to file timely monthly reports:

a. Assessment of a late fee of $10 per day per task, up to a maximum of $1,500 per task and/or

b. 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:

a. Assessment of a liquated damages of up to 10% of the contract value; and/or

b. Termination of the contract for convenience, with the contractor suspended from participating in County contracts for five (5) years together with assessment of a liquidated damages of up to 10% of the contract value; and/or

c. Termination of the contract for default together with assessment of a liquidated damages of 10% of the contract value.

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 seek 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 _____% Women
_____% Asian 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)

## BALTIMORE COUNTY, MARYLAND
## Certified MBE/WBE Utilization and Fair Solicitation Affidavit
## (FORM A)

***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.***

* * * * * * * * * * * * * * *

I acknowledge the goal for solicitation #20203 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 |

# BALTIMORE COUNTY, MARYLAND
## SUBCONTRACTOR PARTICIPATION SCHEDULE
## (FORM B)

**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.*

| | |
|---|---|
| **Prime Name** | **Prime Address, Telephone Number and Email** |
| **Bid/Proposal Name and Number** | **Project Location** |
| | **Base Bid** $_____ |
| **1. Subcontractor Name and Tax ID** | **Subcontractor Address** |
| **Telephone Number** _____<br>**Fax Number** _____<br>**Select One:** ☐ MBE ☐ WBE ☐ SBE ☐ N/A<br>**Provide if Applicable:**<br>☐ MDOT ☐ Baltimore City #_____ | **Minority Status (If applicable):**<br>❑ African American ❑ Disabled<br>❑ Alaska Native Corporation ❑ Disadvantaged<br>❑ Asian American Pacific ❑ Female<br>❑ Asian American Sub-continent ❑ American Indian<br>❑ Hispanic American<br>❑ Native American<br>❑ Small Business<br>❑ Other |
| **NAICS Code(s), Work to be Performed and Dollar Amount** | **Percent of Total Contract** |
| **2. Subcontractor Name and Tax ID** | **Subcontractor Address** |
| **Telephone Number** _____<br>**Fax Number** _____<br>**Select Once:** ☐ MBE ☐ WBE ☐ SBE ☐ N/A<br>**Provide if Applicable;**<br>☐ MDOT ☐ Baltimore City #_____ | **Minority Status**<br>❑ African American ❑ Disabled<br>❑ Alaska Native Corporation ❑ Disadvantaged<br>❑ Asian American Pacific ❑ Female American Indian<br>❑ Asian American Sub-continent ❑ Hispanic American<br>❑ Native American<br>❑ Small Business<br>❑ Other |
| **NAICS Code(s), Work to be Performed and Subcontract Dollar Amount** | **Percent of Total Contract** |
| **3. Subcontractor Name and Tax ID** | **Subcontractor Address** |
| **Telephone Number** _____<br>**Fax Number** _____<br>**Select Once:** ☐ MBE ☐ WBE ☐ SBE ☐ N/A<br>**Provide if Applicable:**<br>☐ MDOT ☐ Baltimore City #_____ | **Minority Status**<br>❑ African American ❑ Disabled<br>❑ Alaska Native Corporation ❑ Disadvantaged<br>❑ Asian American Pacific ❑ Female<br>❑ Asian American Sub-continent ❑ American Indian<br>❑ Hispanic American<br>❑ Native American<br>❑ Small Business<br>❑ Other |
| **NAICS Code(s), Work to be Performed and Subcontract Dollar Amount** | **Percent of Total Contract** |
| **Subcontractor Total Dollar Amount** | **Total Subcontractor Percent of Entire Contract** |
| **Form Prepared by:**<br>**Name/Date:** _____<br>**Title:** _____<br>**Email:** _____ | **Reviewed and Accepted by Baltimore County Minority Business Enterprise Office**<br>**Name** _____<br>**Title** _____<br>**Date** _____ |

| | | |
|---|---|---|
| ☐MBE or ☐WBE Prime Participation | _____% | $_____ |
| Total MBE Subcontracting Participation | _____% | $_____ |
| Total WBE Subcontracting Participation | _____% | $_____ |
| Total MBE/WBE Participation | _____% | $_____ |
| Total SB/SBE Participation | _____% | $_____ |

## BALTIMORE COUNTY, MARYLAND

### MBE/WBE PRIME PARTICIPATION SCHEDULE
### (Form B-Prime)

**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:

| NAICS CODE | WORK ITEM, SPECIFICATION NUMBER, LINE ITEMS OR WORK CATEGORIES (IF APPLICABLE). FOR CONSTRUCTION PROJECTS, GENERAL CONDITIONS MUST BE LISTED SEPARATELY. | DESCRIPTION OF SPECIFIC PRODUCTS AND/OR SERVICES | VALUE OF THE WORK |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

**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: _____

**BALTIMORE COUNTY, MARYLAND**
**MBE/WBE –UNAVAILABILITY CERTIFICATE**
**(FORM D)**

***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

# BALTIMORE COUNTY, MARYLAND
# MBE/WBE - OUTREACH EFFORTS - COMPLIANCE STATEMENT
# (FORM E)

***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

**DONALD I. MOHLER III**
County Executive

**KEITH DORSEY, Director**
Office of Budget and Finance

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

# S E C T I O N  V I

## 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.**20203 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 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 **Six Hundred Fifty-Five (655) WORKING DAYS** (the "Contract Period") after written notice has been given by the Director or his/her 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**

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:** _____

WITNESS

FEDERAL TAX ID or SS #: _____

_____

By: _____ (Seal)

_____
Type (Print) Name

Name: _____

Title: _____ Date: _____

WITNESS:

**BALTIMORE COUNTY, MARYLAND**

_____
Executive Secretary

By: _____ Date: _____
Stacy L. Rodgers, County Administrative Officer

_____
Type (Print) Name

APPROVED FOR FORM AND LEGAL SUFFICIENCY* (Subject to execution by the duly authorized Administrative official and Chairperson of the County Council, as indicated).

APPROVED:

_____ Date: _____
D'Andrea L. Walker, Director
Department of Public Works and Transportation

_____
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.

# P E R F O R M A N C E  B O N D  Bond No._____

| | |
|---|---|
| **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**

| | |
|---|---|
| **Penal Sum of Bond (express in words and figures)** DOLLARS | $_____ |
| **Towson Water Pumping Station Renovations** **Contract Name** | _____ **20** _____ **Date of Contract** |
| **20203 WX0** **Contract Number** | _____ **20** _____ **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**, 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 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

# PAYMENT BOND

Bond Number_____

**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**

**Penal Sum of Bond (express in words and figures)** DOLLARS $_____

**Towson Water Pumping Station Renovations**
**Contract Name**

_____ **20** _____
**Date of Contract**

**20203 WX0**
**Contract Number**

_____ **20** _____
**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

## INSURANCE PROVISIONS

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 coverage's listed herein.

1.2 Certificate of Insurance:
Before starting work on the contract, or prior to the execution of the Contract on those bid, the Contractor/Vendor shall provide Baltimore County, Maryland with a Certificate of Insurance provided by the County, or an exact replica thereof, 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.

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 (Data and Media) 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 under taken by the Contractor/Vendor.

2.6 Builder's Risk-see page 1008.